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Article

The Effect of Science Literacy Skills to Contextual Thinking Skills on Science Literacy-Based Learning

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ABSTRACT

Along with the development of the 21st century, humans are required to have science literacy and contextual thinking skills. The need for contextual thinking and science literacy is one of the challenges in education. This study aims to determine whether science literacy-based learning can improve contextual thinking skills and science literacy skills and to determine the effect of science literacy skills on contextual thinking skills. The method used in this research is quantitative with correlation research design. The sample used was 28 students selected by purposive sampling technique to participate in filling out student worksheets, multiple choice questions and essays. The research data analysis used non-parametric statistical tests with the help of SPPS 26 for Windows software. The results showed that science literacy-based learning improved science literacy with an N-Gain value of 0.1368 and contextual thinking skills with an N-Gain value of 0.6981. Based on the non-parametric statistical test conducted, the sig value is 0.001 or <0.05, and it can be concluded that alternative hypothesis is accepted and science literacy ability affects the ability to think contextually, and there is a correlation coefficient value of 0.601 which means the level of strength of the relationship (correlation) between variables is a strong correlation and is unidirectional. Therefore, to improve literacy and contextual thinking skills, science literacy learning can be used, and high science literacy skills can improve students' contextual thinking skills.

INTRODUCTION

Advances in education are characterized by the increasing fields of science and technology used as educational standards in Indonesia, resulting in the need for a balance between human resources and technological advances that occur. The occurrence of progress in the field of technology and education certainly provides a challenge in the form of the ability to adapt quickly to the changes that occur to maintain competitiveness and relevance to technological and educational developments. Therefore, it is necessary to optimize human resources to become more qualified to support the era of advances in education and technology (Fajriyani et al., 2023).

The quality of human resources can be seen from the ability to master technology and broad science that will create human resources that can make decisions with scientific answers to the problems they face. The quality of human resources is essential to improve so that along with the development of knowledge and technology, humans are required to increase knowledge, especially in the field of science to create individuals who think scientifically to be able to face issues and problems that occur (Afifah & Faizah, 2023; Anas, 2022; Astuti et al., 2023; Ulandari & Mitarlis, 2021). In education, the ability to deal with issues and problems in actual conditions can be obtained from contextual thinking skills. Thus, efforts must be made to improve contextual thinking skills in students (Sayuti, 2021).

Efforts that can be made to improve students' contextual thinking skills are through science learning. Science learning is a means to develop scientific knowledge by providing experience to students in the application of theories learned through observation and practicum, namely through events in the surrounding environment, natural phenomena, birth, and development (Matta, 2014; Muharna & Fajriyani, 2022). Science learning is closely related to human daily life and can be used to solve problems. Based on this, science can provide learning that bridges students to be able to apply the knowledge they learn in everyday life, which can be obtained from learning activities that can improve students' science literacy skills, namely through science literacy-based learning (Sakila et al., 2023; Wang & Tsai, 2019).

Science literacy-based learning is one of the learning approaches to improve students' science literacy skills. Science literacy is the ability to use scientific knowledge, be able to identify questions obtained, and be able to draw conclusions obtained from objective evidence used to obtain decisions from activities carried out by humans (Sari et al., 2022; Turiman et al., 2012). The use of the science literacy approach can provide an increase in student skills, presentation skills, cognitive process skills, self-confidence, and a sense of fun, strengthen self-concept, improve teamwork skills, strengthen the memory of the study material, and encourage students to think critically and work hard (Lutfirohmatika & Novika Pertiwi, 2021). Learning with a science literacy approach can also make students stronger in remembering study material through direct activities in the field, easy to understand the study material, able to apply the study material in real life, and able to analyze the study material learned and found (Angraini et al., 2019; Siregar et al., 2020).

