JPPIPA 11(1) (2025)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Development of Thematic Learning Using the Field-Trip Method Assisted by the Surrounding Environment to Improve Students' Scientific Literacy Abilities

Sri Luah[1], Parmin Parmin[2], Widiasih Widiasih[3*]

[1] Elementary Education, Postgraduate Program, Universitas Terbuka, Tangerang Selatan, Indonesia
[2] Natural Science Education, Faculty of Mathematics and Science, Universitas Negeri Semarang, Semarang, Indonesia
[3] Physic Education, Faculty of Teacher Training and Education, Universitas Terbuka, Tangerang Selatan, Indonesia

Received: October 06, 2024
Revised: December 02, 2024
Accepted: January 25, 2025
Published: January 31, 2025

Corresponding Author:
Sri Luah
widiasih@ecampus.ut.ac.id

DOI: 10.29303/jppipa.v11i1.9355

Abstract: The purpose of this study is to produce learning tools with a field-trip learning method assisted by the surrounding environment to improve students' scientific literacy skills. The learning tool developed in this class VI material has the theme of saving living things with the subtheme of plants, friends. Development device learning refers to the Borg & Gall model which consists of 7 steps. Thematic learning tools with the field-trip method assisted by the surrounding environment were validated by 3 expert validators in the fields of science, language and instructional design learning so that results that met the following valid success criteria were obtained: Syllabus 4.48 (very good category), RPP 3.95 (good category), student teaching materials 3.81 (good category), and LKS 4.35 (very good category). The results of the effectiveness test of the learning tool were carried out on grade VI students of SDN Dampyak 02, resulting in an increase in scientific literacy skills of 4.14 (good category). Effectiveness was also obtained when teachers managed learning by 4.56 (very good category). The level of practicality of the field trip method during learning was 4.14 (good category), 4.30 (very good category). Thus, the overall learning tools of the field trip method developed are valid, effective, and practical.

Keywords: Field trip; Scientific literacy abilities; Surrounding environment; Thematic learning

Introduction

The curriculum has changed along with the times. It is hoped that the curriculum changes will improve the quality of education in Indonesia, which is relatively low and underdeveloped when compared to neighboring countries, such as Malaysia and Singapore. The quality of education can be seen from the results of the 2022 "Trends in International Mathematics and Science Study" survey, conducted by the Global Institute. The survey results show that only 5% of Indonesian students are able to work on high-category reasoning questions, while Korean students can reach 71%. In contrast, 78% of Indonesian students can do low category memorization questions, while 10% of Korean students (Dalaila et al., 2022; Fitriani, 2023; Octaviani et al., 2023). This test is carried out on students who are 15 years old, because at 15 years old it is time to think about the right field for their future.

Other evidence was seen in 2015, the Organization for Economic Cooperation Development (OECD) through PISA reported that Indonesia's scientific literacy, reading and mathematics capabilities were ranked 69th out of 76 countries (Amala et al., 2023; Anshar et al., 2023; Apriliyani et al., 2023; Fakhriyah et al., 2017; Fatmawati & Khotimah, 2023). Based on these

How to Cite:
Luah, S., Parmin, P., & Widiasih, W. (2025). Development of Thematic Learning Using the Field-Trip Method Assisted by the Surrounding Environment to Improve Students' Scientific Literacy Abilities. *Jurnal Penelitian Pendidikan IPA*, *11*(1), 432–445. https://doi.org/10.29303/jppipa.v11i1.9355

results, it can be concluded that the material taught in Indonesia is different from that tested or internationally standardized (Hadiprayitno et al., 2021; Nuryanti et al., 2023). If this continues continuously and changes are not made immediately, it is feared that Indonesia will not be able to compete in a global context. Based on the problems above, steps that can be taken to overcome the backwardness of Indonesian students and to keep up with current developments, one of which is the need to train students in scientific literacy so that they are able to compete with students from other countries so that they have better quality (Adnan et al., 2021; Ismail et al., 2016; Roberts et al., 2020).

This research presents a novel approach by integrating the field-trip method, aided by the surrounding environment, to enhance students' scientific literacy in thematic learning. While previous studies have focused on improving scientific literacy in middle and high schools, little attention has been given to fostering these skills at the elementary level, where foundational cognitive abilities are developed. The innovation lies in applying this method to elementary school students, aiming to make learning more engaging and contextually relevant. Given the critical role that scientific literacy plays in equipping students with the skills needed to navigate an increasingly complex and technology-driven world, it is essential to introduce these competencies early in their education. By using real-world experiences and hands-on learning, this study seeks to bridge the gap between theoretical knowledge and practical application, preparing students for future scientific challenges. This approach is vital in addressing the current educational shortcomings and aligning Indonesia's education standards with global benchmarks.

Scientific literacy is the ability to use scientific knowledge in solving various daily problems based on evidence and facts that have been obtained (Foo & Foo, 2022; Nwedu, 2018; Samarawickrema & Raponi, 2020), Scientific literacy also includes skills and knowledge in making scientifically correct decisions in order to achieve a more comfortable, healthier and better life Scientific literacy is important because it aims to foster critical thinking, skills in solving problems creatively (Arsjad et al., 2023; Luengvilai et al., 2021; Omeodu & Abara, 2018; Turner et al., 2018). One way to train scientific literacy is through innovation by teachers. Teachers as learning managers must change their mindset from "teachers and what they will teach" to "students and what they will do" (Aikenhead, 2002; Bórquez-Sánchez, 2024; Guerrero & Torres-Olave, 2022; Lederman, 2018). Therefore, currently teachers are no longer the main source of information for students but have turned into facilitators and mentors whose job is to direct students (Costa et al., 2021; Norambuena-Meléndez et al., 2023; Pérez-Rodríguez et al., 2024).

The role of the teacher as a learning manager, the teacher must carry out learning planning so that the learning process can take place well and learning objectives can be achieved (Aydin, 2019; Ferrero et al., 2021). This is because every learning process certainly has a goal to be achieved. Things that must be considered to achieve these goals are how to organize learning, how to convey learning content, and how to organize interactions between existing learning resources so that they can function optimally (Anggoro et al., 2024; Batdı, 2017; Dharin et al., 2024).

Learning and living competence in the 21st century is characterized by four important things, namely: High understanding competence (Gope & Gope, 2022; McGunagle & Zizka, 2020; Saari et al., 2021), namely abilities related to a person's ability to have an understanding of various sciences; Critical thinking competency, namely the ability to use one's reasoning and thinking power to be able to criticize various phenomena that occur (Abdullateef et al., 2023; Pandya et al., 2022; Yadav et al., 2018); Collaboration and communication competence, namely abilities related to a person's ability to work and interact with other people (Mudzar et al., 2022; Satpathy et al., 2020; Tushar & Sooraksa, 2023); and Creative thinking competency, namely a person's ability to produce ideas, processes or products that are unique, have more value and have new characteristics (Buasuwan et al., 2022; Mahmud & Wong, 2022a; Tight, 2021). To be able to support and develop these four competencies, literacy skills are needed (Harishree & Mekala, 2020; Mahmud & Wong, 2022b; Srichaitung et al., 2024; Turiman et al., 2019).

The complexity of educational problems is the basic thing that influences the quality of education. The problems that exist in the world of education need to be fixed, one of which is improving the quality of education (Cansız & Cansız, 2019; Karataş et al., 2022; Stylos et al., 2023). One of the factors that can improve the quality of education is teachers. According to Shabir, teachers as professional educators are tasked with educating, teaching, guiding, directing, training, assessing and evaluating students in early childhood education on the formal education route (Altun & Kalkan, 2021; Hacıemınoglu, 2019; Sinaga et al., 2017). Teachers play a very important role in learning activities. Learning activities are a process carried out systematically where each component influences each other. This learning is a set of events that influence the teaching and learning process (Çelik & Doğru, 2024; Ma, 2023; Zeybekoğlu & Koğar, 2022).

