The Profile of Enhancing Student Science Literation Ability Through Scientific Learning

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Abstract. This research is an insufficient experiment that seeks to characterize the profile of the improvement in students' literacy ability as a result of their involvement in scientific study. The research methodology that was employed was a one group pretest-posttest design, and the sample size for the study was 32 students from class VII at one of the SMP Muhammadiyah 3 campuses in Yogyakarta during the academic year 2014/2015. These students were chosen using the purposive sampling method. The procedure for collecting the data involved administering a science literacy test that was comprised of 22 questions and offered respondents a total of four possible responses to each question. In order to determine whether or not there was an increase in the user's capacity for scientific literacy, the data were evaluated by computing the normalized average score (N-gain) score data. This was done with Microsoft Excel. After that, the data were subjected to statistical analysis, which consisted of comparing the students' pre-test and post-test values, as well as carrying out a normality test, a homogeneity test, and a paired sample t-test with the help of the IBM SPSS Statistics 22 program. The overall yield of N-gain that was obtained was 0.46, which places it in the category of having a moderate rise. The outcome of the hypothesis test using the t-test indicates a significance level of 0.00; it is lower than = 0.05 (Sign 0.05), which indicates that the hypothesis is not supported. The results of this test suggest that students' levels of science literacy before and after they applied scientific study are not the same. Another way of expressing this idea is to say that there is a substantial gap between students' levels of science literacy before and after they applied scientific learning. According to the findings of this study, students' literacy skills can be improved through the study of science, both in terms of their level of competency and their level of knowledge on the subject matter of environmental pollution.

Keywords: Scientific Literacy · Scientific Learning · Environmental Pollution

1 Introduction

It is imperative that the Indonesian educational system attain a high level of scientific literacy. According to a ranking by the OECD, the position of Indonesian institutions among developing nations in terms of scientific literacy is still low. Sani revealed that

Y. Sulaiman et al. (Eds.): ICoSPACS 2022, ASSEHR 774, pp. 166–179, 2024.
https://doi.org/10.2991/978-2-38476-106-7_21

education in the twenty-first century should lead to a sequence of activities that prepare students for the era of globalization, environmental issues, advances in information technology, convergence of science and technology, knowledge-based economics, the rise of creative industries and culture, power shifts in the global economy, and the influence and impact of science-based technology [1]. In this regard, the mastery of literacy in reading, mathematics, and science is an issue that must be addressed for learning that is not only focused on the learning process and implementation of knowledge mastery, but also learning activities. The NRC states that scientific literacy is the ability to use science knowledge in an effort to solve problems [2].

In addition, Toharudin emphasized the significance of students achieving a high level of scientific literacy since it allows them to better comprehend issues concerning the economy, health, and the environment, as well as other challenges confronted by contemporary society that are heavily reliant on technological advancement and the progression of scientific research.

The Organization for Economic Co-operation and Development, more often known as the OECD, is a global organization that focuses on the improvement of educational opportunities for people all over the world. Every three years, the Organization for Economic Co-operation and Development (OECD) runs a program called the Program for International Student Assessment (PISA). The pupils' level of scientific literacy was one of the aspects that were evaluated as part of this program. PISA includes Indonesia as one of the nations that takes part in the test every year. However, the outcomes that were obtained are in no way satisfying. Indonesia's accomplishments have always been below the worldwide standards that have been established, and they have even shown a trend of declining. The rating of Indonesian citizens' scientific literacy from the years 2000 to 2012 is provided in Table 1.

According to the data presented in Table 1, the scientific literacy level of pupils in Indonesia is generally quite poor. This circumstance highlights the importance of making efforts that are both gradual and ongoing to enhance the teaching of science in schools. In order to be successful, efforts to improve the quality of education provided in schools need to be supported by information regarding the amount to which the scientific literacy achievements of students are reviewed in terms of their aspects. Furthermore, these efforts need to be fitted to the goals of Indonesia's national education system.

Table 1. Data of Indonesian rating on scientific literacy.

