

Analysis of Science Literacy Skills in Science Subjects on Heat Material of Grade VII Students at Junior High School 10 Sampit¹Ronny Setiawan, ¹Tazkiyatunnafs Elhawwa   ¹Universitas Muhammadiyah Palangkaraya, Central Borneo, Indonesia.**Research Article****Citation Information:**

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ABSTRACT

The results of the 2022 PISA (Paris- Implementation of Indonesian Science /PISA) show that Indonesian students' scientific literacy remains low, including in heat. This study aims to analyze the scientific literacy skills of seventh-grade students at Junior High School 10 Sampit regarding scientific knowledge and attitudes. The study used a descriptive quantitative method with a sample of 55 students. Data were obtained through a scientific literacy test and a scientific attitudes questionnaire, then analyzed using descriptive percentages. The results show that scientific literacy achievement in the knowledge aspect was 41.21% (very poor category) and in the scientific attitudes aspect was 69.92% (sufficient category). The highest level of knowledge was in content (43.33%) and the lowest in epistemic (36.36%), while the highest level of scientific attitudes was in understanding environmental issues (72.00%) and the lowest level in interest in science and technology (69.23%). The main influencing factors were interest in learning science, limited practical work, and lack of experience working on scientific literacy-based problems. These findings indicate the need to improve practice-based learning strategies and practice problems.

Keywords: Scientific Literacy, Scientific Attitudes, Heat, Science Learning

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INTRODUCTION

Education is any form of learning experience that occurs throughout life (lifelong learning) in various situations and circumstances and positively impacts each individual's development (Pristiwanti et al., 2022). Education is a forum that plays a role in developing abilities and shaping dignified characters to develop student potential (Elhawwa et al., 2023). In terms related to schools, education is an effort to develop students' abilities to have good competencies and awareness of the environment and surrounding communities.

According to H. W. Fowler, science is systematic knowledge, formulated and related to a natural phenomenon based on observation and deduction (Trianto, 2010). Science plays an important role in creating a generation that can understand self-interaction with the environment in school learning. A deeper understanding of science requires exposure to the environment and scientific working methods, so students know science. One of the main objectives of science education is to improve science literacy. (Dragos et al., 2015).

Science literacy is the ability and knowledge (scientific attitude) needed to identify a problem, obtain new information, explain scientific phenomena, and draw conclusions based on facts. It also includes an understanding of the characteristics of science, an awareness of how science and technology affect the natural and social environment, and a willingness to engage and care about science-related issues. (OECD, 2016). Rusilowati et al. (2016) consider that science literacy empowers students to analyze, predict, and apply scientific concepts in everyday life. Based on the evaluation results from the Program for International Student Assessment (PISA) 2022, Indonesia is ranked 67th out of 81 participating countries with an average score of 383. These results show that the level of science literacy among students in Indonesia is still low. Although Indonesia's ranking has improved, the score obtained is still below the international average of 485 (OECD, 2023).

Heat is the energy exchanged between a system and its environment due to the temperature difference. Based on the International System of Units (SI), heat uses units similar to the amount of energy expressed in joules. Calorific value is positive

when heat energy is transferred from the environment to the system (the system absorbs heat). Conversely, calorific value becomes negative when energy is transferred from the system to the environment, resulting in heat being released or lost from the system. (Halliday et al., 2005). Caloric material is the basic material of Natural Science subjects related to lifestyle that requires knowledge, evidence, and application in daily activities. Students should understand the concept by applying science literacy to know its usefulness in daily activities. Based on the results of preliminary observations, it shows that students in Class VII of Junior High School 10 Sampit still have low achievements, with an average score of 48.5 in the daily assessment of science subjects regarding heat material.

From the definition and problems above, the author needs to get an overview of the extent to which students can understand scientific concepts (knowledge) and their scientific attitudes. Based on this, it is important to conduct research titled "Analysis of Science Literacy Ability of Science Subjects on Caloric Material of Class VII Students at Junior High School 10 Sampit".