Learning is a process of interaction between students and teachers (lecturers/instructors) in an effort to achieve learning objectives that take place in a certain location within a certain time period. Learning devices are tools or equipment to carry out processes that can enable teachers and students to carry out learning activities. In carrying out learning, teachers adhere to learning tools, whether carried out in the classroom, laboratory or outside the classroom. According to (Minister of Education and Culture, 2013) regarding basic and secondary education process standards, it is stated that the preparation of learning tools is part of learning planning. Elementary/MI learning tools, namely the meaning of learning tools, Graduate Competency Standards (SKL), content standards, process standards, and assessment standards, Content Competency (KI), Basic Competencies (KD), and Competency Achievement Indicators (GPA), as well as various thematic learning tools. As a teacher, the professional requirement is to support the performance of learning tools as a support for teaching administration. The learning tools prepared by teachers must be adapted to the needs and conditions of students and the conditions of the school environment. Learning tools include the Annual Program (AP), Semester Program (SP), Learning Implementation Plan (LIM), and Minimum Learning Completeness (MLC).

Integrated thematic learning as a concept involves various fields of study to provide meaningful experiences for students. Integrated thematic learning is related to several themes related to activities carried out by students in their daily lives. Teacher books and student books are not enough as learning resources in integrated thematic learning. There is a need for other learning tools that can support the achievement of the expected educational goals in learning. Teachers should provide opportunities for students to learn more actively in each lesson. Teachers must be able to guide and direct students' learning activities in accordance with meaningful learning objectives. Conditions like this can make teaching and learning activities student-oriented, not teacher-oriented. Based on the analysis the researchers conducted on the available thematic learning tools, their development is still not perfect, such as the syllabus, lesson plans, teaching materials, and even the worksheets used by students. Researchers also found a problem, namely that in the learning process teachers had not used varied learning models or ones that suited students' interests and creativity in learning. The teacher's weak understanding of thematic learning is due to the fact that teachers have not been directed enough to carry out thematic learning. Teachers are not directed enough to carry out learning using scientific learning models. Teachers generally carry out learning for students based on subjects.

Observation activities were carried out on teachers regarding learning tools. Observation results show that there are 61.50% difficulties in compiling learning tools, there are even teachers who have never compiled learning tools, 38.50%; difficulty in delivering the thematic system 23.10%; choose learning media 23.10%; attracting 46.20% student interest; Meanwhile, a student survey was conducted on 14 students from various classes from first to sixth grade and from three adjacent elementary schools in one subdistrict. The survey results showed that teachers who studied every day were always in class and used textbooks in class in the frequent category at 28.60%, always at 42.90%, sometimes at 14.30%, and never at 14.30%. Teachers who have ever used learning devices other than textbooks from the survey results in the often category are 21.40%, sometimes 78.60% and the never category is 0%. This survey also measures students' feelings about participating in learning. The survey results regarding whether students ever felt bored with the learning carried out by teachers in class showed that the results in the frequent category were 14.30%, the sometimes category was 64.50% and never was 21.40%.

Apart from the results of the pre-research survey activities that the researchers carried out, the researchers also observed the scientific literacy abilities of students at the elementary school where we will conduct the research. The results of students' scientific literacy abilities, especially in the content aspect of their scientific literacy abilities, show low results, namely below the predetermined criteria. From the results of several teachers' observations of student respondents through learning before applying the field-trip method, they show very low scores. expected on students' scientific literacy abilities. The average score for scientific literacy skills in the aspect of being able to explain scientific phenomena is 53.7%; the aspect of being able to evaluate and design scientific investigations was 56.9%; and the aspect of being able to interpret data and scientific evidence was 53.6%.

Thematic learning in class is currently still boring and still uses minimal learning tools in thematic learning. Teachers are still unable to develop thematic learning tools in teaching lessons using themes. There is still a mindset with the old model of learning which only uses source books. Apart from that, students are not yet active and cannot show their hard work in understanding and following the learning. It can be seen from their activities that if they are not silent, many students are chatting with their group of friends. Learning becomes meaningless for students. According to the author's observations, one of the causes of children's low interest in thematic learning comes from teacher factors such as the lack of teacher creativity in controlling the class when learning is carried out, so that learning becomes static, stressful and seems boring. All materials will not be enjoyed by children. Teachers do not develop thematic learning tools. Teachers are lacking in providing guidance in the form of direction and advice to children, who often only provide command sentences.

It is necessary for teachers to improve the quality of their learning by starting to create good learning plans by taking into account the objectives, characteristics of students, the material being taught, and the learning resources available. The reality is that there are still many learning processes that are of low quality, less efficient, have no appeal, tend to be boring or even tedious, so that the learning results achieved are not optimal. The low achievement of learning outcomes shows an indication of the low learning performance of students and the teacher's ability to manage quality learning. To find out why student achievement is not as expected, of course teachers need to reflect on themselves to be able to find out the factors that cause student failure in learning. As a good and professional teacher, this problem certainly needs to be immediately resolved.

The problems stated above lead to a process of teaching and learning activities that makes students less motivated in learning. Therefore, it can be said that the learning carried out is not in accordance with integrated thematic learning, namely that students are actively involved in every learning process. To overcome the problems raised, teachers should be able to develop learning tools that are oriented towards appropriate learning models. This model aims to provide a clear pattern and sequence in the development of the material carried out. However, to be more focused, the learning tools developed should use learning models that are appropriate to the conditions and demands of students. Learning tools must first be developed by completing them completely which must be prepared before the learning process. Therefore, learning tools are something that must be prepared by teachers.

Problems that occur in learning tools in thematic learning are still obstacles for teachers in the teaching they provide. The results of the situation analysis and initial observations in class VI of SDN Dampyak 02, Kramat District, Tegal Regency, show how little thematic learning tools have been developed. Currently, students still use learning tools prepared by schools or purchased from publishers, which are generally still standard, including syllabus, lesson plans, teaching materials, and assessment instruments in the form of worksheets containing written material and questions but are lacking in encouraging student activity. The existing learning tools are not supported by other assessment components such as lesson plan implementation observation sheets, student questionnaire responses, and student scientific literacy ability assessment sheets, so the reference for assessing learning outcomes is still limited. Another problem is the teacher's mastery of thematic learning tools, so that not all content can be implemented and delivered.

To overcome this problem, there needs to be a renewal or innovation in the teaching and learning process and student learning process, especially in class VI elementary school. One form of innovation in thematic learning in elementary school is through the Field-Trip learning method assisted by the surrounding environment.

Using the Field-Trip method with the help of the surrounding environment in developing learning tools can help students understand the existing material and carry out activities beyond what they will face by finding out, not being told.

According to (Books, 2017), Scientific literacy is the ability to identify, understand and give meaning to science-related issues that a person needs to make decisions based on scientific evidence. Scientific literacy is the main goal of science education

In reality, in the field, students' scientific literacy skills are now increasingly required to be capable and mastery. Meanwhile, students' scientific literacy abilities are still low and far from expectations. The indicators to be achieved in scientific literacy include: 1) Science as a body of knowledge; 2) Science as a way of investigating; 3) Science as a way of thinking; 4) Interaction between science, technology and society. Therefore, the use of the Field-Trip method assisted by the surrounding environment is appropriate for use in learning and can increase students' scientific literacy.

Based on the problems mentioned above, researchers are interested in conducting development research with the title: "Development of Thematic Learning Tools with the Field-Trip Method Assisted by the Surrounding Environment to Improve Students' Scientific Literacy Abilities".