Year of Study	Average Score of Indonesia	Maximum Score	Rank of Indonesia	Number of Country Study Participants
2000	393	500	38	41
2003	395	500	38	40
2006	393	500	50	57
2009	383	500	60	65
2012	375	500	64	65

Article 3 of Law No. 20 Concerning the National Education System outlines the goals of national education. These goals include the development of people who believe in and fear God Almighty, possess noble character, are healthy, knowledgeable, capable, creative, and independent, and who become democratic citizens to be responsible. These goals ought to be accomplished by efforts that are both planned and systematized, and they should be accomplished through instructional activities in schools. According to Sani, a great education requires students to participate actively in their own education and to lead the construction of values that students will need to take with them into adulthood [1]. Students need to acquire the skills necessary to continue their education throughout their lives, study from a variety of sources, learn to learn from one another, adapt, and solve difficulties. Because of this, the paradigm of education needs to be altered so that it positions students as the focus of their own learning and instructs them to develop their own knowledge based on the natural occurrences that take place around them. This is known as a student-centered approach to education. In order for students to actively seek new knowledge and to act as facilitators or mediators for learning, the role of the teacher in the learning process needs to transition from that of a teacher to that of a learning designer.

Learning about science is one of the subjects that has prompted educators to engage in some thought-provoking conversation in conjunction with the introduction of the curriculum for 2013. It is believed that education that corresponds to the constructivist philosophy can meet the requirements of the national education goals that need to be realized at this time. The application of this learning presents a challenge for teachers, and they might meet this challenge by developing student activities to take place throughout learning activities.

According to Majid, activities in scientific learning are those activities that are aimed to build students' thinking skills in order to develop students' curiosity [3]. The expectation is that students will be driven in this way to observe the phenomena that are occurring around them, to record or identify facts, and then to frame problems that they want to know the answers to by asking questions. It is expected of students that they would be able to articulate what it is that they wish to learn after completing this phase. It is anticipated that learning environments such as these will encourage students to search out knowledge from a variety of sources, rather than having it told to them by the teacher.

Students are encouraged to notice a wide variety of phenomena that are relevant to their lives on a daily basis as part of their scientific education. Students are expected to be able to identify issues that are associated with the body of information that will be acquired through the process of making observations described here. The role of the teacher is that of a facilitator who assists students in the development of critical thinking skills, problem solving abilities, and group skills in order for students to recognize problems, create hypotheses, search for data, perform experiments, design solutions, and select the best answer for the conditions of the problem. Students are able to uncover connections within their own knowledge, develop their potential for creative problem solving, and take on a greater sense of responsibility as a result of their scientific education. In accordance with this, the scientific literacy abilities of the students will be developed on their own and will progress over the course of their education [4]. In light of the information presented above, the purpose of this investigation is to investigate how scientific education can contribute to the development of students' scientific literacy skills.

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2 Theoretical Basis

2.1 Science Literacy

Literacy in science is derived from two Latin words: Literatus, which means literate, educated, or inscribed with letters; and Scientia, which means knowledgeable. Paul de Hart Hurt of Stanford University, C. E. de Boer was the first individual to use the term scientific literacy. Science literacy, as defined by Hurt [2], is the process of comprehending and applying science to meet human requirements.

OECD defines scientific literacy as the competence, knowledge [5], and attitude that refers to science as the following: (1) individual scientific knowledge and the ability to use that knowledge to identify problems, acquire new knowledge, explain scientific phenomena, and draw conclusions based on relevant evidence with science issues; (2) understanding the main characteristics of knowledge built on human knowledge and inquiry; (3) sensitivity to how science and technology form material, intangible, and immaterial forms; and (4) being aware of how science and technology form material, immaterial, and immaterial forms Toharudin, et al. take this definition and simplify it even further by defining scientific literacy as a person's capability to understand science [2], communicate science (orally and in writing), and apply science knowledge to problem-solving in such a way that they have a high attitude and sensitivity to themselves and their environment. Consider scientific evidence before settling on a course of action.

The OECD states that context, knowledge, competence, and attitude are the four components that make up the field of science literacy [5]. The PISA test is given to students so that they can gain an understanding that there is a particular significance that science holds for both individuals and society in terms of enhancing and preserving quality of life as well as in the formation of public policy. As a result, the PISA science literacy questions center on contexts or specific situations for assessment activities that are tied to individual, social, and global rules. The PISA assessment of scientific literacy does not focus on the context, but rather evaluates the scientific literacy itself. This study makes reference to the PISA test that was administered in 2013, during which the subject area of scientific literacy was evaluated as a component of both knowledge and competence.

