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Mapping Elementary Students' Scientific and Social Literacy in Integrated Science and Social Studies Learning: A Qualitative Exploratory Study

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Abstract
Scientific literacy and social literacy are essential competencies that should be developed from the early stages of formal education, particularly within integrated science and social studies learning. This study aims to map the current condition of elementary school students' scientific and social literacy in Integrated Science and Social Studies learning in Lampung Province, Indonesia. A qualitative approach with a descriptive exploratory design was employed to obtain an in-depth understanding of students' literacy conditions in authentic classroom contexts. The research participants consisted of elementary school teachers and students selected through purposive sampling based on their direct involvement in Integrated Science and Social Studies instruction. Data were collected through classroom observations, semi-structured interviews, and documentation studies involving lesson modules, textbooks, and student worksheets. The data were analyzed using the interactive model of Miles, Huberman, and Saldaña, which includes data condensation, data display, and conclusion drawing/verification. Data trustworthiness was ensured through source triangulation, technique triangulation, and member checking. The findings reveal that students' scientific literacy remains at a basic level. Students were generally able to observe phenomena but experienced difficulty in reasoning, interpreting information, explaining causal relationships, and applying concepts to real-life contexts. Similarly, students' social literacy had developed in terms of basic interaction and group work but had not yet reached the level of critical social understanding and reflective social reasoning. These conditions were influenced by the dominance of conventional teaching methods, limited exploratory activities, weak contextualization of learning materials, and suboptimal use of technology. This study implies that strengthening students' scientific and social literacy requires a transformation of instructional practices toward more inquiry-based, contextual, reflective, and student-centered learning.
Keywords: Elementary Education; Integrated Science and Social Studies; Qualitative Study; Scientific Literacy; Social Literacy.

INTRODUCTION

Scientific literacy and social literacy have become fundamental competencies in contemporary education because students are increasingly required to understand complex information, respond critically to environmental and social issues, and participate responsibly in society (Georgiou & Kyza, 2023; Kumar et al., 2024; OECD, 2024). In the twenty-first century, education is no longer expected to focus merely on the transmission of factual knowledge or memorization of concepts (Barata et al., 2025; Handoko et al., 2024; Marcinauskas et al., 2024; Palermo et al., 2017). Instead, schools are expected to develop students' abilities to observe phenomena, interpret information, reason scientifically, communicate ideas, solve contextual problems, and reflect critically on social realities, as these competencies are central to scientific literacy, inquiry-based learning, and meaningful participation in contemporary society (Muhamad Dah et al., 2024; Suryanti et al., 2024; Tytler, 2025). These competencies are essential because students live in an era characterized by rapid technological advancement, environmental challenges, information expansion, and increasingly complex social interactions (Marcinauskas et al., 2024; Palermo et al., 2017; UNESCO, 2021). Consequently, literacy development has become one of the primary orientations of educational reform worldwide (Cheng, 2020; Hanemann & Robinson, 2022).

Scientific literacy refers to the ability to use scientific knowledge, identify questions,

explain phenomena scientifically, interpret evidence, and make informed decisions related to science and technology (OECD, 2024). Scientific literacy is therefore not limited to understanding scientific facts but also includes reasoning, inquiry, critical thinking, and the application of knowledge in meaningful contexts (Georgiou & Kyza, 2023; T Kotsis, 2025; Valladares, 2021). Similarly, social literacy refers to the ability to understand social relationships, communicate effectively, demonstrate empathy, interpret social phenomena, and participate responsibly in community life (O'Conner et al., 2017; Pramudita, 2024). Social literacy also involves reflective and ethical dimensions because students are expected to understand multiple perspectives, evaluate social issues critically, and make responsible decisions within social contexts. Thus, scientific literacy and social literacy are interconnected competencies that support students' intellectual, emotional, and social development (Chan & Lee, 2021; Nawalinsi et al., 2024; Valladares, 2021).

