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Integration of Realia Media and the Scientific Approach in Strengthening Students' Scientific Attitudes: A Systematic Literature Review

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Abstract
Meaningful science learning requires active student engagement supported by contextual media. This study aims to analyze the use of realia media through the scientific approach and its contribution to strengthening students' scientific attitudes. A systematic literature review following the PRISMA protocol was conducted. Of 52 identified articles, 26 met the inclusion criteria and were analyzed. The findings show that integrating realia media with the scientific approach enhances student engagement, conceptual understanding, and science process skills. It also promotes scientific attitudes such as curiosity, honesty, accuracy, openness to evidence, and responsibility. However, challenges include teacher readiness, classroom management, and limited instructional time. Overall, this study confirms that the integration of realia media and the scientific approach is an effective strategy for strengthening scientific attitudes in elementary IPAS learning.
Keywords: *Realia media, scientific approach, scientific attitude, systematic literature review, science learning*

Abstrak
Pembelajaran sains yang bermakna memerlukan keterlibatan aktif siswa melalui penggunaan media pembelajaran kontekstual. Penelitian ini bertujuan menganalisis penggunaan media realia melalui pendekatan saintifik serta kontribusinya dalam memperkuat sikap ilmiah siswa. Metode yang digunakan adalah *systematic literature review* dengan mengikuti protokol PRISMA. Dari 52 artikel yang teridentifikasi, sebanyak 26 artikel memenuhi kriteria inklusi dan dianalisis. Hasil kajian menunjukkan bahwa integrasi media realia dengan pendekatan saintifik mampu meningkatkan keterlibatan siswa, pemahaman konsep, dan keterampilan proses sains. Selain itu, pendekatan ini juga berkontribusi terhadap pengembangan sikap ilmiah seperti rasa ingin tahu, kejujuran, ketelitian, keterbukaan terhadap bukti, dan tanggung jawab. Namun, terdapat beberapa kendala dalam implementasi, seperti kesiapan guru, manajemen kelas, dan keterbatasan waktu pembelajaran. Secara keseluruhan, integrasi media realia dan pendekatan saintifik merupakan strategi efektif dalam memperkuat sikap ilmiah siswa pada pembelajaran IPAS di sekolah dasar.
Kata kunci: Media Realia, Pendekatan Saintifik, Sikap Ilmiah, Tinjauan Pustaka Sistematis, Pembelajaran Sains

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INTRODUCTION

Natural and Social Science (IPAS) learning in elementary schools plays a strategic role in building the foundation of students' scientific ways of thinking from an early age. Science is not merely understood as a collection of concepts and facts, but also as a process and a set of attitudes that reflect how scientists work in understanding natural and social phenomena. Therefore, IPAS learning should not be oriented solely toward cognitive outcomes, but also toward the development of scientific attitudes such as curiosity, honesty toward data, openness to evidence, accuracy, and responsibility in the learning process (Harlen, 2014; Rustaman, 2017).

However, empirical data indicates that the quality of science learning in Indonesia still faces significant challenges. The results of the Programme for International Student Assessment (PISA) show that Indonesian students' scientific literacy remains relatively low compared to the international average. In the 2018 PISA assessment, Indonesia ranked in the lower tier, with students demonstrating limited ability to apply scientific knowledge in real-life contexts (OECD, 2019). Similarly, the Minimum Competency Assessment (AKM) results also indicate that many students have not yet achieved optimal levels of scientific reasoning and understanding. These findings suggest that science learning has not fully succeeded in fostering higher-order thinking skills and scientific attitudes among students.

At the elementary school level, these problems are often rooted in classroom practices that are still teacher-centered and focused on memorization. Several studies reveal that IPAS learning tends to be abstract, less contextual, and not sufficiently engaging students in direct scientific experiences (Anwar, 2019; Kurniawan et al., 2020). Students often receive knowledge as something "ready-made," rather than as the result of processes of observation, reasoning, and verification. This condition is not aligned with the cognitive developmental characteristics of elementary school students, who require concrete, contextual, and experience-based learning environments.

