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Overcoming Difficult Science Topics through Alternative Media in Elementary Education

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Abstract

Twenty-first century education demands deep conceptual understanding and applied abilities to address the challenges of modern learning. This study aims to identify the main difficulties faced by elementary school students in science subjects and propose relevant solution strategies to enhance learning effectiveness. Employing a mixed-method approach, the research integrates quantitative and qualitative analyses gathered from two IPAS teachers and thirty sixth-grade students through questionnaires, interviews, and observations. Results reveal that two topics "Let's Get to Know Our Earth" (63.33%) and "Harmony in Life" (36.66%) are the most challenging, significantly affecting student engagement and comprehension during lessons. Various solution strategies, including the use of Canva media, spinning earth surface visualizations, LKPD worksheets, 3D sociodrama, and interactive animation videos, have demonstrably improved students' conceptual understanding and active participation. These findings highlight the importance of innovative media and contextual strategies in supporting more effective and meaningful science learning at the elementary level.

Keywords: *Learning Challenges, Elementary Science, Innovative Media, Learning Solutions.*

Abstrak

Pendidikan abad ke-21 menuntut pemahaman konseptual yang mendalam serta kemampuan aplikatif untuk menghadapi tantangan pembelajaran modern. Penelitian ini bertujuan untuk mengidentifikasi kesulitan utama yang dihadapi siswa sekolah dasar pada materi IPA serta mengajukan pendekatan solusi yang relevan untuk meningkatkan efektivitas pembelajaran. Dengan menggunakan pendekatan mix method, penelitian ini menggabungkan analisis data kuantitatif dan kualitatif yang diperoleh dari dua guru IPAS dan tiga puluh siswa kelas VI melalui angket, wawancara, dan observasi. Hasil menunjukkan bahwa dua materi, yaitu "Ayo Berkenalan dengan Bumi Kita" (63,33%) dan "Harmoni dalam Kehidupan" (36,66%), merupakan topik yang paling sulit dipahami oleh siswa, memengaruhi tingkat keterlibatan dan pemahaman mereka selama proses pembelajaran. Berbagai strategi solusi yang diterapkan, seperti penggunaan media Canva, visualisasi spin bentuk muka bumi, LKPD, 3D sosiodrama, dan video animasi interaktif, secara nyata membantu meningkatkan pemahaman konseptual dan partisipasi aktif siswa. Temuan ini memberikan gambaran yang menyeluruh tentang pentingnya inovasi media dan strategi kontekstual untuk mendukung pencapaian pembelajaran IPA yang lebih efektif dan bermakna di tingkat sekolah dasar.

Kata Kunci: Masalah Pembelajaran, IPA Sekolah Dasar, Media Inovatif, Solusi Pembelajaran

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INTRODUCTION

Twenty-first century education strongly demands both conceptual understanding and practical skills in applying learned knowledge (Habiddin et al., 2022; Nahar et al., 2022; Pare & Sihotang, 2023; Saleha et al., 2022). Critical thinking, creativity, collaboration, and communication abilities enable mastery of digital technologies, adaptation to change, and the development of competencies to solve complex real-life problems. Moreover, education serves as a transmission channel for character formation, values, and norms, alongside the mastery of advancing technologies (Desmita et al., 2023; Hadiana, 2015; Sanga & Wangdra, 2023; Yuningsih et al., 2024). Therefore, twenty-first century education focuses not only on knowledge mastery but also on developing the capacity for lifelong learning and the ability to contribute effectively within an ever-evolving global society. However, this does not come without challenges.

A problem refers to a condition or situation that requires a solution or resolution. A problem is something that disrupts the course of the learning process and demands special attention (Salim, 2012). Twenty-first century education demands not only mastery of knowledge but also the development of lifelong learning capacities and the ability to contribute effectively within an ever-evolving global society. However, this ambition is not without challenges. Problems are conditions requiring solutions, often disrupting the learning process and demanding special attention (Malik, 2007). Such problems may arise due to limited resources, insufficient understanding, or inappropriate teaching methods (Suryabrata, 1994). In educational contexts, challenges refer to obstacles that hinder the achievement of learning or developmental goals.