The importance of literacy development has been emphasized in various international educational frameworks (Monggun Maulidiya Siregar et al., 2025; Sutriani, 2025). The Organisation for Economic Co-operation and Development (OECD) highlights scientific literacy as an essential competency for preparing students to engage with science-related issues as reflective citizens in modern society (OECD, 2019). Likewise, UNESCO emphasizes literacy as a foundation for lifelong learning, sustainable development, and active participation in society. These perspectives indicate that literacy should not merely be interpreted as the ability to read and write but as a multidimensional competence involving reasoning, interpretation, communication, and contextual understanding (OECD, 2024; UNESCO, 2021). Therefore, educational institutions are increasingly encouraged to design learning experiences that are meaningful, contextual, inquiry-oriented, and student-centered.

Science education in the twenty-first century is increasingly shaped by the need to provide learning experiences that are not only informative but also interactive, contextual, and conceptually meaningful (McFarlane, 2013; Rehman et al., 2024). In elementary education, literacy development becomes particularly important because this stage forms the foundation for students' cognitive and social growth (Apriliana et al., 2022; Chen et al., 2024; Maulani et al., 2021). Students at the elementary level are in the process of developing reasoning abilities, conceptual understanding, communication skills, and social interaction patterns (Hačatrjana & Namsone, 2024; Oktaviani et al., 2023). Therefore, learning experiences provided at this stage significantly influence students' future literacy development.

In Indonesia, literacy development has become one of the main priorities within the implementation of the Merdeka Curriculum (Haq & Wakidi, 2024; Hunaepi & Suharta, 2024). The curriculum emphasizes meaningful learning, contextual understanding, character development, higher-order thinking skills, collaboration, and problem-solving abilities (Junianto et al., 2025; Thornhill-Miller et al., 2023). One of the important curricular transformations at the elementary school level is the integration of science and social studies into Integrated Science and Social Studies (IPAS). This subject was designed to provide holistic learning experiences by integrating scientific and social perspectives in understanding phenomena encountered in everyday life (Erwin Akib et al., 2020; Hanum et al., 2024).

Conceptually, Integrated Science and Social Studies learning has strong potential to support the development of scientific and social literacy simultaneously (Thornhill-Miller et al., 2023; Valladares, 2021). Integrated Science and Social Studies learning allows students to explore relationships between humans, society, and the natural environment through observation, inquiry, discussion, reasoning, and reflection (Ossai & Alordiah, 2024; Zumrotun et al., 2025). Students are expected to understand environmental phenomena, recognize social interactions, interpret contextual issues, and apply concepts to real-life situations (Şeker, 2023; Villarreal Arroyo et al., 2023). Therefore, this subject functions not only as a medium for conceptual learning but also as a pedagogical space for strengthening literacy-oriented learning.

From a theoretical perspective, literacy development is closely associated with meaningful learning experiences. Constructivist learning theory suggests that knowledge is actively

constructed through interaction with the environment, prior experiences, and social communication (Le & Nguyen, 2024; Szabó & Csépes, 2023; Taber, 2024). Learning becomes meaningful when students are actively involved in observing phenomena, questioning information, discussing ideas, analyzing evidence, and reflecting on experiences (Muhamad Dah et al., 2024; Strat et al., 2024). Consequently, literacy-oriented learning requires instructional practices that encourage inquiry, exploration, collaboration, interpretation, and contextual problem-solving rather than passive reception of information (Mafarja et al., 2023; Qablan et al., 2024).

However, the implementation of literacy-oriented learning in elementary schools still faces various challenges. International assessment results indicate that Indonesian students continue to experience difficulty interpreting contextual information, applying concepts, and solving problems requiring reasoning and reflection. The Programme for International Student Assessment (PISA) consistently reports that Indonesian students' scientific literacy remains below the international average (OECD, 2019, 2021a). Many students are still limited to recognizing explicit information and have difficulty interpreting data, explaining scientific phenomena, and connecting knowledge with real-life contexts. These findings indicate that literacy development in Indonesia still requires substantial improvement, particularly at the elementary school level where foundational competencies are formed.

At the regional level, literacy achievement among elementary school students in Lampung Province also remains below optimal expectations. Educational report data indicate that the average literacy achievement of elementary students is categorized as moderate, with a score of 57.89, and the distribution of literacy achievement remains uneven across districts and municipalities (Kemendikbudristek, 2023). This condition suggests that students' abilities to understand contextual reading materials, reason from information, and interpret simple data still need to be strengthened through more meaningful and systematic instructional practices.