One strategic innovation to address this issue is the use of realia media in learning. Realia media refers to learning media that present real objects or replicas that closely resemble their original conditions, enabling students to interact directly with learning resources (Sudjana & Rivai, 2017; Arsyad, 2019). The use of realia media helps bridge the gap between abstract concepts and concrete experiences, thereby strengthening students' conceptual understanding and engagement. Empirical studies have shown that realia media can improve learning outcomes, student activity, and understanding of science concepts in elementary education (Jumiati et al., 2022; Wicaksono et al., 2021; Hayati et al., 2023).

In addition, realia media have strong potential to support learning based on scientific processes. When students interact with real objects, they are naturally encouraged to observe, ask questions, explore, and draw conclusions based on empirical evidence. This aligns with the scientific approach, which emphasizes active student involvement in constructing knowledge through systematic steps such as observing, questioning, collecting data, reasoning, and communicating (Hosnan, 2016; Daryanto, 2018). In the context of the 2013 Curriculum and the Merdeka Curriculum, the scientific approach is recognized as a key strategy to develop higher-order thinking skills, science process skills, and scientific attitudes (Kemendikbud, 2017; Sani, 2019).

Previous studies have demonstrated that the scientific approach can enhance student motivation, learning activities, and science process skills (Sholihah & Sudibyo, 2020; Rahayu et al., 2021; Yuliana et al., 2022). Moreover, each stage of the scientific approach inherently supports the development of scientific attitudes. For example, observation fosters accuracy, questioning stimulates curiosity, data collection requires honesty, and communication promotes responsibility.

The strengthening of scientific attitudes is a crucial aspect of science education. Harlen (2014) states that scientific attitudes are developed through consistent and meaningful experiences rather than through direct instruction. Empirical studies also confirm that learning involving experiments, direct observation, and contextual problem-solving significantly contributes to the development of students' scientific attitudes (Haryono et al., 2019; Dewi et al., 2022; Fitri et al., 2023). However, the effectiveness of these efforts depends on the integration between learning media and instructional approaches.

In this regard, the integration of realia media with the scientific approach represents a potentially powerful combination. Realia media provide concrete learning experiences, while the scientific approach offers a structured framework for engaging in scientific processes. Together, they create a learning environment that is not only meaningful and contextual but also conducive to the development of scientific attitudes.

However, despite the growing body of research on realia media and the scientific approach, no comprehensive synthesis has systematically examined their combined contribution to strengthening students' scientific attitudes, particularly in the context of IPAS learning in Indonesian elementary schools. Existing studies tend to focus separately on cognitive outcomes, learning activities, or process skills, with limited attention to scientific attitudes as an integrated outcome. Moreover, research findings remain fragmented across different contexts, making it difficult to draw general conclusions.

Based on these gaps, this study seeks to address the need for a comprehensive understanding of how the integration of realia media and the scientific approach contributes to the development of students' scientific attitudes. Therefore, the research problem can be formulated as follows: (1) how is realia media implemented within the scientific approach in IPAS learning? (2) what are the impacts of this integration on students' scientific attitudes? and (3) what patterns and trends can be identified from previous studies?