In this research into the development of learning tools, we hope to achieve a learning tool that is valid, practical and effective. A learning tool is valid if there is a consistent linkage of each component of the learning tool that has been developed with the characteristics of the learning model being implemented. It is said to be practical if the learning tool is easy and can be used in teaching and learning activities, while it is said to be effective if the learning objectives can be achieved through the use of the learning tool. which was developed.

The application of the field-trip method to improve scientific literacy skills has been proven to improve students' scientific literacy skills. In several previous studies, research was conducted to prove the influence of the field-trip method on improving students' scientific literacy skills, research was also carried out at an advanced level. In this research This is development research carried out on elementary school thematic learning tools using the field-trip learning method with the help of the surrounding environment to improve students' scientific literacy skills, as an effort to train scientific literacy through more learning carried out in middle and high school. Similar efforts have not been made in elementary schools. We consider that scientific literacy-oriented learning should start as early as possible in elementary school, which is the initial stage of a student's life. The main reasons underlying the researchers' assumptions are the important value of focusing on providing children with skills that are important for everyday life, it is more effective in training scientific literacy in elementary schools where the level of complexity of learning topics is simpler than in secondary schools, and it is more efficient to get used to this from early.

The objectives of this development research, as derived from the problem formulation, are twofold. First, it aims to evaluate the feasibility of implementing thematic learning through the field-trip method assisted by the surrounding environment. This approach is specifically applied to the learning of Theme 1, "Save Living Creatures," for sixth-grade students at SDN Dampyak 02. Second, the research seeks to enhance students' scientific literacy skills by utilizing thematic learning tools that integrate the field-trip method with contextual environmental support. These objectives reflect the intent to create an engaging and effective learning experience that bridges theoretical concepts with practical, real-world applications, fostering critical scientific competencies in students.

Methods

This study utilizes a Research and Development (R&D) design, following the ten-stage procedure outlined by Borg and Gall. These stages include: needs analysis; data collection; model development; model assessment; model revision; limited testing; further model revision; broader model testing; post-broad testing revision; and dissemination and implementation. The research subjects comprise sixth-grade students from SDN Dampyak 02, Kramat District, Tegal Regency. Data collection instruments include observations and questionnaires. The questionnaires focus on various aspects, such as validation by material experts, interactive design experts, and language experts, alongside student response questionnaires. Observations are utilized to examine teacher management of learning and students' scientific literacy abilities.

The data analysis methods in this research include testing the validity of the learning tools, testing the practicality of the learning tools, and testing the effectiveness of the learning. The validity of the device is calculated from the average sum of each validator by dividing the number of validators, or can be formulated as:

$$x_{All} = \frac{x_1+x_2+x_3}{3} \quad (1)$$

Learning tools will be said to be valid if the average score is in the "good" category. There are two practical tests, namely analysis of the implementation of learning management and analysis of student responses. Analysis of teachers' abilities in managing learning was obtained from observations made by an observer during 6 learning meetings.

$$Implementation\ of\ Learning = \frac{\textbf{score of each indicator}}{\textbf{maximum score}} \quad (2)$$

Analysis of student responses in learning is calculated using a questionnaire which is then grouped by the percentage of student responses using the formula:

$$Students\ Response = \frac{Score\ Obtained\ by\ the\ Student}{Maximum\ Score} \times 100\% \quad (3)$$

According to Hake normalized gain can be calculated using the following formula.

$$Normalized\ Gain = \frac{Posttest\ Score - Pretest\ Score}{Ideal\ Maximum\ Score - Pretest\ Score} \quad (4)$$

The gain index criteria according to Hake can be seen in the Table 1.

Table 1. Gain Index Criteria

Gain Index	Criteria
$g \geq 0.7$	Tall
$0.3 \leq g < 0.7$	Currently
$0.3 < g$	Low

Result and Discussion

This section describes the results and discussion of research regarding Thematic Learning with the Field-Trip Learning Method assisted by the surrounding environment, My Friend's Plants Sub-theme. The research began by developing learning tools with field implementation to determine the validity and practicality of the tools and determine the effectiveness of learning using tools developed to improve students' scientific literacy skills.

Field tests were carried outin May 2023 to June 2023 for class VI students at SDN Dampyak 02 odd semester of the 2023/2024 academic year with a total of 20 students as an experimental class. Observations to measure students' scientific literacy abilities were carried out by observing each lesson containing science lessons which were carried out in 2 meetings in 6 lessons, namely in the 1st and 3rd lessons.

Figure 1. Implementation of thematic learning using the field-trip method assisted by the surrounding environment

Results of development research thematic learning device using the field-trip method, rocky surroundings, theme 1 save living creatures, sub-theme 1 plants, my friends, class VI what has been done includes the results of the development of learning tools and the results of research in the form of data analysis valid, practical and effective. Development of learning tools with the environmentally assisted field-trip method around theme 1 sub-theme 1 class VI uses the development model from Borg and Gall.

Learning Device Validation Test Results

In general, the results of expert validation of the development of thematic learning tools using the field-trip method assisted by the surrounding environment are tools that have valid, good criteria, and can be used with slight revisions. The results of the learning device validation are presented in Table 2.

Table 2. Learning Device Validation Results and Learning Observation Instrument

Recapitulation	Validator			Average	Criteria
	V1	V2	V3		
Syllabus	4.75	3.95	4.75	4.48	Good
lesson plan	3.95	3.10	4.81	3.95	Good
Student teaching materials	4.00	3.10	4.00	3.81	Good
Student worksheet	4.30	3.95	4.81	4.35	Good
Observation Sheet for Science Literacy Skills	4.00	3.23	4.00	3.74	Good
Learning Management Sheet	4.00	3.95	4.75	4.56	Good
Student Response Questionnaire on Learning	4.00	4.03	4.14	4.30	Good

The device developed is declared valid, this can be seen from the average validation by experts which meets the good criteria based on the indicators contained in the device development validity sheet.

Practicality Test Results

Table 3. Practicality Test Results

Practicality Indicator	Results (Mean)	Information
The teacher's ability to manage learning	4.21	Very good
Positive response from students to learning	3.96	Very good

The practicality of learning tools is determined by the following indicators: the results of observations of the teacher's ability to manage learning in the minimum good category; positive responses from students towards learning or in the good category. The practicality test results can be summarized in Table 3.

Based on the description above, it is known that the results of observations of teachers' abilities in managing learning are good. Students give good responses, because students can use learning tools well. This means that learning tools are easy to use and apply in the learning process. According to Riyadi et al. (2015), the learning tools developed are said to be practical if experts and practitioners state that theoretically the learning tools can be applied in the field and the level of implementation is in the good category.

Results of Increasing Scientific Literacy Skills

The indicators used to measure scientific literacy abilities in this research are threefold. First, the ability to explain scientific phenomena, which evaluates students' understanding of key scientific concepts and their application to real-world scenarios. Second, the ability to evaluate and design scientific investigations, reflecting students' skills in critically analyzing experimental processes and developing their own investigative methods. Third, the ability to interpret data and scientific evidence, demonstrating how students draw meaningful conclusions from data and use evidence to support their reasoning. The analysis of observations focuses on these indicators and examines the scientific literacy abilities of five selected students, highlighting their progress and performance across the research activities.

Description of increasing SP1 students' scientific literacy

1st Choice Students (SP1) are students from classes using the field-trip learning method assisted by the surrounding environment who get the highest score on the pretest. In this case, the selected students are experimental class students number 19 (E19). The results obtained by SP1 in observing scientific literacy abilities from the first to the sixth meeting can be seen in Figure 2.