Conceptually, Integrated Science and Social Studies learning has a strategic role in developing students' scientific and social literacy because it is designed as an integrative and contextual subject (Verawati et al., 2020). Integrated Science and Social Studies learning does not only emphasize conceptual mastery but also encourages students to develop scientific and social reasoning through observing, questioning, reasoning, and reflecting on real-life phenomena (OECD, 2021b). However, existing evidence indicates that the implementation of Integrated Science and Social Studies learning has not fully supported the optimal development of these literacy competencies (Kemendikbudristek, 2023).

The preliminary study conducted in elementary school classrooms strengthened this indication. Based on classroom observations and teacher interviews, students still experienced difficulties in explaining phenomena coherently and connecting concepts with everyday life. One teacher stated, "Students can answer when they are asked directly, but when they are asked to explain why something happens, they are still confused" (T1, Interview, 2025). This finding was reinforced by another teacher who explained, "When students are given questions that are slightly different from the examples, they tend to have difficulty connecting the concepts they have learned" (T2, Interview, 2025). These interview excerpts indicate that students' understanding tends to remain at the level of factual recall and has not yet developed into causal reasoning or conceptual transfer.

From the students' perspective, literacy limitations were also reflected in their difficulty connecting classroom learning with real-life contexts. One student stated, "I can answer questions from the book, but when I am asked to give examples from everyday life, I am still confused" (S1, Interview, 2025). This statement suggests that students' understanding remains at a basic conceptual level and has not yet developed into applicative literacy. In other words, students may be able to reproduce information from textbooks, but they still struggle to use that knowledge flexibly in authentic situations.

Furthermore, the learning process was still dominated by textbook use and verbal explanation from teachers, which limited students' opportunities for exploration and analysis.

One teacher emphasized, "Learning still depends heavily on textbooks because of limited time and learning media, so students do not engage much in exploratory activities" (T3, Interview, 2025). This condition indicates that students' opportunities to develop literacy skills through meaningful learning experiences remain insufficient. Literacy development requires students to engage in inquiry, discussion, interpretation, reflection, and contextual problem-solving, whereas conventional learning tends to restrict these processes.

The limitations identified in this study indicate that literacy problems are not caused solely by students' individual abilities but are also closely related to the quality of instructional practices implemented in classrooms. Meaningful and contextual learning has been shown to contribute significantly to literacy development because it enables students to connect concepts with authentic experiences, reason from evidence, and construct understanding actively (Trilling & Fadel, 2020). Inquiry-based learning, problem-based learning, collaborative learning, and contextual approaches have also been reported to improve students' reasoning, interpretation, communication, and critical thinking skills. However, the successful implementation of these approaches depends greatly on teachers' pedagogical competence, instructional design, and classroom learning culture.

Another important issue related to literacy development is the integration of technology in learning. Technology has the potential to support literacy development by facilitating visualization, interactive learning, access to information, and collaborative activities. Digital learning environments can help students explore phenomena, analyze information, and communicate ideas more effectively. Nevertheless, the use of technology in elementary classrooms remains inconsistent and often limited by infrastructure, media availability, and teachers' technological competence. Consequently, opportunities to strengthen literacy through interactive and technology-supported learning remain underutilized.

The Technological Pedagogical Content Knowledge (TPACK) framework emphasizes that effective teaching requires the integration of content knowledge, pedagogical competence, and technological understanding. Although the present study does not explicitly implement the TPACK framework, the findings indicate that literacy development requires instructional practices that integrate contextual content, student-centered pedagogy, and meaningful learning media. Such integration is important for helping students develop both scientific and social literacy in authentic classroom contexts.

Although numerous studies have discussed scientific literacy, digital literacy, and literacy-oriented learning, empirical studies specifically exploring scientific literacy and social literacy simultaneously in Integrated Science and Social Studies learning at the elementary school level remain relatively limited. Most previous studies tend to focus on quantitative measurement of literacy achievement through test scores, while fewer studies examine how literacy conditions appear in actual classroom practices, teacher perceptions, student experiences, and instructional interactions. Consequently, there remains a need for qualitative studies that provide deeper contextual understanding regarding students' literacy conditions and the factors influencing their development.