In science (IPA) education, developing countries frequently encounter barriers such as inadequate resources, insufficient teacher training, and limited instructional materials. According to Darussyamsu et al., (2024) teachers are expected to adapt quickly, yet the World Bank (2019) reports that over 60% of schools in developing nations lack adequate access to digital technologies essential for teaching science. Curricula often emphasize global concepts that may neglect local wisdom. Science is systematically organized knowledge applied to natural events (Fatimah & Kartika, 2013), involving observation, hypothesis testing, data collection, and result analysis (Puger et al., 2024). It is not merely a collection of facts but a discovery process providing meaningful learning for daily life (Pujawan et al., 2022). Prior research (2024) emphasizes that science learning should foster ethical understanding and environmental responsibility. However, (2024) notes that many teachers struggle to present content effectively due to inadequate training in integrating local knowledge, while students' inability to follow instructions hinders comprehension.

Factors such as overwhelming foreign terminology, dense curricula, rote memorization, limited learning resources, and passive teaching styles contribute to student difficulties in learning science (Awang, 2016). Effective science education requires contextualization, hands-on experiences, and process skills development

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(Wahyuni et al., 2024). Without practical applications, abstract scientific concepts become increasingly challenging (Wibawa et al., 2024).

At the Integrated Islamic Elementary School (SDIT) level, science (IPA) instruction is not limited to the national curriculum but is often enriched with Islamic values to explain natural phenomena. However, in practice, both students and teachers face various challenges in understanding and delivering science content. Some topics are perceived as difficult by students due to their abstract nature, requiring deep conceptual understanding or because of limited opportunities for direct experimentation. On the other hand, teachers struggle to deliver these materials effectively due to a lack of teaching aids, limited instructional time, and the diverse learning abilities of students. Therefore, the teaching methods applied in schools play a crucial role in determining students' comprehension levels in science subjects. Conventional approaches that fail to actively engage students often lead to low interest and motivation. Without innovative strategies, abstract scientific concepts become increasingly hard to grasp. Hence, more interactive and practice-based teaching methods are needed to help students better understand and apply scientific knowledge in their daily lives

Findings by Kerans Arifin (2021) highlight the importance of students contextualizing what they learn to make science education meaningful. Additionally, Briggs (2012), points out the abstract and terminology-heavy nature of science, while Mulia & Murni (Mulia & Murni, 2022) stress that lacking practical skills and applications hampers understanding, which practical experiments can improve. Palinussa et al., (2023) confirms that process-skills-based learning enhances comprehension, and Yunarti (2021). notes barriers like dense curricula and foreign terms. Al Nasseri et al., (2014) emphasize the negative impact of rote-focused teaching and limited hands-on practice, while Zannah (2019) point to the harm of teacher dominance and few experiments. Adriani & Lazuardi (2018) underline environmental and external material challenges.

Despite these insights, prior studies rarely integrate mixed methods to explore both the specific topics students struggle with and the tailored media solutions that address them, making this study's approach and contextual innovation a meaningful contribution. This study aims to identify which science topics are perceived as difficult in elementary education and to analyze the factors behind these difficulties. It seeks to explore effective teaching strategies that align with students' characteristics and enhance understanding and motivation. The findings are expected to offer valuable insights for educators in designing more interactive, innovative instructional approaches that improve the quality of science learning in schools.

METHODS

This research uses a mixed-method approach where quantitative data is reinforced by qualitative data. This approach allows the researcher not only to obtain numerical insights regarding students' learning styles and strategies but also to understand the reasons behind those choices through interviews and direct observations

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The research procedure begins with collecting quantitative data through a closed-ended questionnaire designed to identify students' learning styles. This questionnaire includes a series of questions that group students who have difficulty understanding science (IPA) material based on their responses. The obtained quantitative data is then calculated using the percentage formula to determine the proportion of each science topic considered difficult. According to Sugiyono (2019), the percentage formula is as follows:

$P = F / N \times 100\%$

Explanation:

P = Percentage,

F = Frequency,

N = Number of respondents

This design enables the exploration of relationships between variables statistically (quantitative) while also understanding individual experiences and perspectives in depth (qualitative). Addressing the weaknesses of each approach: quantitative data provides a general overview but lacks depth of interpretation, while qualitative data offers deeper understanding but lacks generalizability. Combining both provides a more comprehensive understanding. The relevance to the research topic—studying difficult science topics—requires not only numerical data but also insights into how and why individuals choose certain solutions. Using both data types enhances thematic analysis quality, making research results more reliable.

