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Research Artikel

ANALYSIS OF PRIMARY SCHOOL SCIENCE TEACHERS' PERCEPTIONS IN NORTH LAMPUNG ON SCIENCE LITERACY BASED ON EIGHT SCIENCE LITERACY INDICATORS

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Abstract

One of the main skills that are part of the basic skills of the 21st century is critical thinking skills which are part of science literacy. The teacher's ability to educate their students determines the success of learning science literacy. This study aims to identify the science literacy perceptions of elementary school science teachers in North Lampung as a reference for developing science literacy learning in College. The data collection method is carried out by distributing website-based online questionnaires. The research subjects were elementary school science teachers in North Lampung. Data analysis was performed using the Rasch model to determine the level of reliability of respondents and item items and to determine the distribution of respondents' answers. The results of this study show that the level of reliability of the respondents is very good, with a value of 0.92, and the reliability of the items is quite good, with a value of 0.79. Further analysis was carried out to see the perceptions of elementary school science teachers on science literacy. The results of the analysis revealed that the perceptions of elementary school science teachers regarding science literacy based on eight indicators obtained an average percentage of 54.6% and is in the middle category range. From the results of data analysis, the findings in this study are the lack of ethics in science among elementary school science teachers in North Lampung.

***Keywords**: Science literacy; science teacher; science literacy indicators; science teacher's perception; teacher science literacy.*

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INTRODUCTION

Technological advances have altered the educational paradigm of learning (Simpson & Obdalova, 2014). The ease of access to information makes knowledge available anywhere, rather than requiring classroom instruction alone (Traverso et al., 2014). For a person to continue to progress in a technologically advanced society, he must master a range of fundamental abilities (McKenna, 2019; Rahman et al., 2021). Digital literacy is one of the core competencies of the 21st century (Chan et al., 2017; van Laar et al., 2017). In accordance with this, Weitze and Majgaard (2020) assert that digital literacy is an essential component of the 21st-century abilities required of students in many nations. Understanding associated with digital literacy is inseparable from mastering numerous abilities that overlap with other compentecies, such as critical thinking skills, which are also part of the fundamental science literacy skills (Siarova et al., 2019).

Based on the results of the 2018 PISA research, the science literacy skills of Indonesian students over the past decade have remained low (OECD, 2018). In addition to the low science literacy of pupils, evaluations of science teachers in Indonesia over the past five years have produced miserable results, according to the findings of various research (Suwono et al., 2022). Inadequate teaching resources are one of the reasons for impeding science education (Pereira et al., 2020). Science literacy emphasizes decision-making ability on everyday societal challenges (Suwono et al., 2022).

Numerous research on science literacy skills in Indonesia has been conducted, with varying foci (Fakhriyah et al., 2017, 2017; Pahrudin et al. 2019, 2019; Winata et al., 2016, 2016). Pahrudin et al. (2019) focused research on the achievement of science competency among pre-service physics teachers, Fakhriyah et al. (2017) focused research on the achievement of science literacy competence among students in elementary school teacher education, and Winata et al. (2016) focused on developing science evaluation tools for college students. In Indonesia, research on science literacy focuses mostly on elementary school students, while research on primary school science teachers is scarce.

Science teachers in primary schools are mainly responsible for fostering science literacy in pupils as a foundation for understanding science literacy in higher education. Therefore, it is essential to research how elementary school science teachers perceive science literacy. The results of this study can be utilized as a guide for defining various strategies for advancing science literacy education in postsecondary institutions. This study seeks to map the science literacy skills of elementary school science teachers in North Lampung to enhance science literacy instruction at tertiary institutions as part of the Elementary School Teacher Education program. In this study, researchers posed the question, "How do elementary school science teachers in North Lampung perceive science literacy?"

METHOD

The method in this study is described in several sections including study design, sampling method, determination of inclusion and exclusion criteria and method of collecting research data. Each component of the research approach is described below.

Study Design

This study is a descriptive, cross-sectional design and was conducted to reveal the science literacy understanding of science teachers in elementary schools towards eight indicators of science literacy. The research was done over the course of four months, from April to June 2022.