Based on these considerations, this study aims to map the condition of elementary school students' scientific and social literacy through a qualitative exploratory approach. Specifically, the study investigates students' ability to observe phenomena, reason scientifically, interpret information, apply concepts contextually, interact socially, understand social phenomena, and express reflective opinions within Integrated Science and Social Studies learning. In addition, the study explores instructional factors influencing literacy development, including classroom learning practices, exploratory activities, contextualization of learning materials, and technology use. The findings are expected to provide empirical insights into students' current literacy conditions and serve as a foundation for developing more effective instructional practices oriented toward strengthening literacy in elementary education.

METHODS

This study employed a qualitative approach with a descriptive exploratory design to map the condition of elementary school students' scientific literacy and social literacy in Integrated Science and Social Studies learning. This approach was selected because it enabled the researchers to obtain an in-depth understanding of literacy phenomena as they occurred contextually in the classroom learning process. The study was conducted in elementary schools in Lampung Province, Indonesia, with research participants consisting of teachers and students who were directly involved in Integrated Science and Social Studies learning. The participants were selected using purposive sampling based on their direct engagement in the learning process and their relevance to the focus of the study.

Data were collected through observation, semi-structured interviews, and documentation studies. Observation was conducted to examine classroom learning processes directly, particularly activities that reflected students' scientific literacy and social literacy. The observation focused on students' ability to observe phenomena, reason, interpret information, connect concepts with real-life contexts, interact socially, and participate in classroom learning. Semi-structured interviews were conducted with teachers and students to explore their experiences, perceptions, and challenges in developing scientific and social literacy through Integrated Science and Social Studies learning. Documentation studies were carried out by analyzing instructional documents, including teaching modules, textbooks, and student worksheets, to identify the extent to which literacy components were embedded in the learning materials.

Data analysis was conducted interactively through the stages of data reduction, data display, and conclusion drawing/verification. The analysis was carried out iteratively to obtain findings that were deep, consistent, and grounded in the data. Data reduction was conducted by selecting and organizing information relevant to scientific literacy, social literacy, instructional practices, and factors influencing literacy development. The reduced data were then displayed in descriptive and thematic forms to facilitate interpretation. Conclusions were drawn and verified continuously by comparing data obtained from observations, interviews, and documentation.

The trustworthiness of the data was maintained through source triangulation and technique triangulation. Source triangulation was conducted by comparing information obtained from teachers, students, and instructional documents, while technique triangulation was carried out by comparing data from observations, interviews, and documentation studies. In addition, member checking was conducted with informants to ensure that the data and interpretations accurately reflected the realities experienced in the field. This process was used to strengthen the credibility, consistency, and validity of the research findings.

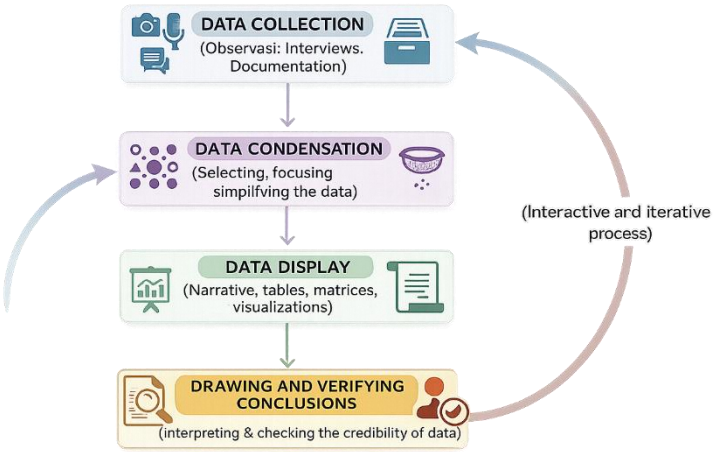

Figure 1. Qualitative Data Analysis Model (Milles & Huberman)

RESULT AND DISCUSSION

The findings of this study indicate that elementary school students' scientific literacy and social literacy remain at a basic developmental level and have not yet developed optimally within Integrated Science and Social Studies learning. The results reveal that students were generally able to identify and observe phenomena encountered during classroom learning; however, their abilities to reason scientifically, interpret information critically, apply concepts contextually, and reflect on social issues remained limited. These findings suggest that students' literacy competencies are still dominated by factual understanding rather than higher-order reasoning and reflective thinking.