Science Knowledge Aspect. The goal of the Program for International Student Assessment (PISA) is to provide a description of the extent to which students are able to apply

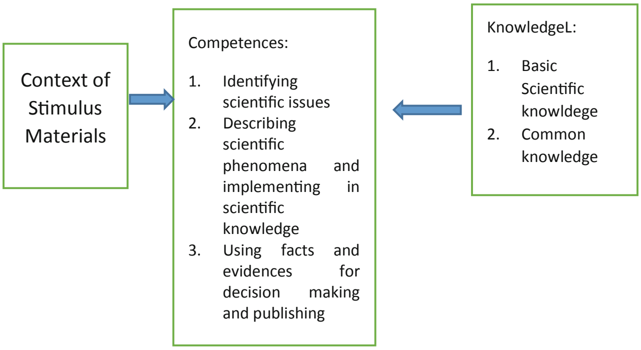

Fig. 1. The Diagram to construct and analyse scientific literacy instruments.

their knowledge in situations that are pertinent to their life. As a result, the primary areas of physics, chemistry, biology, earth and space science, and technology will be chosen to serve as the basis for the evaluation of one's level of knowledge.

Aspects of Science Competence PISA Assessment in Scientific Literacy Gives Priority to Several Competencies. Namely:

1. Recognizing scientific topics, which includes recognizing problems that could be researched scientifically, recognizing important words for scientific information, and acknowledging the characteristics of scientific investigation.
2. Provide an explanation for scientific phenomena, including the application of scientific knowledge in a specific context, the description or interpretation of events and the forecast of changes, and the identification of descriptions, explanations, and relevant predictions.
3. Utilizing scientific evidence, specifically interpreting scientific evidence and drawing conclusions, providing reasons to support or reject conclusions, and identifying assumptions made in the process of reaching conclusions, communicating conclusions related to evidence and the reasoning behind conclusions, and making reflections based on the social implications of scientific conclusions. The results of the OECD's assessment of scientific literacy are depicted in Fig. 1.

2.2 Scientific Learning

Scientific learning, according to Abidin, is problem-solving-oriented learning that requires students to think critically, creatively, and communicate to improve their understanding. This understanding implies that students must move like scientists [4].

Thus, the scientific learning process helps students solve problems through meticulous planning, data collecting, and data analysis to draw conclusions. According to Abidin, students must be sensitive to information gathering, 4) reasoning, and 5) communicating to complete a sequence of learning activities [4]. Majid found that students use facts and theories to enhance logical thinking skills during scientific learning [5].

In addition, according to Barringer, scientific learning is learning that pushes pupils to think in a methodical and critical manner in order to find solutions to issues. Through activities such as brainstorming, creative thinking, doing research or inquiry activities, and creating knowledge conceptualizations, learning will involve students in the process of issue solving. When it comes to learning theories, scientific learning adheres to the constructivist learning theory. Under this theory, students are responsible for developing their own personal conceptualizations of information, and the function of the instructor is limited to that of a facilitator when it comes to the actual learning activities. According to Lerman's interpretation [6], constructivism is based on two hypotheses: 1) knowledge is actively constructed by individuals; and 2) becoming knowledgeable is a process of adaptation. Adaptation is defined as the process by which an individual tries to organize his experience with the environment around him, which results in the formation of a concept. In the same passage, Watts and Bently explain one of the tenets of the constructivist school of thought, which is that an individual's knowledge is formed both from within themselves and in connection with the outside world. People acquire knowledge both internally and in connection to objects that are present in their surrounding environment.

According to the previous explanation, the researcher has the presumption that scientific learning that embraces constructivism conditions students to be actively involved in the learning process through a series of scientific methods to construct their own independent conceptualization of knowledge through phenomena that are familiar to students in their everyday lives. In order for students to be able to immediately enhance their literacy abilities through the use of their knowledge to address certain difficulties that arise in their daily lives as a result of this learning.

3 Research Methods

3.1 Research Design

The study method that was employed was a weak experiment study with one group pretest-posttest design research design. This research design only comprised one experimental class, and its purpose was to determine the profile of students' scientific literacy abilities improvement prior to and following the implementation of scientific learning.