1. Sampling

The population of this study consisted of 25-to-40-year-old primary school teachers. There are 4,419 teachers in the area under study. According to data from Data Pokok Pendidikan (Dapodik), North Lampung has 431 primary schools, including 406 public and 25 private schools. The public and private schools were then divided into two location-based categories. In group 1, 50 science teachers were involved in public and private schools located in an urban area. In

contrast, in group 2, 50 science teachers were taken from public and private schools in rural areas.

2. Inclusion Criteria

Researchers utilize inclusion criteria to choose the sample to be used based on provisions that have been established. The inclusion criteria for this study were elementary school science teachers aged 25 to 45 with at least five years of teaching experience who were willing to complete online surveys and wished to participate. This criterion was established based on the researcher's views regarding the experience of science teachers within a minimum period of 5 years who already have a great deal of experience teaching science in the classroom. The age range is intended to limit the number of productive teachers. According to data on 367 primary school teachers, 307 did not match the inclusion criteria and were ejected because they had taught for less than five years, were older than 45, did not teach science, or were unwilling to complete a questionnaire.

3. Data Collection

Data was collected by inviting elementary school science teachers to fill out a questionnaire via an online link (Google Forms) sent via WhatsApp. Information about the objectives and research procedures is presented on the initial page of the questionnaire containing the consent form. Participants choose an answer by clicking on the confirmation option for those who receive online participation. The data collection form consists of eight sections according to indicators of science literacy. The following describes the contents of each science literacy indicator given to elementary school science teachers as research participants.

a. The first part of the questionnaire: Metacognitive Ability (MC)

The first section of the questionnaire comprises questions about awareness, belief, and knowledge regarding the validity of research techniques, the capacity to perform research, and the significance of scientific research.

b. The second part of the questionnaire: Understanding the Nature and Functions of Science (NFS)

The second section of the questionnaire consists of questions regarding the influence of science on human life, knowledge of the development of science, the significance of studying science, the relationship between scientific research and social problems, and the significance of using the scientific method to solve problems.

c. The third part of the questionnaire: Science as a Human Endeavor (SHE)

The third section of the questionnaire asks about the significance of honesty in disclosing research results, openness in conducting research, the relationship between science and technology in society, the need for public support for scientific research, and the impact of creativity on science.

d. The fourth part of the questionnaire: Habits of Mind (HM)

The fourth section of the questionnaire consists of questions about habits of mind, such as being cautious when conducting and analyzing research data, seeking information from various sources related to the research being conducted, and evaluating research results based on information from various sources.

e. The fifth part of the questionnaire: Interest in Science (IS)

The fifth section of the questionnaire consists of items regarding interest in science, such as the significance of science classes, motivation to study science, favorable attitudes toward science, and the significance of science in everyday life.

f. The sixth part of the questionnaire: Teaching of Science Literacy (TSL)

The sixth section of the questionnaire consists of questions about teaching science literacy, which includes discussing science-related issues with colleagues, making decisions based on scientific processes, conducting classroom

experiments or research projects, and actively participating in the learning evaluation process.

g. The seventh part of the questionnaire: Sense of Moral and Social Responsibility (MSR)

The seventh section of the questionnaire consists of questions regarding concern for problems affecting the worldwide community, participation in resolving scientific issues affecting global living, and tolerance for people from other parts of the world.

h. Part eight of the questionnaire: Ethics in Science (ES)

The eighth section of the questionnaire consists of questions regarding the significance of scientific research techniques, the significance of performing research with a worldwide influence, and the significance of linking the discoveries of other researchers to the current research.

This study investigates the science literacy perceptions of elementary school science teachers in North Lampung as a reference for building science learning models in higher education, particularly for incoming elementary school students. To evaluate the scores on the perception questionnaire of elementary school science teachers about science literacy, very high, high, medium, low, and very low levels were applied (Slameto, 2001). Cronbach's alpha coefficient exceeds 0.80 for all items and the majority of domains; these results imply that the general reliability of the questionnaire items is satisfactory (Meyers et al., 2016).

This study used a qualitative descriptive method. The objective of a descriptive qualitative technique is to detect and describe trends and variations in populations, to develop new measurements of essential phenomena, or to describe samples in causality-oriented studies. The importance of description in scientific processes in general and educational research, in particular, cannot be overstated (Dincer, 2018). The descriptive analysis identifies data patterns to answer questions about who, what, where, when, and to what extent (Ammah & Hodge, 2005). This guide shows how to approach successfully, conduct, and convey quantitative descriptive analysis (Kheirabadi & Mirzaei, 2019).