Students' Scientific Literacy Condition

The results show that students' scientific literacy was primarily reflected in their ability to observe and recognize phenomena. Based on classroom observations, students were generally capable of identifying objects, describing visible phenomena, and responding to direct questions related to learning materials. However, students still experienced considerable difficulty explaining causal relationships, interpreting information, and connecting concepts to real-life situations. Most students tended to describe only what they observed without being able to explain why the phenomenon occurred scientifically.

This finding was reinforced by interview data with teachers. One teacher stated, *"Students can answer simple questions, but when they are asked to explain the reasons or processes behind a phenomenon, they still experience difficulty"* (Teacher Interview, 2025). Another teacher explained that students frequently struggled when questions differed slightly from examples provided in textbooks or classroom explanations. These findings indicate that students' understanding remains strongly dependent on memorization and factual recall rather than conceptual reasoning and knowledge transfer.

From the students' perspective, similar limitations were identified. One student stated, *"I can answer questions from the textbook, but when I am asked to give examples from everyday life, I still feel confused"* (Student Interview, 2025). This statement demonstrates that students' understanding remains at a nominal and functional literacy level and has not yet developed into conceptual or multidimensional literacy. According to OECD (2019), scientific literacy involves not only recognizing scientific information but also explaining phenomena, interpreting evidence, and applying scientific understanding in authentic contexts. Therefore, the findings suggest that students' scientific literacy remains limited because the learning process has not fully facilitated higher-order thinking and contextual application. The findings regarding students' scientific literacy are summarized in Table 1.

Table 1. Students' Scientific Literacy Findings

Literacy Aspect	Field Findings	Indication
Observation	Students were able to identify phenomena	Developing
Reasoning	Difficulty explaining causal relationships	Not optimal
Interpretation	Difficulty drawing conclusions from information	Low
Concept Application	Difficulty relating concepts to real-life situations	Low

The relationship among these aspects demonstrates that observation ability alone is insufficient for developing scientific literacy comprehensively. Students who are able to identify phenomena do not automatically possess the ability to interpret, reason, or apply concepts contextually. The findings indicate that scientific literacy development requires interconnected cognitive processes involving observation, interpretation, reasoning, and application. When one aspect remains weak, the development of other literacy components is also constrained. In this study, limited reasoning ability contributed directly to students' difficulties in interpreting information and applying concepts to real-life situations.

Students' Social Literacy Condition

The results also indicate that students' social literacy had developed only at the level of basic interaction and collaboration. Students were generally capable of participating in group work and interacting with peers during classroom activities. However, they still experienced difficulty understanding social phenomena critically and reflecting on social issues contextually.

One teacher explained, *"Students are able to work in groups, but they are not yet able to connect the material with social conditions around them"* (Teacher Interview, 2025). This finding indicates that students' social literacy remains limited to social participation and interaction rather than reflective and analytical understanding. Students could cooperate with peers but had not yet developed deeper social awareness regarding community problems, social relationships, and contextual social realities.

Students themselves also acknowledged difficulties in expressing reflective opinions. One student stated, *"When I am asked for my opinion, I often feel confused about what to answer"* (Student Interview, 2025). This finding demonstrates that students still lack confidence and critical reasoning skills in responding to social issues. According to UNESCO (2013), social literacy includes the ability to understand social contexts, demonstrate empathy, interpret social situations critically, and make responsible decisions in society. Therefore, the findings indicate that students' social literacy remains at the interaction stage and has not yet developed into reflective social literacy. The findings regarding students' social literacy are summarized in Table 2.

