

Study correlation between science literacy and reading literacy: A study on prospective elementary teachers as an implementation of SDGs



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Abstract This research investigates the connection between scientific literacy and reading literacy among prospective elementary school teachers in Indonesia. Both scientific and reading literacy are crucial competencies for enhancing educational standards and tackling global challenges, as outlined in the Sustainable Development Goals (SDGs). These skills are vital for preparing future elementary school teachers to address international educational demands and contribute meaningfully to achieving the SDGs. Nevertheless, Indonesia's performance in these areas remains a concern, with below-average results in international assessments such as PISA, underscoring the pressing need for improvement. This study utilizes a quantitative correlational methodology to analyze the relationship between scientific and reading literacy. Data were gathered through standardized questionnaires completed by 158 participants from various teacher education institutions across Indonesia. The results indicate that the average reading literacy score (67.8) surpasses the average scientific literacy score (61.9), highlighting an imbalance in competency levels. Further statistical analysis reveals a significant positive relationship between the two literacies, indicating that stronger reading skills enhance scientific understanding. These results underscore the importance of implementing comprehensive strategies to improve literacy in teacher education programs. Bridging these gaps is essential for equipping future educators to meet the challenges of modern education. Efforts should prioritize the development of both scientific and reading literacy to ensure balanced and integrated skill growth. Aligning these initiatives with national and international educational priorities will help drive sustainable advancements in education quality.

Keywords: education for sustainability, science and reading integration, interdisciplinary

1. Introduction

The background of this research focuses on the phenomenon of scientific literacy and reading literacy among prospective elementary school teachers in Indonesia, which is becoming increasingly relevant in the context of achievement Sustainable Development Goals (SDGs). In Indonesia, scientific literacy and reading are two basic skills that are very important for improving the quality of education and preparing a generation capable of facing global challenges. According to data from the Program for International Student Assessment (PISA), Indonesia shows worrying results in scientific literacy, with an average score that is far below the OECD average (Latip et al., 2021). This shows that there is an urgent need to increase scientific literacy among prospective teachers, who will later play a role in educating students in elementary schools.

Statistics show that only approximately 30% of students in Indonesia have adequate reading literacy skills (Khusna et al., 2022; Hadiansah et al., 2021; Muhyidin et al., 2018). This is a serious problem, considering that reading literacy is the foundation for learning in all fields, including science. Research has shown that there is a significant relationship between reading literacy ability and scientific literacy (Johanes et al., 2022). Therefore, it is important to explore how these two types of literacy are interconnected and how prospective teachers can be prepared to teach these skills to their students.

The main problem faced in this context is the low level of scientific literacy and reading among prospective teachers, which can have a negative effect on the quality of education in primary schools (Oktaviani, 2023). Research by Khusna et al. (2022) shows that the School Literacy Movement (GLS) program implemented in various elementary schools still faces various challenges, including a lack of support from schools and the community (Wola, 2023). In addition, research by Hardiyanti shows that despite efforts to improve reading literacy, many students still have difficulty understanding reading texts (Sumanik et al., 2021). This shows that there are gaps in the implementation of literacy programs that need to be addressed.

Previous research has provided insight into the importance of scientific literacy and reading, but shortcomings remain in terms of the methodology and population studied. Most previous research focused on students, whereas research on prospective teachers is still limited (Hardiyanti, 2022). Additionally, many studies do not use quantitative approaches that could



provide a clearer picture of the relationship between scientific literacy and reading. This research aims to fill this gap by using quantitative methods to analyze the relationship between scientific literacy and reading literacy among prospective elementary school teachers.

Thus, the main aim of this research is to explore and analyze the relationship between scientific literacy and reading literacy among prospective elementary school teachers in Indonesia. It is hoped that this research can make a new contribution to the development of science, especially in the field of education, by providing more accurate and comprehensive data regarding the literacy skills needed for prospective teachers. Practically, it is hoped that the results of this research will be the basis for developing more effective curricula and training programs for prospective teachers; so that they can be better prepared to teach scientific literacy and reading to their students.