4. Data Analysis

The Rasch measurement model (Bond et al., 2020) was used to examine the instruments' quality and the participants' responses. The results of a Rasch analysis can explain the difficulty level of a test item with the correct measurement, detect item fit, and identify item bias (called the differential item function or DIF). The logarithmic function of the participant's probability answer is utilized in WINSTEPS version 5.2.4 to transform the data into logit (odd units of the logarithm) (Sumintono & Widhiarso, 2015).

The logarithmic function is used to convert ordinal data (Likert data) into logit data (odd log units). Assessing the adequacy of the entire instrument and the respondents (Bondan & Fox, 2015), this method differs from the classical test theory (also known as CTT), which depends on scores that do not provide accurate and exact measures and are latent (Andrich & Maris, 2019). The test results are deemed compatible with the model if the Outfit MNSQ value from the analysis results falls between 0.5 and 1.5 and if the Outfit ZSTD scores fall between -2.0 and 2.0 (Sumintono & Widhiarso, 2015). Based on eight indicators, the Winstep software findings were used to examine elementary school teachers' judgments of science literacy.

RESULTS AND DISCUSSION

As a result of collecting data from the science teacher's answer questionnaire to science literacy based on eight variables, 88 respondents filled out the questionnaire. Sixty respondents were deemed valid based on the inclusion and exclusion criteria. The findings were then analyzed using Winstep to establish the respondents' level of reliability as well as the questionnaire items' reliability. The following are the results of a statistical analysis of responses to a questionnaire about elementary school science teacher perceptions regarding eight indices of science literacy.

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a. Level of Reliability of Respondents and Items

The data analysis results about respondents' reliability and items using Winstep software are summarized in Table 1.

Table 1. Statistical Summary

Parameter	Element	Score
Logit	Person	3,5
	Item	0
Reabilitas	Person Reliability	0,92
	Item Reliability	0,79
Outfit MNSQ	Person	0,86
	Item	0,86
Outfit ZSTD	Person	1,5
	Item	1,1

Table 1 presents the results of an analysis conducted with the Winstep software. It revealed that the logit value of the individual or the mean measure is 3.5, while the logit of the items is 0. These results imply that the respondent's ability to answer item questions is greater than the item questions' complexity. Person reliability of 0.92 and item reliability of 0.79 implies that the consistency of respondents' responses is quite high and that the quality of the questionnaire's items is quite high.

Table 1 also shows the outfit MNSQ or the outfit mean square for persons and items of 0.86, which is included in the fit criteria because it falls within the range of 0.5<MNSQ<1.5, indicating that the questionnaire used to measure science teachers' perceptions of science literacy was by the model. Table 1 also displays the ZSTD outfit or standard Z value for individuals with a Z value of 1.5 and for goods with a Z value of 1.1. The ZSTD output value for both the person and the item falls within the range 2.0<ZSTD<2.0, indicating that the person and item items comply with the Rasch model, allowing the questionnaire instrument to be utilized.

b. Levels of Probability Respondents Assign toward Items

The probability level of respondents to each item for each measure of science literacy is shown in Figure 1.

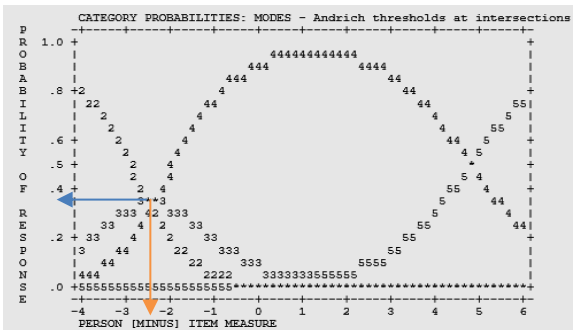

Figure 1. The probability level of science literacy item responses.