Table 2. Students' Social Literacy Findings

Literacy Aspect	Field Findings	Indication
Social Interaction	Students were able to work collaboratively	Developing
Social Understanding	Limited understanding of social phenomena	Moderate
Social Reflection	Difficulty expressing opinions critically	Low

The findings demonstrate that social interaction does not automatically lead to reflective social understanding. Students may participate actively in group activities while still lacking the ability to interpret social realities critically. This suggests that social literacy development requires learning experiences that encourage reflection, perspective-taking, discussion, empathy, and contextual analysis rather than merely collaborative participation.

Factors Influencing Students' Literacy Development

The analysis identified several interconnected factors influencing students' scientific and social literacy development. These factors included conventional instructional practices, limited exploratory activities, weak contextualization of learning materials, and limited use of technology in classroom instruction.

Table 3. Factors Influencing Students' Literacy Development

Factor	Findings	Impact
Conventional learning	Dominance of lectures and textbooks	Students became passive
Limited exploration	Lack of inquiry activities	Literacy development remained limited
Limited contextualization	Learning materials disconnected from real life	Difficulty applying concepts
Limited technology use	Learning media lacked variation	Weak visualization and interaction

Teacher interviews further strengthened these findings. One teacher stated, *"Learning still depends heavily on textbooks because of limited time and media"* (Teacher Interview, 2024). This statement reflects how instructional limitations directly influence students' literacy opportunities. The dominance of textbook-based instruction and verbal explanation restricts

opportunities for inquiry, discussion, visualization, and contextual exploration, all of which are essential for literacy development.

The findings indicate strong relationships among the identified factors. Conventional learning practices contributed to limited exploratory activities because students were positioned primarily as passive recipients of information rather than active constructors of knowledge. Limited exploration subsequently reduced opportunities for students to connect concepts with real-life contexts, thereby weakening conceptual understanding and literacy development. In addition, limited use of technology further constrained students' opportunities for visualization and interactive learning experiences, particularly in understanding abstract concepts and social phenomena. These interconnected factors collectively contributed to students' low literacy development.

Model of Research Findings

To provide a clearer understanding of the relationships among instructional conditions, classroom learning practices, and students' literacy development, the findings of this study are synthesized into a conceptual model presented in Figure 2. The model illustrates how the characteristics of Integrated Science and Social Studies learning influence the development of students' scientific literacy and social literacy in elementary classrooms.

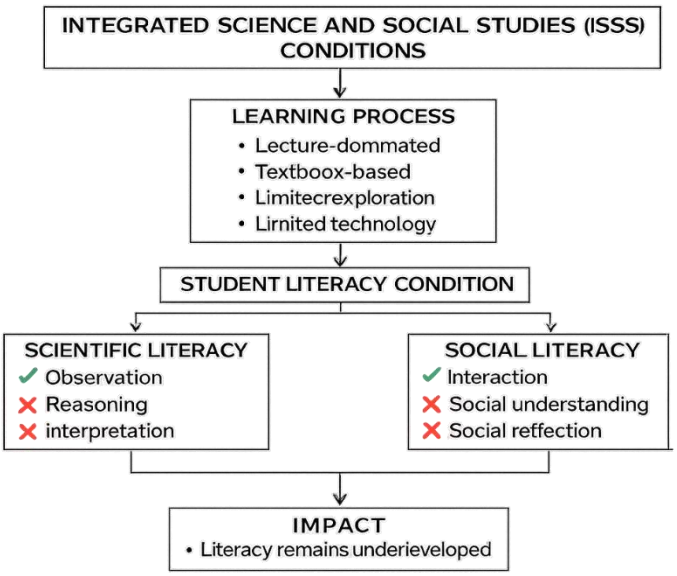

Figure 2. Study Findings Model

The conceptual model shows that the condition of Integrated Science and Social Studies learning is still dominated by conventional instructional practices, including lecture-based teaching, textbook-centered learning, limited exploratory activities, and minimal use of technology. These instructional conditions affect students' opportunities to engage actively in inquiry, contextual learning, and reflective discussion.

As a consequence, students' scientific literacy develops unevenly. Students generally demonstrate the ability to observe phenomena, indicating that basic observational skills have begun to develop. However, students still experience difficulty in reasoning scientifically and interpreting information critically. This condition indicates that students' scientific literacy remains limited to functional understanding and has not yet reached conceptual and multidimensional literacy.