The current state of the research field should be carefully reviewed, and key publications, especially recent ones, should be cited. The Introduction should be comprehensible and connect the points mentioned above with a dynamic flow of reading, making it accessible to scientists outside of the specific research field.

2. Materials and Methods

The research method used in this study is a quantitative approach with a correlational research design. A quantitative approach was chosen because it allows researchers to measure and analyze the relationship between two variables, namely, scientific literacy and reading literacy, among prospective elementary school teachers. By using a correlational design, this research can provide a clear picture of how strong the relationship between two variables is; and provide reliable data to support the conclusions drawn. This is in line with previous research showing that quantitative approaches are effective in exploring relationships between variables in the educational context (Muharromah, 2021; Hidayah & Yuliawati, 2021).

Data collection will be carried out through a questionnaire instrument specifically designed to measure the level of scientific literacy and reading literacy of prospective teachers. This questionnaire consists of several sections, including questions about the understanding of science concepts, reading ability, and attitudes toward science and reading. The use of questionnaires as a data collection tool was chosen because it can reach a large number of respondents and allows for more in-depth statistical analysis. In this research, the total respondents is 158. In addition, a standardized questionnaire can increase the validity and reliability of the data obtained (Kurniawan & Hidayati, 2022; Nurjaman, 2023). This research will also involve prospective teachers from various educational institutions in Indonesia to ensure the diversity and representativeness of the sample used.

Data analysis will be carried out via descriptive and inferential statistical techniques. Descriptive statistics, such as age, gender, and educational background, are used to describe respondent characteristics. Moreover, inferential analysis, such as the Pearson correlation test, can be used to determine the relationship between scientific literacy and reading literacy. Thus, this research provides insight into the relationship between these two variables and offers data-based recommendations for developing curriculum and training programs for prospective teachers in Indonesia. The results of this analysis are expected to make a significant contribution to understanding the importance of scientific literacy and reading in the context of basic education in Indonesia (Utami, 2020; Yulian, 2023).

3. Results and Discussion

3.1. The average scores for science literacy and reading literacy

This figure examines the connection between science literacy and reading literacy, emphasizing the interdependence of these crucial skills (Figure 1). Science literacy pertains to the ability to understand and utilize scientific ideas, whereas reading literacy involves the ability to interpret and critically assess written content. Figure 1 illustrates how proficient reading abilities can improve one's capacity to interact with and understand scientific texts, promoting a richer comprehension of science. This finding also indicates that scientific knowledge can, reciprocally, aid in advancing reading literacy by expanding vocabulary and enhancing comprehension techniques.

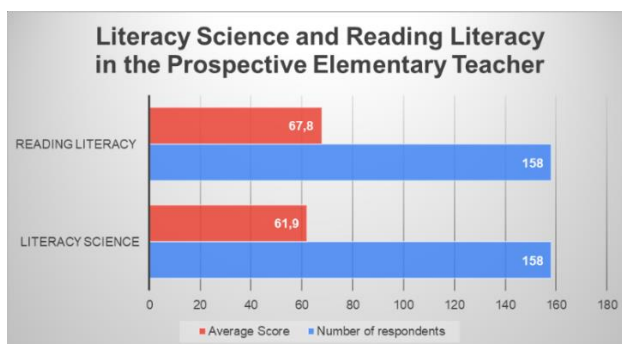


Figure 1 The average scores for science literacy and reading literacy.

Description of the Chart: The bar chart compares the average scores and the number of respondents in two areas of literacy: i.e., reading literacy and science literacy, among prospective elementary teachers. The chart includes reading literacy, which has an average score: of 67.8, with 158 respondents. However, science literacy has an average score: of 61.9, with 158 respondents. The data indicate that the number of respondents is the same for both categories, represented by blue bars, but the average scores (red bars) differ.

Performance Comparison: Reading literacy; has a higher average score (67.8) than does science literacy (61.9), suggesting that prospective elementary teachers are better at reading comprehension skills than at understanding scientific concepts (Duke et al., 2021).