3.2 Research Subject

All of the seventh grade students who participated in this research were enrolled at one of the Muhammadyah III High Schools located in the Yogyakarta Municipality during the 2014–2015 academic year. The technique of purposive sampling is used to choose the sample, and each of the 32 students that make up a single class are selected at random.

3.3 Research Instrument

The area of scientific literacy abilities that were evaluated in this research was split into two categories: the knowledge category and the competency category. Both of these elements are measured by research instruments in the form of multiple choice questions that were produced by researchers. Both of these aspects are measured utilizing research instruments. This instrument has been through and passed the stage of validation by three expert lecturers, as well as the validation of test items through a trial process. This data is then analyzed using the AnatesV4 program and IBM Statistics 22 to determine the validity of the instrument, power difference, difficulty level of the questions, and reliability of the instrument. This evaluation consists of 22 questions, each of which can be answered in one of four different ways. The parts of knowledge that can be measured include information regarding the substance that constitutes environmental pollution. This material is broken down into three sub-materials: air pollution, water pollution, and the greenhouse effect. While the measured parts of competency consist of three competency indicators, such as identifying scientific issues, describing scientific phenomena, and making use of scientific evidence, the measured aspects of competency themselves are not themselves measured.

3.4 Research Procedure

This research was conducted during five meetings. The research activity begins with a preliminary test (pretest) which aims to determine the students' initial abilities during one meeting.

This investigation was carried out during the course of five meetings. A preliminary test, also known as a pretest, is given to the students in the first meeting of the research activity. The purpose of the pretest is to determine the students' starting ability.

The next step in the process is to carry out the learning process for a total of three in-person meetings, with the intention of achieving mastery of the learning content in the areas of air pollution, water pollution, and the greenhouse effect. Following the completion of the scientific learning activities, students were given a final examination, often known as a post-test, with the intention of establishing a profile of their levels of scientific literacy.

3.5 Data Analysis

The calculation of the normalized gain average score (N-gain) was created by Hake [7] and the following formula is used in the data analysis that is included in this study. This formula is used to determine the increase in scientific literacy abilities that were measured. Using the criterion, the null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted.

$$< g >= \frac{Spost - Spre}{sm - ideal - spre} \tag{1}$$

Information:
<g> = Normalized average gain score
Spost = Average score of students' post-test
Spre = preliminary Average scores of students
Sm ideal = ideal maximum scores

Table 2. The Interpretation of average scores of N-gain

Value of <g>	Criteria
<g> $\geq$ 0,7	High
<g> $<$ 0,7	Medium
<g> $<$ 0,3	Low

The N-gain of average scores which is already interpreted based on Table 2.

The gathering of research data was followed by a statistical analysis, which consisted of comparing the students' scores on the pre-test with the post-test. Tests were conducted in the form of tests of normality and homogeneity, as well as statistical tests in the form of a t test (Paired Samples T Test) utilizing the application program IBM SPSS Statistics 22. In this test of the hypothesis, the significance level () that is being employed is 0.05, which is equal to 5%. The importance or probability of the data variation has a role in the decision on whether or not to test the hypothesis.

Normality Test. The objective of the normality test is to ascertain the distribution of the data that was gathered. The Shapiro-Wilk test was chosen as the normality test for this investigation. This test examines the distribution of data using a sample size of less than 50 at a significance level of 95% and an error () value of 0.05. In this particular study, the significance level was set at 95%. The testing process starts with the formulation of a hypothesis about the significance and probability levels.

H0: data is normally distributed
H1: data is not normally distributed

The significance and probability values that are obtained serve as the basis for the decision-making criterion. In the event that the significance value is asymp. Sig (2 tailed) or the probability is greater than 0.05, the null hypothesis (H0) is accepted and the data are considered to be regularly distributed.

The homogeneity test is carried out in order to determine whether or not the data values that were acquired (g = the normalized average score of gain) from the two groups are comparable to one another.

S = the average score of the student's final test of variance or not. In this study, the S test post = ideal initial test score of ideal student m = ideal maximum score.

Obtaining the average value of N-gain homogeneity is done using Levene with a significance level of 95% and error (α) = 0.05. The hypothesis given to the obtained values is then interpreted based on Table 2.