Literacy and science are two things that are closely related to knowledge (Bania, 2020). Science literacy can also be defined as understanding and knowing symptoms, events, or phenomena that occur in the real world or real life (Narut & Supradi, 2019). Through science literacy skills, students can provide knowledge about discovering facts, concepts, procedures, principles, and laws that exist in Natural Sciences based on efforts to produce products by science (Rusilowati, 2018). Science literacy is not only limited to the ability to read but also the ability to write and use appropriate language orally to convey information scientifically (Hayati & Afrizon, 2019; Turiman et al., 2012). Science literacy also has several interrelated aspects: science content, process, and context. Some of these aspects are important in education and everyday life (Widiyanti & Susilayati, 2023; Utami et al., 2022).

The application of science literacy in students can be described as a triangle, starting from basic, intermediate, and highest abilities or disciplinary literacy. The concept of this triangle has a literacy base in the form of the ability to read, write, speak, or communicate phenomena to the stage where students can apply science literacy in learning activities or daily life. Therefore, the main goal of cultivating science literacy focuses on the ability to read, write, and speak, which is used to express language and convey an understanding of phenomena in study materials or the surrounding environmen (Jufrida et al., 2019; Permatasari, 2022; Widyasari & Haryanto, 2022).

Contextual thinking skills are fundamental in science learning and for students, especially junior high school students because the 21st century requires students to acquire their knowledge independently, including contextual thinking skills. Students are taught Contextual

thinking skills to acquire knowledge by forming and acquiring it themselves. Science learning with contextual thinking skills can also produce students who can experience the actual practice of the study material they learn because it uses a real context and can be observed through the five senses and events that occur in the real world (Murtini et al., 2022 ; Yang et al., 2019).

Contextual thinking skills can provide students with authentic experiences to connect the knowledge they have from learning activities in the classroom with situations in the real world (Yustina et al., 2021; Sari et al., 2022). Learning that is oriented towards contextual thinking skills can make learning more effective. In addition, learning-oriented to contextual thinking skills can improve attitude and skill competencies and increase knowledge competencies (Picardal & Sanchez, 2022). Students with contextual thinking skills can improve learning outcomes and learning activeness because high contextual thinking skills will produce high material understanding (Ardiawan & Diari, 2020; Fadhilah et al., 2021). Students with contextual thinking skills can also show interest in study materials and be critical, logical, and able to solve problems (Sayuti, 2021; Afriani, 2018).

Science literacy skills and contextual thinking skills have a relationship in natural science learning, which can be seen from the importance of science literacy skills in everyday life. Basically, every human being has basic literacy skills such as reading and writing. However, basic literacy skills need to be improved to be able to have critical thinking and environmental awareness (Fitriyah & Pratiwi, 2023). Environmental awareness that can be obtained from science literacy skills provides an important role for students in understanding the environment and applying their knowledge in everyday life which is included in contextual thinking skills (Dewi et al., 2021)

Science literacy skills and contextual thinking skills in science learning are needed. So, in addition to developing science literacy skills, it is also necessary to develop students' contextual thinking skills. Contextual thinking skills are fundamental in science learning and for students because the 21st century requires students to acquire their knowledge independently, including contextual thinking skills. Learning that focuses on contextual thinking skills follows the theory of science, which is the study of nature using an authentic context. It can be observed through the five senses and events that occur in the real world of the study material they learn (Mungawanah et al., 2018).

Based on prelimenary data on the same junior high school in September 2023, students still need to improve their science literacy skills and contextual thinking skills. The low ability of science literacy in Madrasah Tsanawiyah can be seen from the lack of students' ability to express opinions, answer questions, ask questions, lack of student interest in reading and observing a phenomenon that occurs. Meanwhile, the low ability of contextual thinking owned by students is the low ability of students in knowing the phenomena that occur in the surrounding environment and not being able to connect the material learned with the phenomena that occur in their environment. The low ability of students can be caused by the need for more effectiveness in the learning process, one of which is the use of learning approaches so that students' interest does not grow (Rizky Anisa et al., 2021). Based on the importance of science literacy skills and contextual thinking skills in students learning, this study aims to determine whether science literacy-based learning can improve contextual thinking skills and science literacy skills and the effect of science literacy skills on contextual thinking skills. This study is expected to determine the effect of students' science literacy skills through science literacy-based learning on the contextual thinking skills of students.