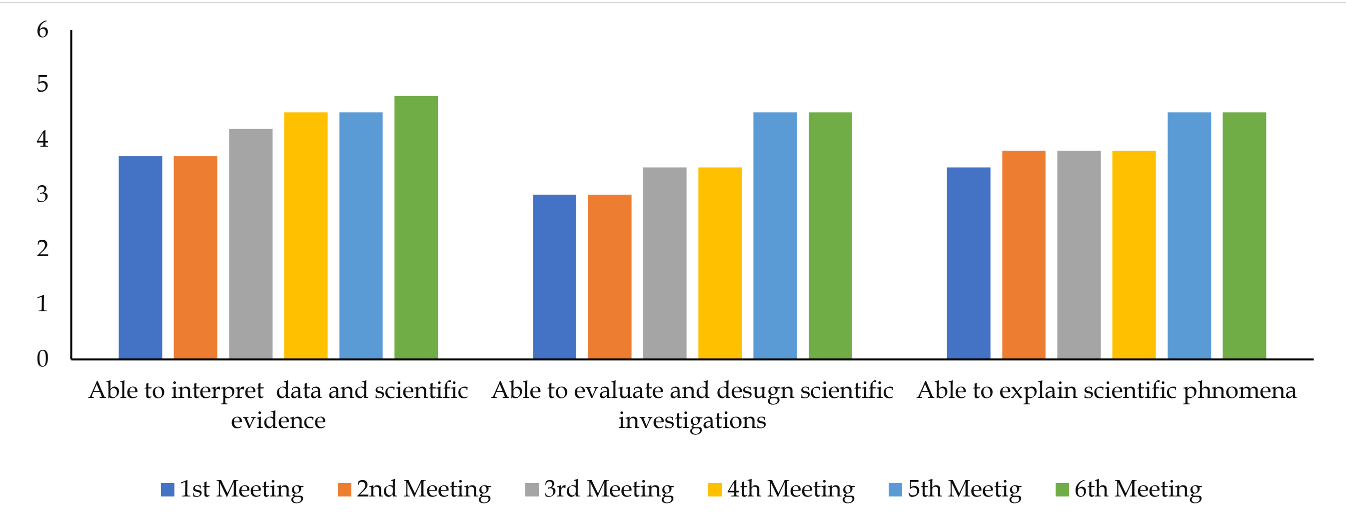

Figure 2. Increasing scientific literacy skills for each SP1 indicator

In the SP1 graph, it can be seen that for each indicator of students' scientific literacy abilities there was an increase in scores from the first meeting to the sixth meeting. This shows an increase in students' scientific literacy abilities in learning the field-trip learning method assisted by the surrounding environment. This result is reinforced by the results of gain calculations during the learning process. The development of SP1 scientific literacy abilities which have been recorded and processed using normalized gain can be presented in Table 4.

Table 4. Normalized gain of SP1 scientific literacy abilities

Normalized Gain	Calculation	Criteria
Gain I (from meeting 1 to 2)	0.00	low
Gain II (from meeting 2 to 3)	0.28	low
Gain III (from meeting 3 to 4)	0.00	low
Gain IV (from meeting 4 to 5)	0.70	currently
Gain V (from meeting 5 to 6)	0.29	low
Gain VI (from meeting 1 to 6)	0.84	tall

Description of increasing SP2 scientific literacy

2nd Choice Students (SP2) are students from classes using the field-trip learning method assisted by the surrounding environment who scored in quartile 1 on the pretest. In this case, the students selected are experimental class students number 17 (E17). The results obtained by SP2 in observing scientific literacy abilities from the first to the sixth meeting can be seen in Figure 3.

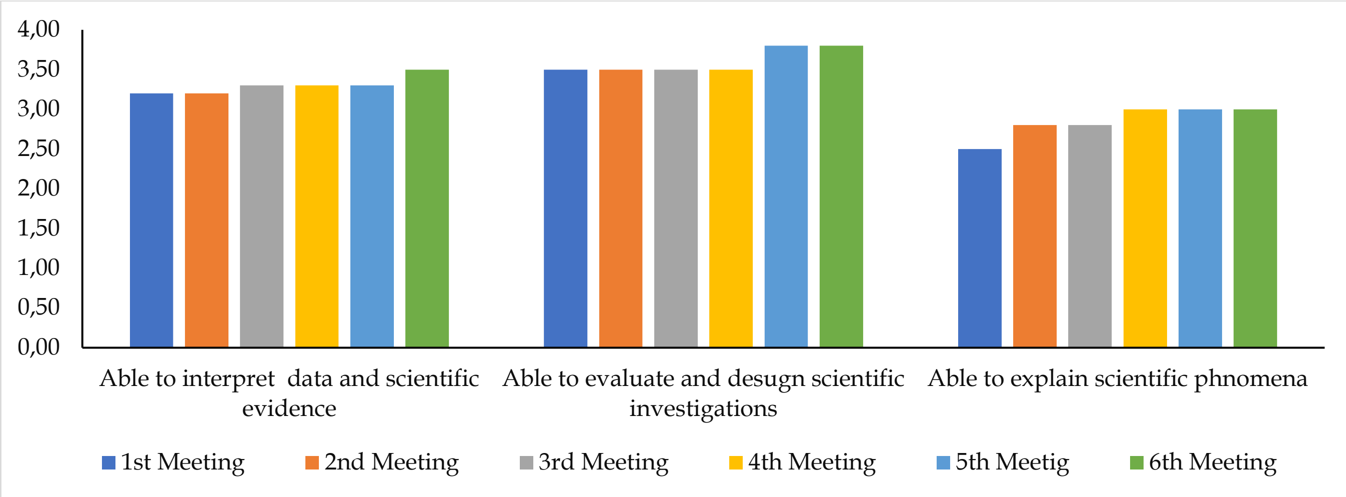

Figure 3. Increasing literacy skills science Each SP2 Indicator

In the SP2 graph, it can be seen that for each indicator of Saims' literacy ability, there was an increase in scores from the first meeting to the sixth meeting. This shows an increase in scientific literacy skills in learning using the field-trip learning method assisted by the surrounding environment. This result is reinforced by the results of the gain calculations during the learning process. The increase in SP2 scientific literacy skills that has been recorded and processed using normalized gain can be presented in Table 5.

Table 5. Normalized Gain of SP2 scientific literacy abilities

Normalized Gain	Calculation	Criteria
Gain I (from meeting 1 to 2)	0.00	low
Gain II (from meeting 2 to 3)	0.10	low
Gain III (from meeting 3 to 4)	0.05	low
Gain IV (from meeting 4 to 5)	0.03	low
Gain V (from meeting 5 to 6)	0.00	low
Gain VI (from meeting 1 to 6)	0.17	low

Description of improving SP3 scientific literacy skills

3rd Choice Students (SP3) are students from classes using the field-trip learning method assisted by the surrounding environment who scored in the 2nd quartile on the pretest. In this case, the students selected are experimental class students number 14 (E14). The results obtained by SP3 in observing scientific literacy abilities from the first to the sixth meeting can be seen in Figure 4.