Ho: Homogeneous data variant Ha: Variant data is not homogeneous The decision-making criteria are based on the significance/probablity values obtained. If the significance value is asymp. Sig (2-tailed) or probability $>$ 0.05, H0 is accepted and the data is homogeneous.

Test Two Paired Samples (Paired Sample T-Test). The paired sample t-test was utilized in order to conduct a comparative analysis or establish a difference between the two groups of data, namely the data on the students' pre-test scores and their post-test scores. The purpose of this examination was to determine whether or not there is a difference between the students' levels of scientific literacy prior to and after participating in applied scientific learning. Because of the findings of this test, the hypothesis will now be tested.

The hypothesis of the study is as follows: first, the hypothesis will be tested, and then a series of statistical tests will be performed on the data received from the pre-test and the post-test. Table 3 provides a summary of the findings from statistical analyses of the data on scientific literacy skills. H0: Science literacy skills of students before and after learning.

4 Results and Discussion

It is known that the average value of the pretest is 71.87 thanks to the information that is presented in Table 3. There was a 46% improvement in scientific literacy abilities after receiving treatment in the form of scientific learning, with an average post-test score of 84.80, placing them in the category of moderate improvement. Analyze the Students' Data and Statistics Regarding Their Literacy Skills.

One of the distinguishing features of quantitative research is the application of statistical analysis to the collected data. An analysis of research data is one of the statistical tests of data that can be carried out. This test gives researchers the ability to find an answer to the problem formulation and to test the hypothesis for the planned research. Before It is common knowledge that the normality of the data was evaluated using the Shapiro-Wilk test. This test displays the significance level for the pre-test value of 0.106 and the post-test value of 0.054, and since both of these values are larger than = 0.05 (Sign. > 0.05),

It may be concluded that Ho is acceptable. Table 3 contains a summary of the outcomes of the value analysis that was performed both before and after the test. As a result, one is able to arrive at the realization that the data on the pre-test and post-test values adhere to the parameters of a normal distribution. When the findings of the students' pre-test and post-test were placed through Levene's test to evaluate whether or not the data were homogenous, the significance level that was attained was 0.164, which was bigger than 0.05 (Sign. > 0.05), showing that the Ho hypothesis can be accepted. This was determined by putting the findings through Levene's test in order to identify whether or not the data were homogeneous. As a result, one is able to arrive at the conclusion that the data on the value of the pretest and the posttest emanated from

Table 3. The Data of students' scientific literacy ability.

Type of Test	N	SD	Min		Max
Pretest	32	10,73	45,45	86,36	71,87
Posttest	32	8,29	68,18	100,00	84,80
			N-gain 0,46	N-gain 0,46	

a population that was consistent throughout, or that the variance of each sample was equal. This may also be stated as saying that the population was the same.

The findings of the paired sample t-test were done on the sets after first establishing that the data for the pre-test and post-test values are normally distributed and originate from a population that is comparable to one another.

Based on Table 4, it is known that the significance level is 0.00, smaller than $\alpha = 0.05$ (Sign. < 0.05) which means that the category is medium. Capacity building.

Ho is ruled rejected, while H 1 is accepted. The results of this test of students' scientific literacy for aspects of knowledge indicate that students' scientific literacy abilities before and after applied scientific learning differ significantly, or that there are significant differences between students' scientific literacy abilities.

Air Pollution (AP), Water Pollution (WP), and Greenhouse Effect (ERK). Histogram the Percentage of the increase of scientific literacy ability based on knowledge aspects. Knowledge about air pollution, water pollution, and the greenhouse effect comprised the scientific literacy skills of the aspects of knowledge analyzed. Table 5 provides information on the scientific literacy skills of students with regard to various facets of knowledge.

Based on Table 5 it is known that:

1. Identifying Scientific Issues all aspects of science knowledge literacy measured have increased. The highest increase occurred in the aspect of knowledge of air pollution, namely
2. Explaining Scientific Phenomena

Table 4. The summary of the Statistic test over the value of pretest dan post-test.