METHODS

The type of research used is descriptive quantitative research and uses a correlation research design. This research was conducted in September 2023 at islamic junior high school in Ponorogo. The research subjects used in this study were students at islamic junior high school, where the samples taken were second grade class students, totaling 28 students who

were classified as a class with students who were active and willing to participate in the learning process for research. Samples were taken using non-probability sampling techniques, with the aim of not providing equal opportunities for each member of the population to be selected as research samples. The sampling technique used is purposive sampling to determine the sample using consideration of the sample in a study. The samples chosen to be the subject of this study are expected to represent the population in science literacy skills and contextual thinking skills.

The implementation of science literacy-based learning was carried out for 2 meetings with the duration of the first meeting of 2 lesson hours or 60 minutes and the second meeting of 1 lesson hour or 30 minutes. In the implementation of learning, several stages are carried out, namely explaining the learning objectives to students along with the learning methods and models carried out, delivering learning materials, and providing conclusions and suggestions from the learning activities that have been designed. Science literacy-based learning is applied to science learning materials regarding physical and chemical changes in accordance with the conditions of students used as research objects to obtain maximum results in using learning methods that will affect the development of student abilities.

The data collection techniques used were observation and tests. The tests given to students included students worksheets to see contextual thinking skills and multiple-choice test and questions to see students' literacy skills. The research instrument has also been validated by several experts, with the instrument being valid with the significance value of all question items <0.05 and reliable with an Alpha value of 0.924 on the science literacy ability instrument and 0.750 on the contextual thinking ability instrument.

The research data obtained from the research in the form of quantitative data will be analyzed using SPSS 26 for Windows software. Data analysis was carried out by comparing the results of research questions per item for literacy and the results of the contextual thinking ability test for each student. The tests used to analyze the data obtained were the N-gain and Spearman rank tests. N-gain on a research data is used to determine the comparison between the average results on the score obtained before treatment with the average value of a test given after treatment. The N-gain test in this study was used to determine the increase in value or the comparison of values between before and after science literacy-based learning on science literacy and students' contextual thinking skills. The N-gain test can be done by subtracting the post-test value from the pre-test value on the test results obtained (Pujasari & Samsudin, 2022).

The N-gain value that has been obtained can then be grouped into the level of influence on the use of science literacy-based learning on science literacy skills and contextual thinking skills. Grouping is done by identifying the magnitude of the N-gain value, namely at a value of less than 0.3 including a low level of influence, at a value of 0.3 to 0.7 including a moderate level and at a value of more than 0.7 including a high level of influence. Therefore, the higher the N-gain value produced, the treatment given can have a higher effect on the abilities possessed by students (Madjid, 2019).

When the N-gain is known to determine the increase in science literacy skills and contextual thinking skills of students, the Spearman rank test is conducted to determine the relationship between science literacy skills and contextual thinking skills. The results of this study will be presented in the quantitative descriptive form in the form of numbers, sentences, and language that is easy to understand to explain a phenomenon that occurs by collecting data in detail and depth. The research design in this study is shown in Figure 1.

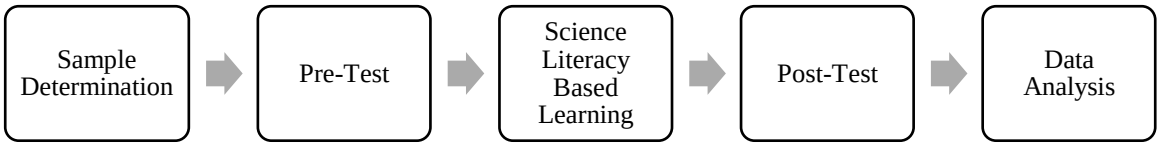

Figure 1. Design Work Plan the Effect of Science Literacy Skills on Contextual Thinking Skills

RESULTS AND DISCUSSION

The results of the data obtained from the literacy skills test done by students were then processed using SPSS 26 for Windows. The researcher reprocessed the data processing results to provide results that were easier to understand and informative. The data processing results in Table 1 contain information about the number of students who work, mean, standard error of the mean, standard deviation, variance, range, minimum score, maximum score, and N-gain.