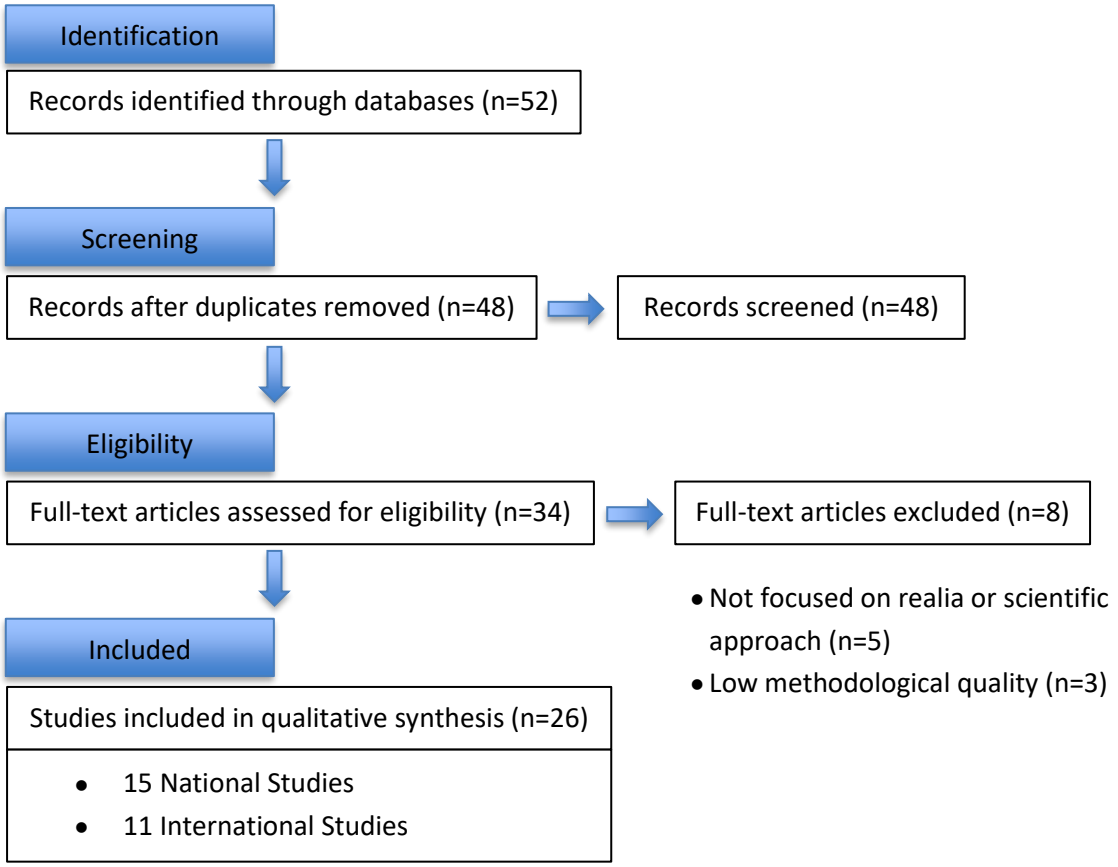
Accordingly, the purpose of this study is to systematically analyze and synthesize relevant research findings on the use of realia media through the scientific approach and their implications for strengthening the scientific attitudes of elementary school students. Through a literature review of national and international scholarly articles, this study is expected to provide a strong theoretical and empirical foundation for developing more meaningful, contextual, and scientifically oriented IPAS learning practices.

METHODS

This study employed a systematic literature review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol to ensure transparency and rigor in the article selection process. Data were obtained from reputable databases, including Google Scholar, Portal Garuda, and DOAJ, focusing on publications from 2014–2024.

The review procedure consisted of four stages: identification, screening, eligibility, and inclusion. The initial search using keywords such as *realia media*, *scientific approach*, *scientific attitude*, and *IPAS/science learning* yielded 52 articles. After removing duplicates and screening titles and abstracts, 34 articles remained. Following full-text eligibility assessment based on predefined criteria, 26 articles were included in the final analysis. The selection process is illustrated in the PRISMA flow diagram.

Figure 1. PRISMA Flow Diagram



The quality appraisal was conducted using criteria adapted from systematic review standards, including relevance of research focus, clarity of methodology, and validity of findings, to minimize bias. The final dataset consisted of 15 national and 11 international articles, with research designs including experimental, quasi-experimental, and descriptive studies.

The data were analyzed descriptively and qualitatively by synthesizing findings into themes related to realia media, the scientific approach, and scientific attitudes to identify patterns, trends, and instructional implications.

RESULTS AND DISCUSSION

Based on the PRISMA-based selection process, 52 articles were initially identified, of which 26 met the inclusion criteria after screening and eligibility assessment. These comprised 15 national and 11 international studies. For analytical purposes, the studies were organized into three main themes: realia media (10 studies), the scientific approach (8 studies), and scientific attitudes or science process skills (8 studies). The detailed characteristics and synthesis of these studies are presented in Table 1.