No	To Test	Type of Test	Results	Decision	Conclusion
1	Normality of Shapir o-Wilk Sig		Pretest = 0,106 Sig. Posttes t = 0,054	H0 is accepted	Data nor- mal
2	Homogenity Levene's test	homogen	Sig. = 0,164	H0 is accepted	Data homogen
3	Results of Pretest-Posttest	Paired Sample t-test	Sig. = 0,00	H0 is rejected,	Data is different (there is a difference)

Table 5. The data of students' scientific ability of the knowledge aspects.

No	Knowledge Aspect	Pretest	Post- test	N- Gain	Category
1.	Air Pollution	80,08	92,58	0,63	Medium
2.	Water Pollution	75,00	80,73	0,23	Low
3.	Green House Effect	61,33	80,08	0,48	Medium

Table 6. The of Students' scientific literacy ability Data of the Competence aspects.

No,	Competence Indicator	Pretest	Post- test	N- Gain	Category
1.	Identify Scientific issues	80,08	92,58	0,63	Low
2.	Describing Scientific Phenomena	75,00	80,73	0,23	Medium
3.	Using the Scientific proofs	61,33	80,08	0,48	Medium

3. Utilization of Scientific Evidence 63.28 84.38 0.57 Moderate 77.68 89.29 0.52 At 63%, the proportion is categorized as moderate. In contrast, the aspect of water pollution pertaining to knowledge increased the least, by 23%, and thus fell into the category of "low." Regarding the knowledge component, the greenhouse effect has increased by 48 percent to this point.

Information pertaining to the scientific literacy abilities of pupils broken down by each knowledge component of scientific literacy abilities according to scientific literacy skills Science Literacy Ability Competence Components of the Student Body Students' ability to identify scientific questions, describe scientific phenomena, and use scientific evidence were the three markers of their mastery of science competencies that were examined as part of the science literacy skills element of the competence analysis.

Based on Table 6, it is known that all measured scientific literacy indicators have increased. The most significant improvement was seen in students' abilities to explain scientific phenomena, which now stands at 57 and falls into the category designated as medium. While increases in competences related to detecting scientific difficulties were the least significant, coming in at 22% and falling into the low group. In terms of competences, making use of scientific evidence has seen a 52% improvement and now falls into the medium group. The enhancement of students' scientific literacy skills for the competency aspects, where it is explained that competency in identifying scientific issues is represented by the number "1". Number "3" is oriented towards mastering students' scientific literacy.

Students' capacities to read and understand scientific information improved after receiving treatment in the form of scientific education. It is possible to deduce this from the fact that the students who took the post-test had an average score of 84.80. This rise is also reflected in the normalized gain average value (N-gain), which reveals a percentage increase of 46% and places the value in the medium category. According to these findings, including a flow constructivist approach into scientific education is one way to assist students in improving their literacy abilities. According to Toharudin, et al., knowledge does not have an absolute nature; rather, it is produced by the learner based on his initial knowledge and view of the world [2]. This remark lends credence to the idea that this is the case and helps to illustrate its importance. Indicators of General Knowledge The fundamental skills that kids already have are explained through a histogram in percentage form illustrating the increase in scientific literacy across all domains of competence The knowledge and the ability to use that information are the two components that make up the scientific literacy abilities that were measured in this research project. The ability to comprehend scientific concepts was evaluated by means of multiple-choice examinations, each of which contained 22 questions and four possible responses. This can be observed by the average value of the pretest, which reveals a value of 71.87, which suggests that the beginning ability of students who are working on their science literacy is sufficient. However, the KKM (Minimum Completion Criteria) that must be met at the school is set at 75.00, and this value does not fulfill it. Because of this, treatment is provided in the form of scientific learning provision in order to acquire a new subject matter, and the role of the teacher is that of a learning facilitator who assists students in developing their prior knowledge into a good conceptual grasp.

There were significant differences between students' scientific literacy skills before and after the application of scientific learning, which was shown by the results of statistical tests, which reinforced the findings of this study. The findings of this study were also supported by the findings of statistical tests, which showed that students' scientific literacy skills before and after scientific learning were not the same. This demonstrates that the process of building knowledge that is carried out by students is the primary emphasis of scientific education.