The respondent's criterion for the ability to answer questions assessing science literacy is -2.4. This indicates that if the respondent's ability is less than -2.4, the respondent's likelihood of selecting the response or option for items 3 and 4 is less than 0.4. While the likelihood of selecting option or response number 2 is more than 0.4%. If the respondent's ability is above -2.4, the chance to choose an answer or choice for items 2 and 3 is below 0.4; however, the opportunity to choose an answer or option for item 4 is between 0.4 and 0.9.

c. Science Teacher Perceptions of Science Literacy Indicators

Based on eight indicators, including Metacognitive (MC), the Nature and Function of Science (NFS), Science as Human Endeavor (SHE), Habits of Mind (HM), Interest in science (IS), the Teaching of Science Literacy (TSL), a Sense of Moral and Social Responsibility (MSR), and Ethics in Science (ES), elementary school science teachers' perceptions of science literacy are illustrated in Figure 2.

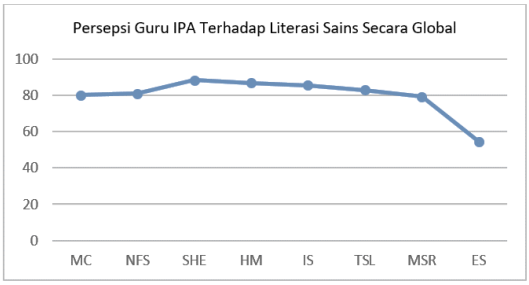

Figure 2. Science teacher perceptions towards science literacy.

Based on the eight indicators of science literacy, the average perception of elementary school science teachers towards science literacy falls into the good category, as depicted in Figure 2. Three of the eight indicators of science literacy discovered in the questionnaire, MC, NFS, and MSR, receive an average score of 80. The SHE, HM, IS, and TSL indicators have average scores between 80 to 90, as shown in Figure 2.

The average score for the ES indicator varies from 40 to 60 and is unsatisfactory. In future research, it will be necessary to examine the ES indicator or the ethical features of elementary school science teachers to determine the causes and alternative remedies that can be utilized to improve science teachers' perceptions of ES Indicators. The ethics of a science educator are tied to the outcomes of research and education. Therefore, it is essential to continue improving so that the quality of education continues to rise.

d. Science teachers' perceptions of science literacy are based on eight indicators

1. Metacognitive Ability

Perceptions of science literacy among science teachers based on measures of metacognitive skills, with a total of seven questions distributed among three categories, namely very high, high, and medium. The perceptions of science teachers on science literacy as measured by metacognitive variables are displayed in Figure 3.

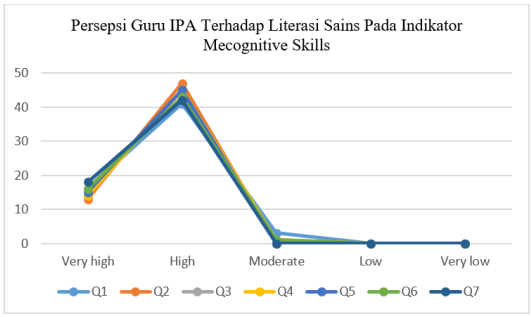

Figure 3. Science teacher's perception of science literacy on metacognitive skills indicators.

Figure 3 depicts the metacognitive skills of a science teacher based on seven questions with comparable diversity. This explains why the average value of the science teacher's perception of metacognitive skills is high.

2. The Nature and Functions of Science

Figure 4 provides a concise summary of the science teacher's comprehension of science literacy as measured by seven indicators of the nature and function of science.

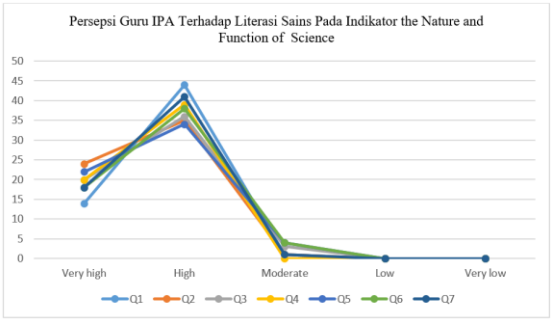

Figure 4. Science teacher's understanding of science literacy on the indicators of the nature and functions of science.

Figure 4 indicates a relatively diverse perception of the nature and function of science teachers. This explains why respondents to the seven questions provided varying responses. However, science teachers' typical beliefs regarding science's nature and function fall within the high group.