Uniform Respondent Pool: An equal number of respondents (158) ensures a fair comparison between the two literacy areas. Therefore, it can ensure that the respondents are the same and equal.

The gap between literacies, if compared with the gap of 5.9 points between reading literacy and science literacy, may reflect differences in the emphasis or quality of training for these competencies in teacher education programs. In addition, a potential challenge is equipping teachers with sufficient science literacy, such as laboratory tools, practical activities, and contextual-teaching and learning, which could affect how they teach science to elementary students.

Implications for Teacher Training: Given the lower average score in science literacy, it may be necessary to enhance the curriculum or provide additional resources and training in science education to prospective teachers. Improving science literacy is crucial for elementary teachers to teach science subjects effectively at the foundational level (Fortus, 2022).

Overall Observation: The scores indicate a moderately strong performance in both areas, but there is room for improvement, especially in Science Literacy.

3.2. *The relationship between science literacy and reading literacy*

The research results revealed a significant positive relationship between scientific literacy and reading literacy among prospective elementary school teachers. On the basis of the questionnaire, data prospective teachers with good reading literacy skills tend to have greater scientific literacy skills. This finding is in line with research by Latip et al. (2021), which states that reading ability contributes to understanding complex scientific concepts (Muzakki, 2023). This confirms that reading literacy is an important foundation for understanding scientific material so that, ultimately, it can improve overall scientific literacy.

Concerning literacy theory, Freebody & Luke's (1990) views provide a relevant framework even though they initially focus more on mathematical literacy. They emphasize the importance of deep reading skills to understand scientific texts (Angriani et al., 2023; Tamba et al. 2020). Therefore, developing reading skills must be a priority in the education of prospective teachers so that they are more effective in teaching scientific literacy to students.

In addition, the use of interactive multimedia in science learning can increase students' scientific literacy (Puspitasari & Sukartono, 2022). This shows that an approach that integrates reading and science literacy through interactive media can be an effective strategy. Thus, prospective teachers need to be trained in the use of technology and learning media to support the development of scientific literacy and reading simultaneously.

Other research by Irsan (2021) highlights the importance of scientific literacy in science learning, which aims to prepare students to become quality individuals capable of competing globally. In this case, prospective teachers need to understand the relationship between reading literacy and science so that they can teach these two skills in an integrated manner. Therefore, developing a curriculum that includes a combination of reading and science literacy is a strategic step to improve the quality of education in elementary schools.

In the future, further research is needed to explore effective methods for increasing reading and science literacy among prospective teachers. This-research provides a deeper understanding of the interactions between these two skills and how prospective teachers can be prepared to teach them to students. Thus, developing an integrated training program will be very beneficial in efforts to improve the quality of education.

3.3. *Challenges in improving science and reading literacy*

Even though there is a positive relationship between scientific literacy and reading literacy, the challenges in improving these two skills are still quite large. Research shows that many prospective teachers have difficulty understanding and teaching science material (Juliana, 2023). This is often due to a lack of practical experience and adequate training. Wola (2023) and Irmanto et al. (2021) reported that prospective teachers who took part in online learning after the COVID-19 pandemic often faced limited access to the resources needed to support the development of scientific literacy. This condition emphasizes the importance of providing wider access to relevant educational materials.

The constructivist theories of Piaget and Vygotsky offer insights for overcoming these challenges. According to them, learning will be more effective if students are actively involved in the learning process and have access to adequate resources (Sativa & Eliza, 2023). In this context, prospective teachers need to receive more intensive training and resource support to

improve their scientific literacy and reading skills. Without sufficient support, prospective teachers' ability to teach these two skills may not develop optimally.

One of the main obstacles is the lack of adequate training for prospective teachers in teaching scientific literacy. Research by Hamimah et al. (2022) revealed that training for teachers is often not deep enough to improve their scientific literacy abilities. Therefore, educational institutions need to provide more focused and sustainable training programs.