METHOD

This research uses descriptive quantitative methods. According to Indrawan et al. (2017), Quantitative research is a scientific approach that analyzes certain phenomena' problems and identifies possible relationships or associations between variables in a predetermined problem. The research time began in August and continued through October 2024. The research site was Junior High School 10 Sampit, with the population and sample being 177 students of Junior High School 10 Sampit and 55 seventh-grade students of Junior High School 10 Sampit. Data collection techniques used science literacy test instruments and science attitude instruments (questionnaires). The data analysis technique used descriptive percentage analysis with the analysis of students' science literacy achievement measured based on the score or percentage of science literacy, as stated by Purwanto (2009) in the following Table I.

Table I. Science Literacy Score or Percentage

Score (%)	Category
$86 < \text{Score} \leq 100$	Excellent
$75 < \text{Score} \leq 86$	Good
$60 < \text{Score} \leq 75$	Fair
$54 < \text{Score} \leq 60$	Poor
$0 < \text{Score} \leq 54$	Very Poor

RESULTS AND DISCUSSION

Results

The results of the research can be seen based on aspects of science literacy that refer to PISA 2022, including aspects of knowledge consisting of content knowledge, procedural knowledge, and epistemic knowledge, and aspects of science attitudes consisting of interest in science and technology, assessing everything with a scientific approach, and understanding and knowing about environmental issues.

Table II. Percentage (Score) of Scientific Literacy in the Knowledge Aspect

Code	%	Code	%
PD-010	71,43	PD-051	42,86
PD-016	61,90	PD-008	38,10
PD-046	61,90	PD-011	38,10
PD-050	61,90	PD-015	38,10
PD-044	57,14	PD-018	38,10
PD-013	52,38	PD-026	38,10
PD-020	52,38	PD-029	38,10
PD-023	52,38	PD-036	38,10
PD-024	52,38	PD-045	38,10
PD-025	52,38	PD-048	38,10
PD-033	52,38	PD-003	33,33
PD-034	52,38	PD-019	33,33
PD-035	52,38	PD-028	33,33
PD-047	52,38	PD-039	33,33
PD-002	47,62	PD-001	28,57
PD-004	47,62	PD-021	28,57
PD-014	47,62	PD-027	28,57
PD-017	47,62	PD-054	28,57

PD-022	47,62	PD-005	23,81
PD-032	47,62	PD-007	23,81
PD-041	47,62	PD-031	23,81
PD-052	47,62	PD-037	23,81
PD-053	47,62	PD-038	23,81
PD-006	42,86	PD-040	23,81
PD-009	42,86	PD-055	23,81
PD-030	42,86	PD-012	19,05
PD-043	42,86	PD-042	19,05
PD-049	42,86		
Average			41,21

Description:

Code: Respondent Code

?: Percentage (score) of students who answered correctly

Based on Table 2, it can be seen that the average percentage of science literacy assessment scores obtained by students is 41.21%. This shows that the achievement criteria for science literacy scores from a knowledge perspective are generally included in the "very poor category. The highest achievement consists of one respondent with sufficient criteria, namely in PD-010, with a score of 71.43%. In contrast, the lowest achievement consists of two respondents with very poor criteria, namely in PD-012 and PD-042, with a 19.05%.

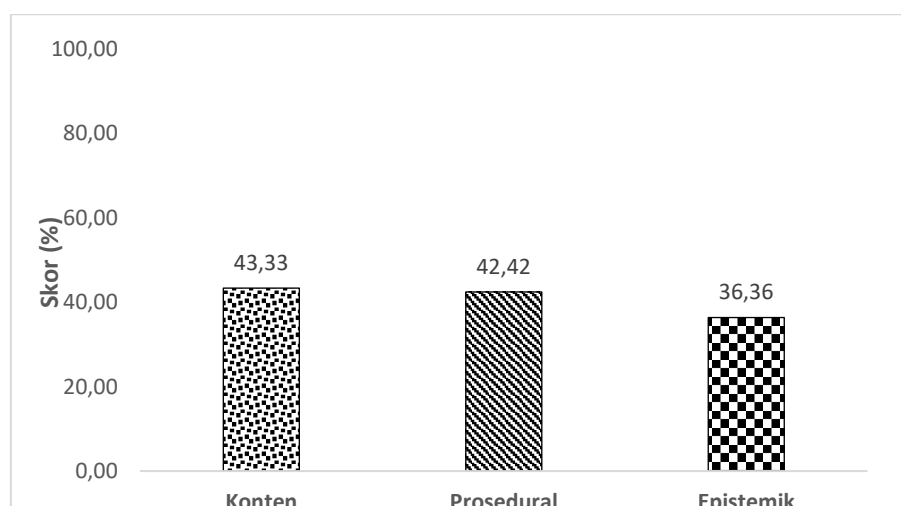


Figure I. Graph of Percentage (Score) of Knowledge Aspect Science Literacy in Each Category

Based on Figure I. It can be seen that the highest achievement is in the content category with a score of 43.33%, followed by the procedural category with a score of 42.42%, and lastly in the epistemic category with a score of 36.36%.