3. Science As Human Endeavor

The science teacher's understanding of science literacy in indicators of science as a human endeavor with a total of 5 items is briefly presented in Figure 5.

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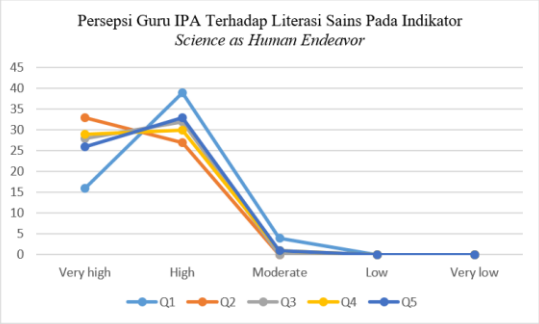

Figure 5. Science teachers' understanding of science literacy on indicators of science as a human endeavor.

The understanding of science as a human endeavor differs significantly based on the teacher's responses to the five questions, as shown in Figure 5. This is evident in the teacher's responses to questions 1 and 2, which are dissimilar. The proportion of respondents who answered question 1 concentrated on the high category, whereas question 2 focused on the extremely high group. Despite the diversity of responses, science instructors' perceptions of science as a business fall into the high category on average.

4. Science Teacher Activity on Habits of Mind

There are a total of five items that serve as indications of the way in which science teachers think regarding science literacy. As shown briefly in Figure 6.

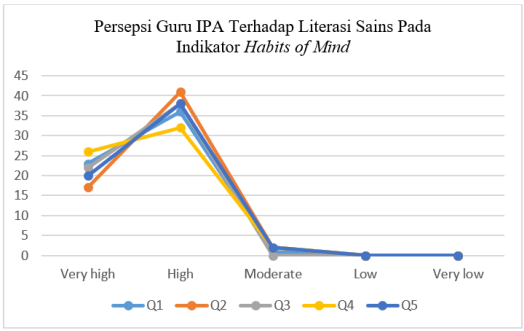

Figure 6. Habits of science teachers towards science literacy on habits of mind indicators

Figure 6 demonstrates that the habits of mind of science educators are quite different. This explains the variance in the respondents' responses to the five questions. Nevertheless, the average value of the science teacher's judgment of the habits of mind falls within the high category.

5. Science Teacher's Understanding of Science

The science teacher's perception of science literacy on the indicator of science perception with a total of 5 items. Complete data on science literacy perceptions are presented in Figure 7.

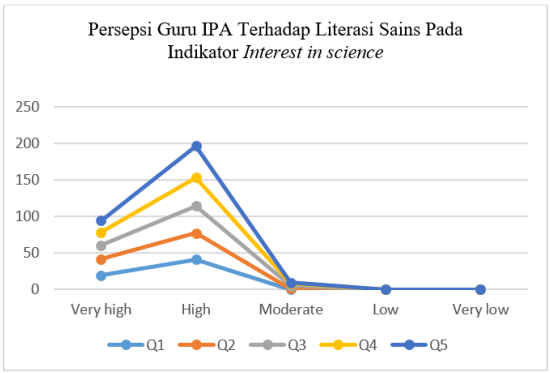

Figure 7. Science teacher's perception of science

Figure 7 illustrates how the participant's responses to the five questions about science differed greatly. The high category was the topic of question number five. However, Q1's item is still some time off. The average value of science teachers' perceptions of science, however, is still high.

6. Habits of Science Teachers in Teaching of Science Literacy

The habits of science teachers towards science literacy in the indicators of habits in teaching science literacy with a total of 5 items. Complete data on habits in teaching science literacy is presented in Figure 8 as follows.

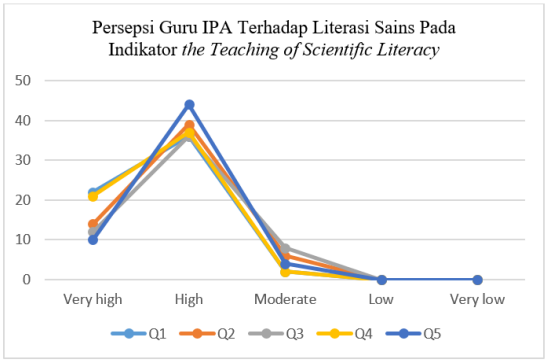

Figure 8. Habits of science teachers in teaching science literacy

Figure 8 depicts the diversity in the ways that science teachers teach science literacy. This explains why the respondents' responses to the five questions varied. The teacher has a high-category habit of teaching science literacy.