Similarly, students' social literacy develops primarily at the interaction level. Students are able to participate in group activities and collaborate with peers, suggesting that basic social interaction skills are developing. Nevertheless, students still show limitations in understanding social phenomena deeply and reflecting critically on social issues. Their ability to express

opinions, connect learning materials with real-life social contexts, and demonstrate reflective social reasoning remains relatively low.

The model further demonstrates that these literacy limitations are interconnected and influenced by the quality of instructional practices implemented in classrooms. Conventional learning environments that provide limited opportunities for inquiry, contextualization, exploration, and technology integration tend to restrict the development of higher-order literacy competencies. Consequently, students' scientific literacy and social literacy remain underdeveloped and have not yet reached the level expected in twenty-first-century education. Overall, the model emphasizes that improving students' literacy competencies requires a transformation of instructional practices toward more inquiry-oriented, contextual, reflective, and technology-supported learning environments. The findings suggest that literacy development is not solely determined by curriculum content but is strongly influenced by how teachers design meaningful learning experiences that encourage reasoning, interpretation, interaction, and reflection.

Discussion

The findings of this study demonstrate that elementary school students' scientific literacy and social literacy remain at a foundational level and have not yet developed optimally within Integrated Science and Social Studies learning. This condition reflects a significant gap between the competencies expected in twenty-first-century education and the actual instructional practices implemented in classrooms. Modern education emphasizes critical thinking, inquiry, reasoning, contextual understanding, collaboration, and problem-solving. However, the findings suggest that classroom learning still tends to emphasize factual recall and textbook-based instruction rather than reflective and inquiry-oriented learning.

From the perspective of scientific literacy, students were generally capable of observing phenomena but experienced difficulty reasoning scientifically and interpreting information critically. This finding suggests that students' literacy remains at the functional level rather than the conceptual or multidimensional level described by OECD (2019). Scientific literacy requires students not only to recognize information but also to explain phenomena scientifically, evaluate evidence, and apply scientific understanding to real-life contexts. In this study, students' inability to explain causal relationships and apply concepts contextually indicates that instructional practices have not fully supported the development of higher-order cognitive processes.

The findings are consistent with previous studies indicating that teacher-centered learning tends to limit students' active participation in inquiry and critical thinking processes (Trilling & Fadel, 2009). In conventional classrooms dominated by lectures and textbook use, students are often positioned as passive recipients of information. As a result, students may acquire factual knowledge but remain limited in their ability to reason, interpret, and apply knowledge meaningfully. Similar findings were also reported by (Darling-Hammond et al., 2020), who emphasized that meaningful learning environments are essential for developing higher-order thinking and literacy competencies. Effective learning environments should encourage students to ask questions, investigate problems, discuss ideas, and construct understanding actively.

The relationship between exploratory learning and scientific literacy development was also evident in this study. Students who lacked opportunities for inquiry and exploration experienced difficulty interpreting information and applying concepts contextually. This finding supports constructivist perspectives suggesting that knowledge is constructed actively through interaction with experiences and environments. Inquiry-based learning allows students to observe phenomena, collect evidence, test explanations, and reflect on findings, thereby strengthening scientific reasoning and conceptual understanding. However, the limited implementation of exploratory learning activities in this study restricted opportunities for students to develop these competencies.

Regarding social literacy, the findings indicate that students had developed basic

interaction skills but had not yet achieved reflective social understanding. Students were able to cooperate with peers in group activities, yet they struggled to connect learning materials with social realities and express reflective opinions critically. These findings are consistent with UNESCO's perspective that social literacy involves not only participation and communication but also empathy, contextual understanding, critical reflection, and responsible social decision-making. In this study, students' social literacy remained limited because classroom learning rarely encouraged reflective dialogue, contextual discussion, and social analysis.

The findings also demonstrate an important relationship between contextual learning and social literacy development. Students who learned primarily through textbook-centered instruction experienced difficulty connecting concepts with everyday social realities. Contextual learning is essential because literacy develops more effectively when students engage with authentic situations related to their daily experiences. When learning remains abstract and disconnected from real-life contexts, students may memorize information without understanding its relevance or practical implications. Consequently, they struggle to develop reflective and critical social understanding.