Table 1. Statistics of Science Literacy Ability

No	Descriptive Measure	Value	
		Pre-Test	Post-Test
1	N	28	28
2	Mean	60.0	66.0
3	Standard Error of Mean	1.06035	1.27450
4	Standard Deviasi	5.61084	6.74400
5	Variance	31.481	45.481
6	Range	15.00	25.00
7	Minimun	50.00	52.00
8	Maximum	65.00	77.00
9	N-Gain	0.1368	

Based on Table 1, the pre-test and post-test results have an N-gain value of 0.1368, which is included in the low category. It can be seen that learning with a science literacy approach has a low effect on increasing the value of students' science literacy skills. This low improvement in science literacy skills can be caused by the lack of supporting facilities owned by the school, the lack of students' interest in reading activities, the lack of students' ability to formulate conclusions and make suggestions or solutions to problems. This is in accordance with several studies which explain that a person who has high literacy skills must have several competencies, such as being able to explain scientific phenomena, evaluate and design scientific investigations, and be able to interpret data and evidence scientifically, which in this study has not been able to be mastered entirely by students (Bellová et al., 2018).

In Table 2, the results of the implementation of learning with a science literacy approach to contextual thinking skills are also carried out data processing whose results are processed again by researchers by containing information about the number of students who work, mean, standard error of the mean, standard deviation, variance, range, minimum score, maximum score, and N-gain.

Table 2. Statistics of Contextual Thinking Ability

No	Descriptive Measure	Value	
		Pre-Test	Post-Test
1	N	28	28
2	Mean	66.6071	91.0714
3	Standard Error of Mean	2.89697	1.35491
4	Standard Deviasi	15.32932	7.16953
5	Variance	234.988	51.402
6	Range	60.00	25.00
7	Minimum	25.00	75.00
8	Maximum	85.00	100.00
9	N-Gain	0.6981	

Based on Table 2, it can be seen that the statistical test results obtained an N-gain value of 0.6981. Based on these results, students' contextual ability is included in the medium level. Students who participated in science literacy-based learning (post-test) have scores above the average compared to student scores before science literacy-based learning (pre-test). The value obtained is a perfect thing from the implementation of science literacy-based learning. It shows the success of implementing science literacy-based learning, where student scores in the pre-test are lower than those obtained in the post-test.

After knowing the value of learning outcomes with a science literacy approach on science literacy skills and contextual thinking skills, data analysis was carried out to determine the

effect of science literacy skills on contextual thinking skills in students. The data obtained was calculated using the spearman rank non-parametric statistical test. Researchers then reprocessed the data processing results to provide more informative results, as in Table 3.

Table 3. Spearman Rank Test Result

No	Descriptive Measure	Value
1	Correlation Coefficient	0.601
2	Sig. (2-tailed)	0.001
3	N	28

Based on non-parametric statistical tests conducted, the interpretation of the research results is the relationship between science literacy skills and contextual thinking skills with a relationship significance value of 0.001 or <0.05, it can be interpreted that there is a significant relationship between the variables of science literacy skills and contextual thinking skills (alternative hypothesis). In the results of data processing with SPSS with non-parametric statistical tests, a correlation coefficient value of 0.601 was also obtained, which means that the level of strength of the relationship (correlation) between variables is a strong correlation. Based on the results of the correlation coefficient which has a positive value, it can also be seen that the two variables are unidirectional or if the ability of scientific literacy is improved, the ability of contextual thinking will also increase.