Table III. Percentage (Score) of Scientific Literacy in the Science Attitude Aspect

Code	%	Code	%
PD-023	85,33	PD-025	70,67
PD-046	84,67	PD-035	70,67
PD-049	84,00	PD-040	70,00
PD-010	81,33	PD-042	69,33
PD-044	81,33	PD-054	69,33
PD-028	80,00	PD-004	68,67
PD-052	78,67	PD-013	68,67
PD-038	78,00	PD-026	68,67
PD-047	78,00	PD-053	68,67
PD-030	77,33	PD-008	68,00
PD-041	77,33	PD-037	68,00
PD-032	76,67	PD-005	67,33
PD-036	76,67	PD-020	66,67
PD-034	76,00	PD-017	66,00

PD-039	76,00	PD-014	64,67
PD-055	76,00	PD-043	64,67
PD-029	75,33	PD-002	64,00
PD-051	75,33	PD-048	64,00
PD-006	74,67	PD-050	64,00
PD-001	73,33	PD-003	61,33
PD-016	72,00	PD-024	60,67
PD-021	72,00	PD-012	58,00
PD-027	72,00	PD-018	53,33
PD-031	72,00	PD-022	50,00
PD-033	72,00	PD-015	48,67
PD-045	72,00	PD-007	47,33
PD-019	71,33	PD-009	44,00
PD-011	70,67		
Average		69,92	

Description:

Code : Respondent Code

% : Percentage (score) of students' science attitude

Based on Table 3, it can be seen that the average percentage of science attitude scores achieved by students is 69.92%. This shows that the criteria for achieving science attitude scores are generally included in the "sufficient" category. The highest achievement with high or good criteria is in PD-023 with a score of 85.33%, while the lowest achievement with very poor criteria is in PD-009 with a score of 44.00%.

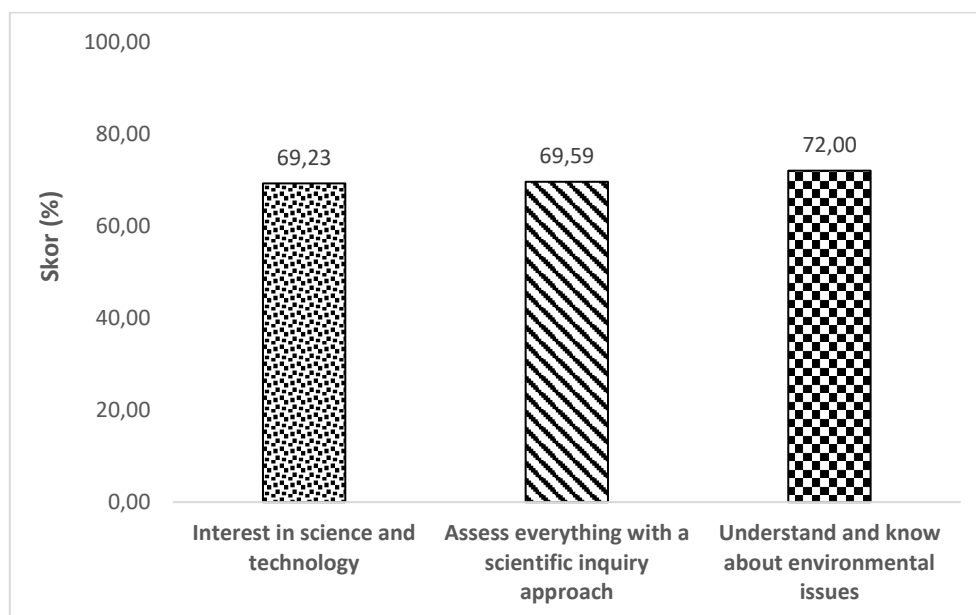


Figure II. Graph of Percentage (Score) of Science Literacy in the Attitude Aspect in Each

Based on Figure 2, it can be seen that the highest achievement is in the category of understanding and knowledge of environmental issues with a score of 72.00%, followed by the category of assessing and evaluating everything with a scientific thinking approach with a score of 69.59%, and finally the category of interest in science and technology with a score of 69.23%.