Another important finding concerns the limited integration of technology in classroom instruction. The results indicate that limited learning media and low technological variation reduced students' opportunities for visualization and interaction. In contemporary education, technology can support literacy development by facilitating multimedia learning, visualization, collaboration, and contextual exploration. Technology-assisted learning environments can help students understand complex phenomena more concretely and interactively. However, in this study, instructional practices remained largely dependent on textbooks and verbal explanation, thereby limiting students' opportunities for meaningful and interactive learning experiences.

The findings strengthen the argument that literacy development is strongly influenced by instructional quality rather than curriculum change alone. Although the Merdeka Curriculum emphasizes meaningful and contextual learning, effective literacy development depends on how teachers design and implement learning activities in classrooms. The results suggest that the transformation of instructional practices is necessary to support literacy-oriented education effectively. Learning environments should encourage inquiry, discussion, contextual problem-solving, collaboration, and reflective thinking rather than rote memorization and passive information reception.

From the perspective of educational implications, the findings suggest several important considerations. First, teachers need to shift from teacher-centered instruction toward student-centered and inquiry-oriented learning approaches. Students should be provided with opportunities to observe phenomena, investigate problems, discuss findings, and reflect on real-life situations. Second, contextual learning should be strengthened so that students can connect scientific and social concepts with their everyday experiences. Third, the integration of technology and interactive learning media should be improved to support visualization, exploration, and active engagement. Fourth, teacher professional development programs should emphasize literacy-oriented pedagogy, inquiry-based instruction, and the integration of content, pedagogy, and technology.

The findings also imply the importance of implementing more integrative learning approaches such as the Technological Pedagogical Content Knowledge (TPACK) framework proposed by Mishra and Koehler (2006). Although this study did not directly implement the TPACK model, the findings indicate that effective literacy development requires the integration of content knowledge, pedagogical strategies, and technological support. Teachers need not only strong content understanding but also pedagogical competence and technological skills to create meaningful learning experiences.

This study contributes empirically to the literature on literacy development in elementary education, particularly within Integrated Science and Social Studies learning. Unlike many previous studies focusing primarily on quantitative literacy measurement, this study provides contextual qualitative insights into how literacy conditions appear in classroom interaction,

instructional practices, and student experiences. The findings enrich understanding regarding the interconnected relationship between scientific literacy, social literacy, instructional design, contextual learning, and classroom practices.

Nevertheless, this study has several limitations. First, the study was conducted only in elementary schools within one province, which limits the generalizability of the findings to broader educational contexts. Second, the study employed a qualitative exploratory design; therefore, the findings focus more on contextual understanding than statistical generalization. Third, the study relied on observations, interviews, and documentation without integrating quantitative literacy assessments that could provide more measurable literacy indicators. Future studies are recommended to combine qualitative and quantitative approaches to obtain more comprehensive literacy profiles. In addition, future research should explore the effectiveness of inquiry-based, contextual, and technology-supported instructional models in improving students' scientific and social literacy across different educational settings.

CONCLUSION

This study concludes that elementary school students' scientific literacy and social literacy in Integrated Science and Social Studies learning remain at a basic level and have not yet developed optimally. Scientific literacy was mainly reflected in students' ability to observe phenomena, while their ability to reason scientifically, interpret information, explain causal relationships, and apply concepts to real-life contexts remained limited. Social literacy had developed in terms of basic interaction and group work; however, students still experienced difficulty understanding social phenomena, expressing opinions, and reflecting critically on social issues. These conditions were influenced by the dominance of lecture-based and textbook-centered instruction, limited exploratory activities, weak contextualization of learning materials, and suboptimal use of technology in the classroom. Therefore, strengthening students' scientific and social literacy requires a transformation of Integrated Science and Social Studies learning toward more inquiry-based, contextual, reflective, and student-centered practices. The findings imply that teachers need to design learning experiences that provide students with more opportunities to observe, investigate, discuss, reason, interpret, and connect concepts with everyday life. Future research is recommended to develop and test instructional models that integrate inquiry activities, contextual problem-solving, social reflection, and technology-supported learning to improve students' literacy competencies more effectively.

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