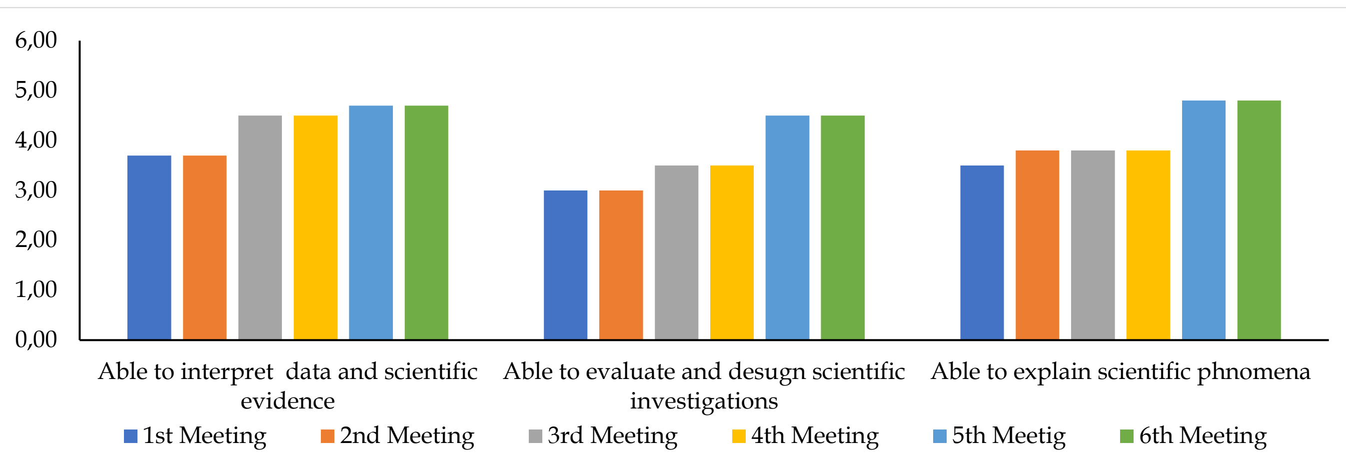

Figure 4. Increasing scientific literacy skills for each SP3 Indicator

In the SP3 graph, it can be seen that for each indicator of scientific literacy ability there was an increase in scores from the first meeting to the sixth meeting. This shows that there is an increase in scientific literacy skills in learning the field-trip learning method using the surrounding environment. This result is reinforced by the results of gain calculations during the learning process. Based on observations made by researchers, the recorded development of SP3 literacy skills is then processed using normalized gain and can be presented in Table 6.

Table 6. Normalized Gain of SP3 scientific literacy abilities

Normalized Gain	Calculation	Criteria
Gain I (from meeting 1 to 2)	0.00	low
Gain II (from meeting 2 to 3)	0.28	low
Gain III (from meeting 3 to 4)	0.00	low
Gain IV (from meeting 4 to 5)	0.70	currently
Gain V (from meeting 5 to 6)	0.00	low
Gain VI (from meeting 1 to 6)	0.78	tall

Description of improving SP4 scientific literacy skills

4th Choice Students (SP4) are students from classes with a field-trip learning model assisted by the surrounding environment who scored in the 3rd quartile on the pretest. In this case, the students selected are experimental class students number 12 (E12). The results obtained by SP4 in observing scientific literacy abilities from the first to the sixth meeting can be seen in Figure 5.

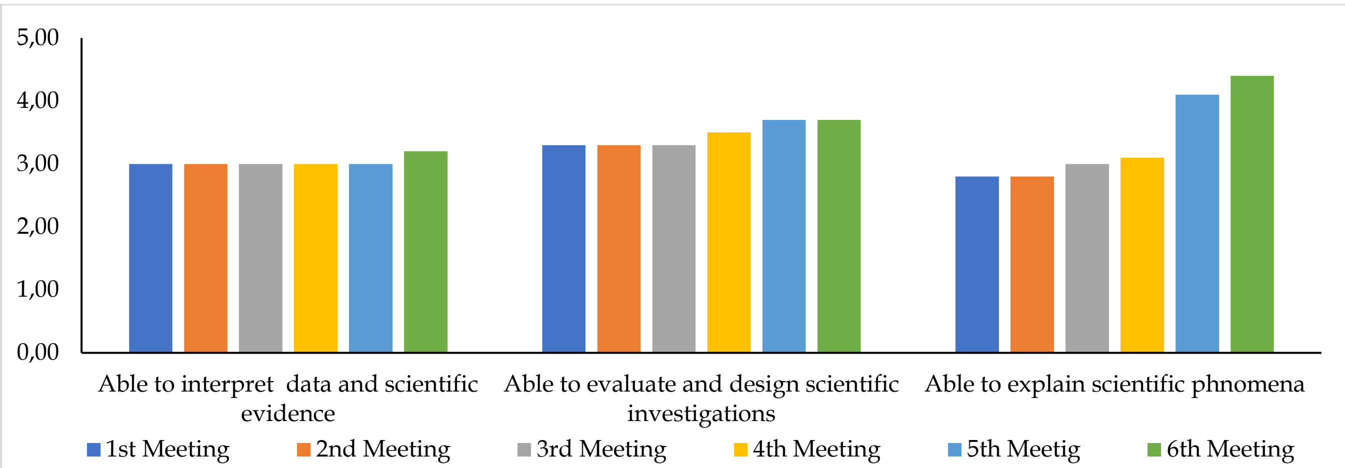

Figure 5. Increasing literacy skills for each SP4 indicator

In the SP4 graph, you can see an increase in scores for each indicator of scientific literacy ability from the first meeting to the sixth meeting. This shows an increase in scientific literacy skills in learning field-trip learning methods assisted by the surrounding environment. This result is reinforced by the results of gain calculations during the learning process. Based on observations made by researchers, the recorded development of SP4 scientific literacy skills is then processed using normalized gain and can be presented in Table 7.

Table 7. Normalized Gain of SP4 scientific literacy abilities

Normalized Gain	Calculation	Criteria
Gain I (from meeting 1 to 2)	0.05	low
Gain II (from meeting 2 to 3)	0.05	low
Gain III (from meeting 3 to 4)	0.05	low
Gain IV (from meeting 4 to 5)	0.06	low
Gain V (from meeting 5 to 6)	0.14	low
Gain VI (from meeting 1 to 6)	0.43	currently

Description of improving SP5 literacy skills

5th Choice Students (SP5) are students from classes using the field-trip learning method assisted by the surrounding environment who get the lowest score on the pretest. In this case, the students selected are experimental class students number 6 (E6). The results obtained by SP5 in observing literacy skills from the first to the sixth meeting can be seen in Figure 6.

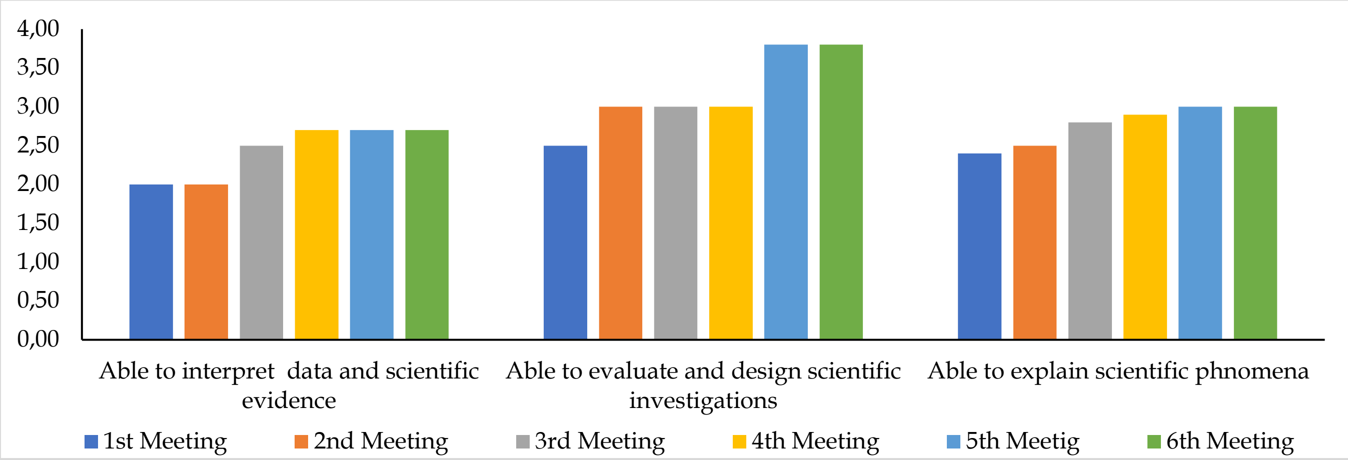

Figure 6. Increasing scientific literacy skills for each SP5 indicator

In the SP5 graph, you can see an increase in scores for each indicator of scientific literacy ability from the first meeting to the sixth meeting. This shows an increase in scientific literacy skills in learning the field-trip learning method assisted by the surrounding environment. This result is reinforced by the results of gain calculations during the learning process. Based on observations made by researchers, the recorded development of SP4 scientific literacy skills is then processed using normalized gain and can be presented in Table 8.