7. Sense of Moral and Social Responsibility

Using a total of 3 items, science literacy, according to science teachers, is evaluated in terms of moral and social responsibility. Figure 9 displays the full set of data.

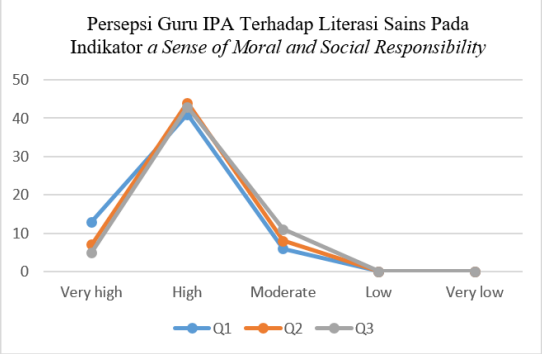

Figure 9. Science teacher's perception of moral and social responsibility

Figure 9 illustrates that the participants' responses were mostly focused on the three question items' high standards. This explains why the scientific instructor's views on morality and civic duty are so similar. Most science teachers place a high priority on having a sense of moral and social responsibility.

8. Ethics in Science

Science teachers' perceptions of science literacy on ethical indicators in science with a total of 4 questions spread across five categories: very high, high, medium, low, and very low. Data on science teachers' understanding of science literacy on ethical indicators in science is presented in Figure 10.

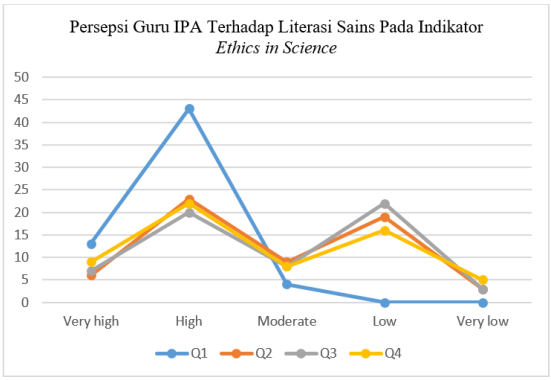

Figure 10. Science teacher's understanding of ethics in science

The results in Figure 10 show that the responses from the respondents were diverse and evenly distributed across all categories. This indicates that science teachers have a range of perceptions about ethics in science. The overall average perception of ethics in science among science teachers falls in the moderate category.

The level of science literacy among elementary school science teachers in North Lampung was assessed using eight indicators based on a previous study (Suwono et al., 2022). The data was collected by distributing an online questionnaire via WhatsApp. The analysis of the data, using the Rasch model, found that the respondents had a high level of reliability (0.92) in their responses, indicating that they were consistent in their answers (Fisher & Based, 2007). The items in the questionnaire also had a good level of reliability (0.79). The mean measure value for the respondents was 3.56, indicating that their abilities tended to be higher than the difficulty level of the items.

The perception of elementary school science teachers in North Lampung towards science literacy was analyzed for each indicator. Overall, their science literacy perception was in the high category, with an average percentage of 79.79%. When considering each individual indicator, the perception of elementary school science teachers towards science literacy was found to be high for metacognitive abilities (MC) and the other six indicators: nature and function of science (NFS), science as human endeavor (SHE), habits of mind (HM), interest in science (IS), the teaching of

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science literacy (TSL), and sense of moral and social responsibility (MSR). However, their perception of ethics in science (ES) was found to be in the medium category, with an average percentage of 54.6%.

CONCLUSION

The perception of science literacy among elementary school teachers in North Lampung was good for seven indicators and sufficient for one indicator. The low level of understanding of ethics in science among these teachers may hinder the development of science literacy in the North Lampung region. Further research is necessary to investigate the ethical practices of science teachers. The results of this study, which used a web-based online questionnaire to collect data from a single area in North Lampung, suggest that elementary school science teachers in this region have a deficiency in their understanding of ethics in science. However, it should be noted that the findings of this research are limited in scope, and further investigation is needed to confirm these results.

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