Table 1. Matrix Synthesis of Reviewed Studies

No	Author (Year)	Country	Design	Focus & Key Findings
1	Anwar (2019)	Indonesia	Descriptive	Contextual learning supports scientific attitudes
2	Kurniawan et al. (2020)	Indonesia	Descriptive	Teacher-centered learning limits engagement

No	Author (Year)	Country	Design	Focus & Key Findings
3	Jumiati et al. (2022)	Indonesia	Experimental	Realia improves learning outcomes and activity
4	Wicaksono et al. (2021)	Indonesia	Quasi-exp.	Enhances conceptual understanding
5	Hayati et al. (2023)	Indonesia	Experimental	Supports concrete learning experiences
6	Kasimah et al. (2022)	Indonesia	Descriptive	Stimulates scientific inquiry activities
7	Ardita et al. (2023)	Indonesia	Experimental	Improves reasoning skills
8	Hosnan (2016)	Indonesia	Conceptual	Provides scientific learning framework
9	Daryanto (2018)	Indonesia	Conceptual	Strengthens structured scientific processes
10	Sholihah & Sudibyo (2020)	Indonesia	Experimental	Increases student participation
11	Rahayu et al. (2021)	Indonesia	Quasi-exp.	Improves science process skills
12	Yuliana et al. (2022)	Indonesia	Experimental	Enhances communication skills
13	Haryono et al. (2019)	Indonesia	Experimental	Direct experience improves attitudes
14	Dewi et al. (2022)	Indonesia	Quasi-exp.	Significant attitude improvement
15	Fitri et al. (2023)	Indonesia	Experimental	Strengthens critical thinking
16	Sudjana & Rivai (2017)	Indonesia	Conceptual	Realia supports meaningful learning
17	Arsyad (2019)	Indonesia	Conceptual	Media enhances engagement
18	Sani (2019)	Indonesia	Descriptive	Identifies implementation challenges
19	Susanti et al. (2020)	Indonesia	Descriptive	Highlights resource limitations
20	OECD (2019)	Intl.	Report	Shows low scientific literacy
21	Harlen (2014)	UK	Conceptual	Attitudes develop through experience
22	Rustaman (2017)	Indonesia	Conceptual	Emphasizes process and attitude
23	Haury & Rillero (1994)	USA	Descriptive	Hands-on learning improves engagement
24	Lederman et al. (2014)	USA	Experimental	Improves scientific inquiry understanding
25	Osborne et al. (2016)	UK	Mixed	Enhances argumentation skills
26	Abrahams & Millar (2008)	UK	Experimental	Practical work supports concept learning

The synthesis indicates that realia media play a significant role in improving the quality of IPAS and science learning at the elementary level. Across the reviewed studies, realia media are consistently defined as instructional tools involving real objects or representations closely related to students' daily experiences. Most studies report that the use of realia media increases students' engagement, facilitates conceptual understanding, and promotes active participation in learning activities (Sudjana & Rivai, 2017; Arsyad, 2019; Jumiati et al., 2022). This finding aligns with the cognitive developmental stage of elementary school students, who require concrete learning

experiences to construct knowledge meaningfully (Wicaksono et al., 2021; Hayati et al., 2023).

However, the findings also reveal variations in the effectiveness of realia media across different studies. Experimental and quasi-experimental studies generally report significant improvements in student engagement, conceptual understanding, and learning outcomes (Sholihah & Sudibyo, 2020; Rahayu et al., 2021). In contrast, several descriptive studies indicate that the impact of realia media is less optimal when instructional design is not well structured or when teachers lack sufficient pedagogical readiness. These differences are influenced by variations in research design, duration of intervention, and teachers' competence in implementing realia-based learning. This indicates that the effectiveness of realia media is not solely determined by the media itself, but also by how it is integrated into meaningful learning activities.

The integration of realia media with the scientific approach demonstrates a stronger and more consistent impact compared to the use of media alone. The scientific approach provides a structured framework consisting of observing, questioning, collecting data, reasoning, and communicating. The analysis shows that realia media are particularly effective at the observation stage, where students' curiosity is stimulated through direct interaction with real objects. This stage often becomes the starting point for deeper inquiry, as students generate more relevant and contextual questions (Hosnan, 2016; Daryanto, 2018).