Table 8. Normalized Gain in scientific literacy abilities SP5

Normalized Gain	Calculation	Criteria
Gain I (from meeting 1 to 2)	0.05	low
Gain II (from meeting 2 to 3)	0.12	low
Gain III (from meeting 3 to 4)	0.04	low
Gain IV (from meeting 4 to 5)	0.11	low
Gain V (from meeting 5 to 6)	0.05	low
Gain VI (from meeting 1 to 6)	0.33	currently

In the description above, a description of increasing the scientific literacy abilities of each selected student has been presented. A recapitulation of each student's scientific literacy skills at each meeting can be presented in Figure 7.

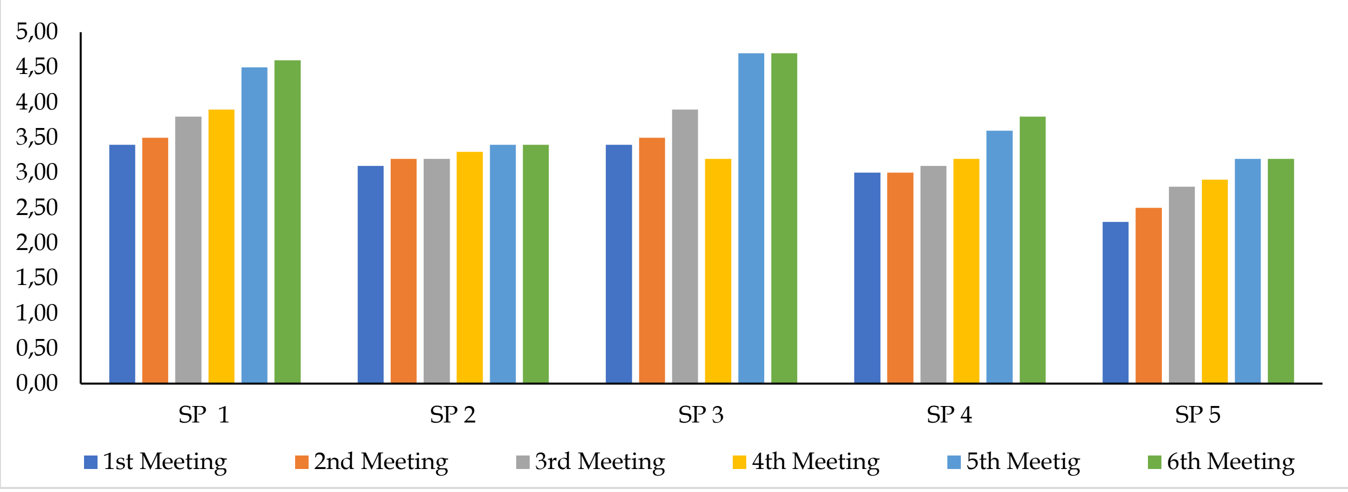

Figure 7. Increasing the literacy skills of selected students

In the graph above, it can be seen that all selected students show increased literacy skills. Overall, the average score for students' scientific literacy skills is 3.1. This means that by implementing the field-trip learning method assisted by nature, students' scientific literacy abilities are relatively high. This is confirmed by the results of the six students' gain test. Below is a recapitulation of the results of the science literacy skills gain test of five selected students.

Table 9. apability Normalized Gain Selected Student Science Literacy

SP	Meeting					Average
	1 & 2	2 & 3	3 & 4	4 & 5	1 & 5	
SP1	0.00	0.28	0.00	0.70	0.84	0.36
SP2	0.00	0.10	0.05	0.03	0.17	0.07
SP3	0.00	0.28	0.00	0.70	0.00	0.20
SP4	0.05	0.05	0.05	0.06	0.14	0.07
SP5	0.05	0.12	0.04	0.11	0.05	0.08
Average	0.02	0.16	0.03	0.32	0.24	0.15

Conclusion

Based on the research results and discussion regarding the development and outcomes of learning tools using the field-trip method assisted by the surrounding environment, the following conclusions can be drawn: the learning tools developed using the field-trip method assisted by the surrounding environment are deemed valid. According to expert validator assessments, the validation scores are as follows: Syllabus (4.48), Lesson Plan (RPP) (3.95), Student Teaching Materials (3.81), Student Worksheets (LKS) (4.35), Scientific Literacy Observation Instrument (4.14), Teacher Observation Instrument for Managing Learning (4.56), and Student Response Questionnaire (4.30). These results show that the average validation score indicates a good level of validity, meaning the learning tools are valid/feasible. The practicality of the learning tools is observed through: (1) Teacher's ability to manage learning, which is categorized as very good with a score of 4.21. (2) Positive student responses to the learning process, with an average score of 3.96. Based on the good average scores for validity and practicality, the learning tools are deemed suitable for use. The learning tools developed using the field-trip method assisted by the surrounding environment are considered effective. This is evidenced by the improvement in scientific literacy skills through the use of the field-trip method supported by the surrounding environment. Observations of student responses from the first to the final meeting indicate a noticeable improvement.

Acknowledgments

The author also expresses his gratitude to the parties who were willing to help during the process of writing this thesis, including: Director of the Open University Postgraduate Program who has provided a lot of guidance and direction during the preparation of this research proposal; Coordinator of the Basic Education Masters Program at UPBJJ Semarang Open University who never tires of providing assistance and motivation to the author to immediately complete this research proposal; All lecturers in the Open University Basic Education Masters Program who have provided guidance during their postgraduate education; Head of SD Negeri Dampyak 02 Kec. Kramat District. Tegal who has permitted and supported the author to make proposals and conduct research; Dampyak 02 State Elementary School teacher who has helped the author in completing this research proposal; Beloved husband, Mr. Agus Setyono and the entire family who always pray for and encourage the author to complete the research. The authors would like to express their gratitude to the funding institutions that provided support for this research. Special thanks are extended to the granting body for their contribution to the completion of this study. The authors also appreciate all participants and individuals who contributed to the development and implementation of this research

Author Contributions

S.L: Conceptualization, methodology, investigation, data curation, writing original draft preparation, and project administration; P.P: Validation, formal analysis, supervision, and writing—review and editing; W.W: resources, visualization, and funding acquisition

Funding

The study did not receive funding support from any government, private, or non-profit agency

Conflicts of Interest

The authors declare no conflict of interest.