The environment also influences these challenges. Many schools in remote areas do not have access to adequate resources, such as books or supporting technology. Nugroho (2019) reported that a lack of quality reading materials can hinder the development of reading and science literacy among students. Therefore, steps to increase access to educational resources in various regions must be prioritized.

To overcome these challenges, developing effective strategies is important. One way is to integrate reading and science literacy into the existing curriculum. This approach can help students understand literacy skills in a relevant context, thereby increasing their motivation to learn. In addition, the use of technology provide wider access to reading materials and learning resources.

Regular evaluation and monitoring of literacy programs are also needed. By carrying out continuous evaluations, educational institutions can identify aspects that need to be improved and perfect existing programs. This effort will help ensure that the literacy program truly provides optimal results in improving students' literacy skills.

3.4. Implications for curriculum development and training

The results of this research have important implications for the curriculum development and training of prospective teachers. A more integrated approach is needed in teaching scientific literacy and reading, with a focus on developing critical and analytical skills. Research by Latip et al. (2021) shows that prospective teachers need to improve their scientific literacy skills through various lecture activities that lead to scientific literacy (Latip et al., 2021). Therefore, developing a curriculum that integrates scientific literacy and reading is very important for improving the quality of education in elementary schools.

The project-based learning theory (project-based learning) proposed by Ibrohim et al. (2022) can be applied in this context. Project-based learning allows students to be involved in real projects that are relevant to their lives, thereby increasing their motivation and involvement in learning (Yulian, 2023). By implementing this approach in the training of prospective teachers, it is hoped that they can develop better scientific literacy and reading skills, which in turn will improve the quality of education in elementary schools.

Additionally, it is important to involve all stakeholders in the curriculum and training development. Collaboration among the government, educational institutions, and society is very important for creating an environment that supports the development of scientific literacy and reading. Research by Sugianto (2017) shows that the development of scientific literacy-based teaching materials can improve students' understanding of scientific concepts. Therefore, the development of relevant and high-quality teaching materials must be a priority in curriculum development.

Finally, further research is needed to explore effective methods for increasing science literacy and reading among preservice teachers. This research can provide deeper insight into how these two skills interact and how prospective teachers can be prepared to teach these skills to their students. Thus, developing training programs that focus more on the integration of scientific literacy and reading would be very beneficial.

Thus, it is hoped that the results of this research can become the basis for developing more effective curricula and training programs for prospective teachers so that they can be better prepared to teach scientific literacy and reading to their students. This is in line with efforts to improve the quality of education in Indonesia and achieve the Sustainable Development Goals (SDGs) in the education sector.

4. Final Considerations

This study highlights the notable connection between scientific literacy and reading literacy among prospective elementary school teachers in Indonesia. The results revealed a positive association between the two competencies, with reading literacy being a stronger skill (average score of 67.8) than scientific literacy (average score of 61.9). These findings validate the hypothesis that improved reading skills can enhance scientific comprehension, highlighting the interdependent nature of these literacies. The outcomes of the study stress the urgent need to address the gaps between scientific literacy and reading literacy within teacher education programs. By nurturing these critical competencies, future teachers will be better prepared to meet global educational demands and contribute to the realization of sustainable development goals (SDGs). This research enriches the broader understanding of literacy development by demonstrating how integrated literacy training can impact the quality of education.

Nevertheless, the study has several limitations. The dependence on self-reported data gathered via standardized questionnaires may introduce bias, and the sample size, while diverse, is confined to 158 respondents from select teacher education programs in Indonesia. Future studies could broaden the sample to include a larger, more varied population and investigate other factors that might influence literacy development, such as teaching methods or curriculum design.

In summary, this research illuminates the crucial relationship between scientific and reading literacy and its significance for teacher preparation. By addressing the identified gaps, educational institutions can play an essential role in preparing educators to meet contemporary educational challenges, thereby advancing progress toward national and global educational objectives.

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Ethical Considerations

This research involved human participation and was conducted following established ethical standards to ensure the protection and respect of all participants.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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