Discussion

The achievement of science literacy skills of seventh-grade students of Junior High School 10 Sampit in the knowledge aspect is 41.21%, categorized as "very poor". The achievement of epistemic category science literacy is the lowest compared to other categories. The low achievement of the epistemic category science literacy in the knowledge aspect shows that students focus more on scientific phenomena (content) and methods (procedural). A more explicit teaching process is needed to distinguish these scientific knowledge aspects (Zetterqvist et al., 2023). In addition, the achievement of science literacy ability of seventh-grade students of Junior High School 10 Sampit in the aspect of science attitude is 69.92%, categorized as "sufficient". The science attitude aspect needs to be assessed to determine students' science attitudes and evaluate whether the material or concepts learned can be well received.

Science literacy in this study is influenced by several factors, including students' desire or interest in science. Based on the analysis of the answers to the science attitude scale instrument on the fifth statement, namely "You actively ask questions during science learning and practicum," has a percentage score of 68% which is categorized as "sufficient". The aspect of science attitude in the "interest in science and technology" category has the lowest percentage score compared to other categories, which is 69.23%. This shows that students' enthusiasm in terms of interest in science is still less than optimal. Interest in science, love of reading, and curiosity are very important attitudes in supporting the development of science literacy. Mayasari et al. (2023) stated that reading habits and creativity significantly influence students' science literacy skills.

Practical activities or experiments are very important to understand a scientific event directly. Based on the analysis of the answers from the science attitude instrument on the fifteenth statement, namely "You draw conclusions from an experiment based on direct observation" has a percentage score of 57.45%, categorized as "very poor". The results of the analysis of the knowledge aspects of the procedural category also show criteria that are categorized as very poor. This low achievement is due to the limitations of students' ability to express thoughts in writing and the lack of ability to reason (Suroso et al., 2021)

Another factor affecting science literacy is experience in solving science literacy-based questions or assessments. Ramli et al. (2022) argue that the low achievement of students' science literacy is due to the lack of practice in working on similar questions and the limitations of teachers in giving questions that play a role in honing critical thinking and analysis skills. Practice and experience in working on science literacy-based questions are very important because they can help familiarize students with solving science-related problems.

Various studies on science literacy in science subjects have been conducted, including by Handayani et al. (2023), who researched the analysis of science literacy skills on heat exchange material in land and sea wind events. The results showed that students' science literacy skills were in the "low" category. Nuryanti et al. (2023) researched the profile of science literacy on climate change material. The results showed that students' science literacy skills were still in the "low" category. Shohib et al. (2021) also researched science literacy skills in the material of hidden electricity (static) and electricity in living things. The results showed that students' science literacy skills were in the "low" category.

Similar research has also been conducted by Syarifuddin et al. (2023) regarding the analysis of science literacy skills with the Nature of Science Literacy Test (NOSLIT). The results showed that students' science literacy skills were in the "low" category. Ashari et al. (2023) also researched the analysis of science literacy skills in junior high school students. The results also showed that students' science literacy skills were still categorized as "low". The low achievement of science literacy from several studies is in line with the results of students' science literacy at Junior High School 10 Sampit, which is also categorized as "very poor". Students' science literacy skills that are still low in the realm of knowledge and competence still need serious attention (Ariska et al., 2020).

CONCLUSION

Based on the results of the study, students' science literacy skills in science subjects show that class VII Junior High School 10 Sampit in the knowledge aspect is in the "very poor" category with a percentage score of 41.21%, while the science attitude aspect is in the "sufficient" category with a percentage score of 69.92%. Factors that influence science literacy are summarized in three points, namely (1) Students' desire or interest in science, (2) Practical activities or experiments, and (3) Practice and experience in working on science literacy-based questions.

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