References

Abdullateef, S. T., Musa Alsheikh, R., & Khalifa Ibrahim Mohammed, B. (2023). Making Saudi vision 2030 a reality through educational transformation at the university level. *Labour and Industry*, *33*(2), 225–240. https://doi.org/10.1080/10301763.2023.2184166

Adnan, A., Mulbar, U., & Bahri, A. (2021). Scientific literacy skills of students: Problem of biology teaching in junior high school in south sulawesi, indonesia. *International Journal of Instruction*, *14*(3), 847–860. Retrieved from https://eprints.unm.ac.id/24285/

Aikenhead, G. (2002). Renegotiating the culture of school science: scientific literacy for an informed public. *Recuperado De*. Retrieved from https://shorturl.asia/jU3Gi

Altun, A., & Kalkan, Ö. K. (2021). Cross-national study on students and school factors affecting science literacy. *Educational Studies*, *47*(4), 403–421. https://doi.org/10.1080/03055698.2019.1702511

Amala, I. A., Sutarto, S., Putra, P. D. A., & Indrawati, I. (2023). Analysis of Scientific Literacy Ability Junior High School Students in Science Learning on Environmental Pollution. *Jurnal Penelitian Pendidikan IPA*, *9*(3), 1001–1005. https://doi.org/10.29303/jppipa.v9i3.1816

Anggoro, S., Fitriati, A., Thoe, N. K., Talib, C. A., & Mareza, L. (2024). Differentiated instruction based on multiple intelligences as promising joyful and meaningful learning. *Int J Eval & Res Educ ISSN*, *2252*(8822), 1195. https://doi.org/10.11591/ijere.v13i2.24791

Anshar, M. A., Rahayu, Y. S., Erman, E., Karimah, K., & Rofiq, A. (2023). The Analysis of Umar Masud Junior High School Studentsâ€™ Science Literacy Ability. *Jurnal Penelitian Pendidikan IPA*, *9*(2), 926–930. https://doi.org/10.29303/jppipa.v9i2.2667

Apriliyani, P., Susantini, E., & Yuliani, Y. (2023). Validity of Science Literacy on the Respiratory System in Indonesia's Merdeka Curriculum. *IJORER : International Journal of Recent Educational Research*, *4*(2), 163–175. https://doi.org/10.46245/ijorer.v4i2.297

Arsjad, R. H., Hulukati, W., Djafri, N., & Rahim, M. (2023). Management of Project-Based Learning and Case-Based Learning in Guidance and Counseling Lessons. *International Journal of Professional Business Review: Int. J. Prof. Bus. Rev.*, *8*(7), 103. https://doi.org/10.26668/businessreview/2023.v8i7.2851

Aydin, H. (2019). The effect of multiple intelligence (s) on academic success: A systematic review and meta-analysis. *EURASIA Journal of Mathematics, Science and Technology Education*, *15*(12), em1777. Retrieved from https://www.ejmste.com/article/the-effect-of-multiple-intelligences-on-academic-success-a-systematic-review-and-meta-analysis-7736

Batdı, V. (2017). The effect of multiple intelligences on academic achievement: A meta-analytic and thematic study. *Educational Sciences: Theory & Practice*, *17*(6). Retrieved from https://jestp.com/menuscript/index.php/estp/article/view/415

Bórquez-Sánchez, E. (2024). Scientific literacy in biology and attitudes towards science in the Chilean education system. *Research in Science & Technological Education*, 1–25. https://doi.org/10.1080/02635143.2024.2320104

Buasuwan, P., Suebnusorn, W., Butkatunyoo, O., Manowaluilou, N., Kaewchinda, M., Lalitpasan, U., Srilapo, N., Sarnswang, S., Suksiri, W., & Wiboonuppatham, R. (2022). Re-envisioning a "skills framework" to meet 21st century demands: What do young people need? *Frontiers in Education*, *7*, 1004748. https://doi.org/10.3389/feduc.2022.1004748

Cansız, M., & Cansız, N. (2019). Reconceptualizing and field testing the scientific literacy framework by exploring the aspect of scientific literacy in Turkish science curriculum. *Journal of Baltic Science Education*, *18*(5), 681–691. Retrieved from https://openaccess.artvin.edu.tr/xmlui/handle/11494/2545

Çelik, M., & Doğru, M. (2024). Development of an attitude scale towards science literacy for secondary school pupils. *Journal of Turkish Science Education*, *21*(2), 304–323. https://doi.org/10.36681/tused.2024.017

Costa, A. M., Ferreira, M. E., & da Silva Loureiro, M. J. (2021). Scientific literacy: The conceptual framework prevailing over the first decade of the twenty-first century. *Revista Colombiana de Educación*, *81*, 195–228. Retrieved from http://www.scielo.org.co/scielo.php?pid=S0120-39162021000100195&script=sci_arttext

Dalaila, I., Widiyaningrum, P., & Saptono, S. (2022). Developing e-module based on socio-scientific issues to improve students scientific literacy. *Journal of Innovative Science Education*, *11*(3), 285–294. https://doi.org/10.15294/jise.v10i1.54500

Dharin, A., Budiningsih, C. A., & Nurwangid, M. (2024). Developing of Multiple Intelligences-Based Elementary School Learning Kits To Improve Student Creativity. *Revista de Gestão Social e Ambiental*, *18*(7), e05474–e05474. https://doi.org/10.24857/rgsa.v18n7-016

Fakhriyah, F., Masfuah, S., Roysa, M., Rusilowati, A., & Rahayu, E. S. (2017). Student's science literacy in the aspect of content science? *Jurnal Pendidikan IPA Indonesia*, *6*(1). https://doi.org/10.15294/jpii.v6i1.7245

Fatmawati, B., & Khotimah, H. (2023). Assessing the scientific literacy of prospective biology teachers. *Jurnal Penelitian Pendidikan IPA*, *9*(5), 2701–2706. https://doi.org/10.29303/jppipa.v9i5.3526

Ferrero, M., Vadillo, M. A., & León, S. P. (2021). A valid evaluation of the theory of multiple intelligences is not yet possible: Problems of methodological quality for intervention studies. *Intelligence*, *88*, 101566. https://doi.org/10.1016/j.intell.2021.101566

Fitriani, R. (2023). Development of environmental pollution e-module containing socio scientific issue to train students' scientific literacy. *Journal of Environmental and Science Education*, *3*(1), 14–20. https://doi.org/10.15294/jese.v3i1.59915

Foo, S. C., & Foo, K. K. (2022). Purposeful field trip: Impact on experiential learning opportunities and critical thinking skills. *Pertanika Journal of Social Sciences and Humanities*, *30*(1), 1–30. https://doi.org/10.47836/pjssh.30.1.01

Gope, D., & Gope, A. (2022). Students and academicians views on the engineering curriculum and industrial skills requirement for a successful job career. *Open Education Studies*, *4*(1), 173–186. https://doi.org/10.1515/edu-2022-0011

Guerrero, G. R., & Torres-Olave, B. (2022). Scientific literacy and agency within the Chilean science curriculum: A critical discourse analysis. *The Curriculum Journal*, *33*(3), 410–426. https://doi.org/10.1002/curj.141

Hacıemınoglu, E. (2019). Student and School Level Variables related to Elementary School Students' Attitudes towards Science. *Eurasian Journal of Educational Research*, *19*(80), 59–88. Retrieved from https://dergipark.org.tr/en/pub/ejer/issue/43338/548894

Hadiprayitno, G., Kusmiyati, K., Lestari, A., Lukitasari, M., & Sukri, A. (2021). Blended Learning Station-Rotation Model: Does it Impact on Preservice Teachers' Scientific Literacy? *Jurnal Penelitian Pendidikan IPA*, *7*(3), 317–324. https://doi.org/10.29303/jppipa.v7i3.676

Harishree, C., & Mekala, S. (2020). Need for 21st century skills education for teachers. *Roots International Journal of Multidisciplinary Researches*, *7*(1), 45–52. Retrieved from https://shorturl.asia/Og94J

Ismail, I., Permanasari, A., & Setiawan, W. (2016). STEM virtual lab: An alternative practical media to enhance student's scientific literacy. *Jurnal Pendidikan IPA Indonesia*, *5*(2), 239–246. https://doi.org/10.15294/jpii.v5i2.5492

Karataş, F. Ö., Orçan, F., Çelik, S., Uludüz, Ş. M., Bektaş, B. T., & Akaygün, S. (2022). Perception and Reality: Two Dimensions of Scientific Literacy Measures. *Journal of Turkish Science Education*, *19*(1), 129–143. https://doi.org/10.36681/tused.2022.114