According to Kuhlthau, Maniotes, and Caspari's research that was published in Abidin [4], scientific learning is defined as learning that needs students to move in the same way that scientists do. Observing, asking questions, performing information excavation, associating (reasoning), and presenting are some of the student learning tasks that are included in scientific education. In addition, Abidin noted that scientific learning is a learning process that helps students to problem-solving through the careful design of activities, the careful collecting of data, and the careful analysis of data in order to develop conclusions. Students need to develop their sensitivity to the phenomenon, improve their ability to ask questions, train their accuracy in collecting data, create their accuracy in processing data to answer questions, and be guided in making conclusions in response to the questions they ask. Only then will they be able to carry out this activity successfully.

Learning activities at each meeting begin with activities to investigate phenomena like air pollution, water pollution, and greenhouse effects that occur in the environment surrounding the meeting location. Students are encouraged to start building their knowledge through activities that involve observation, and they might discover the fact that there is a connection between the object viewed and the subject matter that is to be studied by discovering that there is a relationship between the two. According to Majid, witnessing activities can be of great assistance in satiating the students' natural curiosities, which in turn gives the educational process a deeper level of significance [5]. The students' natural inquisitiveness will be piqued through the utilization of observational exercises, which will then prompt the students to inquire about the occurrence that the instructor has witnessed in the past. The questions that are posed by students will direct other students to another procedure, specifically the process of information extraction. The questions that the students have posed to the teacher are then given back to the students so that they may search for solutions to the queries that they have formulated later. The role of the teacher in this class is that of a facilitator. The knowledge that has been obtained by students is knowledge that students themselves construct by gleaning information from a variety of sources. The information that has been obtained by students. After that, the validity of the information is determined by the form of this knowledge that the teacher possesses. The increase in students' scientific literacy skills in many parts of knowledge and competencies that may be noticed in students' post-test scores is proof of the impact that scientific learning activities have. According to Paolo and Marten's viewpoint (quoted in Toharudin) appropriate science learning for students should consist of the following steps: a) observing what happens; b) comprehending what is being observed; c) utilizing new knowledge to predict what happened; and d) testing the predictions (hypotheses) under conditions to determine whether or not the forecast is accurate. This scientific learning process is in line with Paolo and Marten's viewpoint.

The scientific literacy skills of the aspects that were analyzed were knowledge of environmental pollution material consisting of knowledge of air pollution, water pollution, and greenhouse effects, all of which in the 2012 PISA framework (in the OECD, 2013) fall into some scope of science knowledge material, specifically coverage "Living System" material related to human health and ecosystems, and the range of "Physical System" material related to the nature of matter, physical changes in matter, and the range of "Living System" material related to the Knowledge aspects in this study are also closely related to the context contained in the 2012 PISA framework (in the OECD), and almost all of the contexts are contained in this environmental pollution material. These contexts include the health context, natural resources, environment, and hazards, which in each each context involves almost all personal, social, and global aspects of human life itself [8, 9]. The scientific literacy abilities included in the analysis of the many parts of competency comprised of three indicators of mastery of science competencies. These indicators were the ability to recognize scientific issues, explain scientific phenomena, and use scientific evidence. The use of scientific learning can teach students by having them work through the steps necessary to address problems that they will encounter in the real world. Problems that are found by students in their daily lives and are examined problems that are found by students in their daily lives. Students can build scientific literacy competencies, such as the capacity to identify scientific difficulties, by the challenges they are faced with in the classroom. The ability to demonstrate mastery of this competency can be demonstrated in the activities that students in the group engage in to transmit ideas that allow for assistance in the process of issue resolution. Next, a number of information searches that are helpful for obtaining problems from the phenomena supplied are carried out in order to find a solution to the problem that was being investigated. The ability to make use of scientific evidence is one of the scientific literacy skills that can be developed in students through the completion of activities that include the extraction of information. Students are responsible for interpreting and condensing the scientific data that has been gathered from a variety of dependable sources. This process ultimately leads students to the issue. Students are able to strengthen their scientific literacy skills and become more capable of describing scientific phenomena through the use of the scientific data and findings presented here. Students can further strengthen their ability to use scientific evidence and explain scientific phenomena through classroom discussion activities that are encouraged by the teacher and in which students express their viewpoints verbally and in writing.

5 Conclusion

From the research that has been done, it can be concluded that the profile of students' scientific literacy skills can be improved through scientific learning. This learning can be applied to stimulate student interest in scientific issues, enhance scientific inquiry, and encourage students' sense of responsibility towards their surrounding environment.

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