This study involved two science teachers and thirty sixth-grade elementary students. Selecting these respondents is crucial because teachers play a role in observing and assessing difficult science materials in Grade V, while the students themselves are the main subjects experiencing the learning process directly.

Several instruments were used for data collection. The questionnaire gathered quantitative data regarding difficult science topics in Grade V, helping to measure learning difficulties in relation to the solutions provided. Interview sheets were used to explore deeper information regarding students' and teachers' perspectives on difficult science materials and the challenges faced in the learning process. Observation sheets were employed to directly observe students' learning behaviors in the classroom, allowing researchers to confirm whether the material was indeed difficult.

Data collection was conducted directly in the field. Quantitative data was obtained through questionnaires completed by students, while qualitative data was gathered through interviews with teachers and students, as well as classroom observations. This direct approach provides higher validity since the data is collected in the real-world learning environment.

For data analysis, quantitative data from the questionnaires was analyzed using descriptive analysis techniques to identify difficult science topics. This descriptive statistic includes percentages, averages, and data distributions to provide a general picture of student learning patterns. Qualitative analysis, derived from interviews and observations, was conducted using thematic analysis, grouping findings based on

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themes that emerged from the interview and observation results. This analysis helps understand the reasons behind the difficulties and how teachers adapt solutions.

By using the mixed-method approach, this study presents more holistic data, not just statistics but also deep insights from the direct experiences of students and teachers. This approach enriches the understanding of how students learn and how teachers can more effectively support their learning processes. Data was collected directly in the field and analyzed using descriptive analysis for quantitative data and thematic analysis for qualitative data, ensuring comprehensive results.

RESULTS AND DISCUSSION

Descriptive Statistics

The statistical analysis employed percentage analysis within a single class to process the data. Percentage analysis is a technique in descriptive statistics used to describe proportions or segments of data in percentage form (Supriyadi, 2018). This study aimed to analyze which science (IPA) materials were perceived as difficult in the fifth-grade class at SDIT Al Izhar School Pekanbaru. Data were collected through observations, interviews, and questionnaires administered to students and science teachers. The detailed analysis of the tendencies regarding difficult IPA materials in Grade V at SDIT Al Izhar School Pekanbaru is presented below, based on questionnaires distributed to 30 sixth-grade students. The questionnaire identified the students' preferences regarding which learning topics they found difficult. From the questionnaires completed by the 30 students, the following results were obtained:

Science Topics Perceived as Difficult by Students

Out of the 30 participating students, analysis revealed that 19 students (63.33%) struggled with the topic "Let's Get to Know Our Earth," specifically the section on earth's layers. Meanwhile, 11 students (36.66%) found the theme "Harmony in Life," particularly ecosystems of living beings, to be challenging. This can be seen in Table 1 below:

Table 1. Results of Identification of Difficult Science Material in Grade V Students of SDIT Al Izhar Pekanbaru

No.	Theme	Difficult Material	Students' Reasons	Difficulty Percentage
1	Harmony in Life	Ecosystem of Living Beings	Unable to distinguish habitats of animals; difficult to understand terms.	36.66%
2	Let's Get to Know Our Earth	Earth's Layers	Many unfamiliar terms; hard to memorize; cannot observe directly.	63.33%

In this study, the researcher gathered information from interviews with several students, revealing that they found the "Harmony in Life" topic difficult because they struggled to differentiate between habitats and to understand IPA terms. Students also

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reported difficulty with the *"Let's Get to Know Our Earth"* topic due to the abundance of unfamiliar terms, challenges in memorization, and the inability to observe the material directly. It can thus be concluded that the two most difficult IPA topics are *"Let's Get to Know Our Earth" and "Harmony in Life."*

These topics are often considered difficult because they involve abstract concepts that require understanding complex relationships between various life elements, which are not always easily explained in simple terms.

Based on interviews with a science teacher from Grade V at SD Sungai Pinang, it was found that several concepts within the subject posed consistent challenges for students. The teacher explained that the most difficult material for students to grasp was the topic *"Let's Get to Know Our Earth."*

> **Teacher 1:** *"Children often have trouble understanding the structure and layers of the earth. They struggle to imagine what the earth's structure looks like."*

One of the main factors causing student difficulties in understanding science is grasping the presented concepts, as well as the supporting media. Based on interviews with the second science teacher in Grade V at SDIT Al Izhar School, the teacher revealed that the concepts of harmony in life and the study of Earth's layer structures present major challenges for students.