Lederman, N. G. (2018). The ever changing contextualization of nature of science: Recent science education reform documents in the US and its impact on the achievement of scientific literacy. *Enseñanza De Las Ciencias*, *36*(2), 5–22. https://doi.org/10.5565/rev/ensciencias.2661

Luengvilai, C., Wongta, N., & Yodmongkol, P. (2021). Design and Application of a Legal Game to Promote Factual Investigation Knowledge for Undergraduate Law Students. *Pertanika Journal of Social Sciences & Humanities*, *29*(1). Retrieved from http://journals-jd.upm.edu.my/resources/files/Pertanika PAPERS/JSSH Vol. 29 (1) Mar. 2021/39 JSSH-5404-2019.pdf

Ma, Y. (2023). The effect of inquiry-based practices on scientific literacy: The mediating role of science attitudes. *International Journal of Science and Mathematics Education*, *21*(7), 2045–2066. https://doi.org/10.1007/s10763-022-10336-9

Mahmud, M. M., & Wong, S. F. (2022a). Digital age: The importance of 21st century skills among the undergraduates. *Frontiers in Education*, *7*, 950553. https://doi.org/10.3389/feduc.2022.950553

Mahmud, M. M., & Wong, S. F. (2022b). Stakeholder's perspectives of the twenty-first century skills. *Frontiers in Education*, *7*, 931488. https://doi.org/10.3389/feduc.2022.931488

McGunagle, D., & Zizka, L. (2020). Employability skills for 21st-century STEM students: the employers' perspective. *Higher Education, Skills and Work-Based Learning*, *10*(3), 591–606. https://doi.org/10.1108/heswbl-10-2019-0148

Mudzar, B. M., Muzdalifah, N., & Chew, K. W. (2022). Change in Labour Force Skillset for the Fourth Industrial Revolution: A Literature Review. *International Journal of Technology*, *13*(5). https://doi.org/10.14716/ijtech.v13i5.5875

Norambuena-Meléndez, M., Guerrero, G. R., & González-Weil, C. (2023). What is meant by scientific literacy in the curriculum? A comparative analysis between Bolivia and Chile. *Cultural Studies of Science Education*, *18*(3), 937–958. https://doi.org/10.1007/s11422-023-10190-3

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*(11), 9391–9396. https://doi.org/10.29303/jppipa.v9i11.5208

Nwedu, C. N. (2018). Taking Clinical Legal Education from Classrooms to Streets: A Practical Perspective to Solving Social Problems. *Asian Journal of Legal Education*, *5*(2), 137–151. https://doi.org/10.1177/2322005818768683

Octaviani, L., Ismail, I., & Akmalia, H. A. (2023). The Development of Biology E-Module Based on Unity of Sciences and Science Literacy as Teaching Materials for Students in Senior High School. *Al Kawnu: Science and Local Wisdom Journal*, *3*(1), 49–60. https://doi.org/10.18592/ak.v3i1.10884

Omeodu, M. D., & Abara, J. F. (2018). Relevance of field trips in teaching and learning of physics in secondary schools in Port Harcourt Metropolis Rivers State. *International Journal of Education and*

Evaluation, *4*(4), 67–87. Retrieved from https://shorturl.asia/FmTO8

Pandya, B., Patterson, L., & Ruhi, U. (2022). The readiness of workforce for the world of work in 2030: perceptions of university students. *International Journal of Business Performance Management*, *23*(1–2), 54–75. https://doi.org/10.1504/IJBPM.2022.119555

Pérez-Rodríguez, F., Guerrero, G. R., & Donoso-Díaz, S. (2024). Scientific culture in the normative and curriculum documents of Initial Teacher Education in Chile. *Cultural Studies of Science Education*, 1–21. https://doi.org/10.1007/s11422-024-10226-2

Riyadi, R. A., Nur, M., & Ismayati, E. (2015). *Pengembangan Perangkat Pembelajaran Berbasis E-Learning Moodle dengan Model Pengajaran Langsung di SMKN 2 Tarakan* [State University of Surabaya]. Retrieved from https://shorturl.asia/AYTqo

Roberts, F., Hobbs, H., Jessop, H., Bozzolini, C., Burman, J., Greco, R., Ismail, A., Kazmi, M., Kirgizov, K., & Mancardi, G. (2020). Rehabilitation before and after autologous haematopoietic stem cell transplantation (AHSCT) for patients with multiple sclerosis (MS): consensus guidelines and recommendations for best clinical practice on behalf of the Autoimmune Diseases Working Party. *Frontiers in Neurology*, *11*, 556141. https://doi.org/10.3389/fneur.2020.556141

Saari, A., Rasul, M. S., Yasin, R. M., Rauf, R. A. A., Ashari, Z. H. M., & Pranita, D. (2021). Skills sets for workforce in the 4th industrial revolution: Expectation from authorities and industrial players. *Journal of Technical Education and Training*, *13*(2), 1–9. Retrieved from https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/7830

Samarawickrema, G., & Raponi, K. (2020). A field trip in the first week at university: perspectives from our LLB students. *The Law Teacher*, *54*(1), 103–115. https://doi.org/10.1080/03069400.2018.1547030

Satpathy, S., Dash, K. K., & Mohapatra, M. (2020). A study on the new design thinking for industrial revolution 4.0, requirements and graduate readiness. *Rupkatha Journal on Interdisciplinary Studies in Humanities*, *12*(4). https://doi.org/10.21659/rupkatha.v12n4.09

Sinaga, P., Kaniawati, I., & Setiawan, A. (2017). Improving secondary school students' scientific literacy ability through the design of better science textbooks. *Journal of Turkish Science Education*, *14*(4), 92–107. https://doi.org/10.36681/

Srichaitung, P., Wuttisela, K., & Supasorn, S. (2024). Science Learning Management and Learning Skills Development for the 21st Century Learners. *Journal of Science and Science Education Vol*, *7*(2). Retrieved from https://so04.tci-thaijo.org/index.php/JSSE/article/download/269282/183217/1105115

Stylos, G., Siarka, O., & Kotsis, K. T. (2023). Assessing Greek pre-service primary teachers' scientific literacy. *European Journal of Science and Mathematics Education*, *11*(2), 271–282. https://doi.org/10.30935/scimath/12637

Tight, M. (2021). Twenty-first century skills: meaning, usage and value. *European Journal of Higher Education*, *11*(2), 160–174. https://doi.org/10.1080/21568235.2020.1835517

Turiman, P., Wook, T., & Osman, K. (2019). 21st Century skills mastery amongst science foundation programme students. *Int. J. Adv. Sci. Eng. Inf. Technol*, *9*(1), 46. Retrieved from https://shorturl.asia/v7SyJ

Turner, J., Bone, A., & Ashton, J. (2018). Reasons why law students should have access to learning law through a skills-based approach. *The Law Teacher*, *52*(1), 1–16. https://doi.org/10.1080/03069400.2016.1201739

Tushar, H., & Sooraksa, N. (2023). Global employability skills in the 21st century workplace: A semi-systematic literature review. *Heliyon*. Retrieved from https://www.cell.com/heliyon/fulltext/S2405-8440(23)08231-2

Yadav, N., Gupta, K., & Khetrapal, V. (2018). Next education: Technology transforming education. *South Asian Journal of Business and Management Cases*, *7*(1), 68–77. https://doi.org/10.1177/2277977918754443

Zeybekoğlu, Ş., & Koğar, H. (2022). Investigation of variables explaining science literacy in PISA 2015 Turkey sample. *Journal of Measurement and Evaluation in Education and Psychology*, *13*(2), 145–163. https://doi.org/10.21031/epod.798106