During the data collection stage, realia media enable students to engage in hands-on exploration through observation, measurement, and simple experimentation. Most studies indicate that students become more active and participatory compared to those learning through textbooks or passive instruction. However, some inconsistencies are observed. While many studies report significant improvements in science process skills and participation, a few studies show that these improvements are not always statistically significant, particularly in short-term implementations. This suggests that the development of scientific skills and attitudes requires sustained and continuous exposure rather than one-time interventions (Haryono et al., 2019; Dewi et al., 2022).

At the reasoning and communicating stages, the integration of realia media and the scientific approach supports deeper understanding and scientific communication skills. Students are better able to relate empirical observations to scientific concepts and explain their findings logically (Ardita et al., 2023; Yuliana et al., 2022). These processes also contribute to the development of scientific attitudes, such as honesty in reporting data, openness to others' perspectives, and responsibility for learning outcomes.

From the perspective of scientific attitudes, the synthesis reveals a consistent pattern. Attitudes such as curiosity, critical thinking, accuracy, and responsibility tend to develop more effectively through learning environments that combine direct experience with structured scientific processes (Harlen, 2014; Rustaman, 2017). Nevertheless, some studies highlight that improvements in scientific attitudes are not always immediate or significant. This inconsistency is mainly associated with short intervention duration, lack of repeated practice, and limited opportunities for reflection. Therefore, scientific attitudes should be understood as long-term outcomes that require continuous reinforcement through meaningful learning experiences.

A comparison between national and international studies reveals both similarities and differences. National studies tend to focus on practical classroom implementation and frequently report contextual challenges, such as limited instructional time, inadequate facilities, and teachers' readiness. In contrast, international studies generally emphasize methodological rigor, controlled experimental designs, and more systematic measurement of learning outcomes and attitudes. This difference implies that findings from international studies may offer higher generalizability, while national studies provide stronger contextual relevance for Indonesian educational settings. The combination of

both perspectives enriches the overall understanding of the effectiveness of realia media and the scientific approach.

In addition, several challenges in implementing realia-based scientific learning are consistently identified. These include time constraints, complexity in classroom management, and the need for teacher creativity in utilizing available resources (Sani, 2019; Susanti et al., 2020). These findings suggest that while realia media are highly beneficial, their successful implementation depends on teachers' pedagogical competence and the availability of supportive learning environments.

This review also has several limitations. First, the number of included studies (26 articles) may not fully represent the diversity of research in this field. Second, variations in research design, sample characteristics, and measurement instruments across studies limit the comparability of findings. Third, potential publication bias may exist, as studies with positive results are more likely to be published. Therefore, future research is recommended to include larger datasets, more diverse contexts, and standardized measurement approaches.

Overall, the findings of this literature review demonstrate that the integration of realia media and the scientific approach provides a strong and consistent contribution to strengthening scientific attitudes in elementary IPAS learning. The combination of concrete learning experiences and structured scientific processes creates a learning environment that is contextual, student-centered, and conducive to the development of scientific dispositions. These results reinforce the importance of aligning instructional media and pedagogical strategies to support meaningful and scientifically oriented learning in elementary education.

CONCLUSION

Based on the findings of this literature review, the integration of realia media with the scientific approach is an effective strategy for strengthening students' scientific attitudes in elementary IPAS learning. Realia media provide concrete and contextual learning experiences, while the scientific approach structures students' engagement in observing, questioning, collecting data, reasoning, and communicating. Through this integration, students not only develop conceptual understanding but also cultivate key scientific attitudes such as curiosity, accuracy, honesty, openness to evidence, and responsibility.

The findings imply that meaningful IPAS learning requires the alignment of instructional media and pedagogical approaches. Therefore, teachers are encouraged to integrate realia media within scientific learning processes, supported by adequate pedagogical competence, time management, and creative use of available resources.

However, this review has several limitations. The number of included studies was limited, and variations in research design and context may affect the generalizability of the findings. In addition, potential publication bias cannot be fully avoided.

Future research is recommended to involve larger datasets, more diverse contexts, and longitudinal designs to provide stronger empirical evidence regarding the effectiveness of realia-based scientific learning.

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