> **Teacher 2:** *"Children often struggle to understand how ecosystems or the habitats of living beings work."*

In addition, interviews were conducted with two Grade VI students at SDIT Al Izhar School, Pekanbaru.

> **Student 1:** *"I find it difficult to understand the habitats of living things if I cannot see clear images."*
>
> **Student 2:** "*My difficulty lies in understanding the Earth's layers or structure — like the different surface layers."*

According to Suelsy & Muis (2024), students frequently face challenges in comprehending the material on Earth's structure, which negatively impacts their cognitive learning outcomes. Similarly, Bariroh et al., (2024) explains that students often encounter barriers in grasping the concept of Earth's layers due to the abstract nature of the material, which cannot be directly observed. A related study on ecosystem learning outcomes found that in daily tests on the ecosystem topic, 14% of students scored below the school's minimum competency standard, 59% were at the standard, and only 28% achieved high scores (Kuroru & Rahmah, 2023), indicating persistent difficulties in mastering ecosystem content.

Yulianti (2023) further noted that students tend to be inactive and show little interest in ecosystem lessons. Sulistyowati et al., (2020) observed that students face difficulties integrating multiple subjects, with teachers still relying heavily on lectures and assignments, leading to a memorization-focused approach without connecting material to students' prior knowledge. This hinders students' ability to develop critical thinking skills, making them passive and less enthusiastic in class.

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Efforts made by teachers, based on interviews with two instructors at the research site, included the use of Canva media with spin graphics depicting the Earth's layers.

> **Teacher 1:** *"I use Canva media and spin graphic products along with LKPD to facilitate learning for the 'Let's Get to Know Our Earth' topic, using the Project-Based Learning (PjBL) model."*
>
> Meanwhile, a teacher from another school employed 3D sociodrama media.
>
> **Teacher 2:** *"I invite my students to observe 3D sociodrama models of ecosystems to help them better understand the habitats of living things in a tangible way."*

Several prior studies have highlighted the challenges of teaching these topics, both in terms of conceptual understanding and real-life application. The concept of harmony in life refers to the interconnectedness between components within ecosystems and daily life, encompassing an understanding of ecosystems, food chains, and environmental balance influenced by human activities. According to Taufiqa (2017), students often have limited understanding of ecosystems due to a lack of practical experiences connecting theory to reality; applying contextual learning models can enhance students' scientific attitudes regarding ecosystem topics.

Rai et al., (2024)found that students' difficulties in grasping harmony-in-life topics stem from unfamiliar terminology and the absence of interactive media in teaching. This researcher recommends incorporating more field experiments and real-life modeling to illustrate how changes in one ecosystem component can affect others. Additionally, Purnamasari et al., (2020) showed that project-based learning approaches help students better understand interactions among ecosystem components by allowing them to directly observe these relationships in their environment, thus deepening their comprehension of the importance of ecological harmony.

Syarifah Kamila & Sukartono (2023) identified that students find textbooks unattractive as learning media; many books contain long theoretical texts with minimal illustrations, reducing students' learning engagement. This study showed that using Pop-Up Books in fifth-grade IPAS lessons made students more enthusiastic, focused, and active. Finally, Rosiana et al. (2024) reported that students' cognitive achievement in IPAS remains low, particularly on the "Let's Get to Know Our Earth" topic concerning Earth's layer structure. This topic requires students not only to analyze local problems but also to understand the current state of the Earth's layers, which demands direct, hands-on experience. Project-Based Learning (PjBL) has been proposed as a solution to improve elementary students' learning outcomes. Similarly, Winda's research Riana & Lisnasari (2024) emphasized the need for more engaging learning media. It is recommended that teachers incorporate miniature science models as teaching tools, especially for topics related to Earth's layered structure.

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CONCLUSION

The study revealed that many students struggled to understand abstract science concepts, particularly the structure of the earth and ecosystems, due to the lack of visual aids, interactive media, and direct experiences. These difficulties highlight the need for more innovative learning approaches to improve comprehension and engagement. It is essential to utilize interactive media, contextual learning, experiments, and project-based activities to make science concepts more concrete and relatable. Teachers are encouraged to enhance their teaching strategies through continuous professional development, while schools need to provide adequate learning facilities and resources. These findings emphasize the importance of developing a more adaptive curriculum and regularly evaluating teaching methods to ensure they remain effective, relevant, and aligned with students' learning needs and current educational challenges.

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