Based on the results of data calculations on statistical tests, science literacy skills affect contextual thinking skills. The results obtained in this study follow previous research, which states that students with high science literacy skills can easily understand learning materials, solve problems, be creative, and make decisions that occur in the real world (Putranta & Supahar, 2019). Based on this, the relationship between the science literacy approach and science literacy skills can provide students with a good understanding of the material by providing exciting learning activities, and with science literacy, students can understand the material studied. The relationship between the model and the approach used will influence the ability of students' contextual thinking, which is emphasized can be obtained by students when learning science which is very close to actual natural events

The effect of science literacy skills and contextual thinking skills is also in line with the results of research that has been conducted with the results stating that the scientific attitude that arises in students with science literacy skills can provide new abilities for students in obtaining and discovering facts, concepts, theories, and principles (Hanna et al., 2016). The scientific attitude carried out can also provide students with new experiences with an active role in learning activities to find concepts, find new ideas, or apply concepts to every phenomenon that occurs in everyday life (Arianto & Fauziyah, 2020). The abilities and knowledge obtained by students based on actual phenomena in their lives can make students able to apply the abstract concepts they have obtained to authentic experiences to foster contextual thinking skills in students (E. P. N. Sari & Fauziah, 2021; Milanto et al., 2023).

The contribution of scientific attitudes to identify opinions and information scientifically from science literacy skills also influences the emergence of students' ability to reflect on the knowledge they acquire. The highest level of conceptual thinking is the ability to reflect on this knowledge. The ability to reflect on an individual is based on two components, namely attitude and decision-making. To obtain a solution to a problem, an individual needs to make an effort to analyze and evaluate, which reflects the ability to reflect (Kholid et al., 2020). The ability to reflection possessed by an individual can help to identify concepts, facts, and theories that will eventually form a new concept that can produce solutions that are following existing problems. In addition, forming a concept from reflective actions can foster students' contextual thinking skills (Syamsuddin et al., 2020).

Finding a solution to a problem must be done through identification or search for information obtained from the discovery process and activities that explore information by asking questions or interviews. Extracting information involves students' thinking skills to

perceive, process, present, and store the information obtained (Widodo et al., 2020). A solution can be obtained from observing the condition of the problem by mentioning known information, asking for something unknown and proving by reviewing information with previous knowledge. Therefore, the ability to ask questions in an individual is closely related to the solution provided, so that science literacy skills with the action of finding solutions and contextual thinking skills with the ability to ask questions are closely related to the search for knowledge, one of which is in science (Soebagyo et al., 2022).

The research results obtained from using the science literacy approach give a full role to students in teaching and learning activities so that students can play a more active role in learning. The science literacy learning approach also provides a means and a forum for students to train and hone contextual thinking skills and science literacy skills by actively asking questions, giving opinions, carrying out activities to write reports or scientific papers from practicum activities, learning to solve problems from practicum activities and observations, being able to relate the material learned to actual conditions and being able to apply the knowledge they have gained to answer challenges in the 21st century. This research also resulted in a relationship between science literacy skills and contextual thinking skills. The results of statistical tests and interconnected indicators can prove this much-needed scientific ability.

CONCLUSION

This study concluded that science literacy-based learning can improve science literacy and contextual thinking skills which can be seen from the resulting N-gain of 0.1368 which is still classified as low and N-gain on contextual thinking skills of 0.6981 which is classified at a moderate level. Another result obtained is that there is an influence between science literacy and contextual thinking skills in students with a sig value of 0.001 or <0.05, and there is a correlation coefficient value of 0.601 which means the relationship between variables is strong and unidirectional. The limitation of this study is that it only examines the improvement of science literacy skills and contextual thinking skills using science literacy-based learning and examines the relationship between science literacy skills and contextual thinking skills. Therefore, future research is expected to use this research as a reference and research can be conducted using different approaches or learning methods to determine the improvement of students' abilities, as well as using other ability variables to determine the relationship between the abilities possessed by students.

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