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Content Analysis of Environmental Education Textbooks for Junior High Using Beck, McKeown and Kucan Model

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Abstract
One of the key factors influencing the success of the teaching and learning process is the quality of content delivered by the teacher. To support this, teachers rely on textbooks as essential learning resources. This research aims to evaluate the quality of an Environmental Education textbook used by junior high school students and teachers in South Tangerang City, particularly in its potential to enhance students' higher-order thinking skills, such as critical thinking. The study employs a descriptive analysis method, examining the textbook content through the cognitive development model by Beck, McKeown, and Kucan, which has been adapted into five analytical steps. The analysis reveals that the textbook includes various activities that promote critical thinking and problem-solving. Based on the cognitive development indicators such as the presence of inferential questions, concept linking, and opportunities for student reasoning, the textbook demonstrates a high degree of alignment with criteria supporting meaningful learning. Rather than presenting facts for rote memorization, it engages students in reflective and analytical thinking, which is crucial for addressing Environmental Education challenges at the junior high school level. This evaluation is also aligned with the guidelines by the Indonesian Ministry of Education, Culture, Research, and Technology (Kemendikbudristek), which emphasize the importance of cultivating critical thinking, problem-solving, and inquiry-based learning as core competencies in 21st-century education.

Keywords: Content Analysis, Environmental Education Book, Beck, McKeown and Kucan Model, Junior High School Textbook, South Tangerang City

1. Introduction

One of the key learning resources in formal education is the textbook, which serves as a tool to support both teachers and students in achieving curriculum goals. According to (Japelj Pavešić & Cankar, 2022), textbooks act as a bridge between educational objectives and structured material, while (Nketsiah & Motlhabane, 2025) emphasize their continued centrality in lesson planning and content delivery. It also connects with (Rahmawati, 2017), that textbooks serve as a reference for the teaching and learning process and are used collectively by educational institutions. Textbooks help teachers focus on pedagogy and offer students reliable access to essential knowledge. Rihanah and Irma (2022) added the argument by saying that text book has a function as a support for teaching and learning activities, textbooks must meet the criteria for appropriateness. Anisah and Azizah (2016) conclude that is the reason why having a good text book is fundamental to support learning.

Besides, all of that reason, in the Indonesian context, textbooks play a critical role in supporting the national curriculum, which emphasizes student-centered learning and the development of higher-order thinking skills. Government Regulation No. 25 of 2022 establishes textbook eligibility standards that include aspects of content, language, presentation, and design. In alignment with these standards, (Romyati et al., 2021) emphasize that incorporating varied assessment types and reflective questions in textbooks can actively engage students and enhance their learning experiences. Supporting this view, a study by (Mwikali et al., 2024) found that the effective use of textbooks significantly improved students' academic performance in county secondary schools in Makueni County. The study concluded that ensuring the optimal use of textbook resources is essential to support academic achievement.

Prior studies (Mahardika et al., 2023; Modi et al., 2016) have shown a strong correlation between textbook quality and students' academic success, particularly in fostering critical thinking. In science education, textbooks that incorporate Higher-Order Thinking Skills (HOTS) components enable students to analyse, evaluate, and solve problems more effectively. Mahardika et al. (2023), for example, found that textbooks aligned with the National Curriculum and embedded with structured critical thinking activities promoted greater student autonomy and engagement. As Sabir notes, 21st-century learning demands that students develop essential skills such as critical/logical thinking, creative/innovative thinking, and effective communication and collaboration. In response, the Indonesian government encourages the implementation of HOTS through classroom instruction. Anwas et al. (2022), high-quality textbooks support this initiative by freeing teachers to focus on refining pedagogy and designing more engaging, meaningful learning experiences, rather than compensating for poorly structured content.

However, despite the strategic role of textbooks, Indonesian students' performance remains a concern. According to the (PISA 2022 Results Factsheets Indonesia PUBE, 2023), only 34% of Indonesian students reached the minimum proficiency level in science in the 2022 PISA

assessment, below the ASEAN average of 76%. (Sumarni et al., 2022) argue that one contributing factor is the low quality of learning materials, including science textbooks that fail to stimulate analytical skills or environmental awareness. Textbooks play an important role in learning because they provide both language and instructional structure. A high-quality textbook should contain content and questions that stimulate students to think deeply and critically. This aligns with (Tarigan, 2009) view on psycholinguistics, which he defines as a branch of science that studies the relationship between language and human behavior particularly the mental and psychological processes involved in language acquisition, comprehension, production, and use.

A specific genre that has received limited empirical scrutiny is the Environmental Education textbook at the junior high school level. While prior studies have evaluated general science textbooks, few have focused on environmental content or used cognitive development frameworks in their analyses. This study addresses that gap by analyzing the content of Environmental Education textbooks used in South Tangerang City, using the cognitive development framework developed by Beck, McKeown, and Kucan (2013).

The Beck, McKeown, and Kucan model emphasizes five criteria for cognitive development through text: vocabulary development, active text engagement, higher-order thinking promotion, contextual relevance, and strong vocabulary instruction. Though this model has been widely discussed in reading comprehension and literacy research, its application in textbook content analysis especially in environmental education is still limited. Therefore, this study contributes by examining how well the textbook meets these five dimensions and supports student understanding of environmental issues in a way that fosters critical thinking, relevance, and engagement.

In summary, while regulations define the standards textbooks must meet, few empirical studies have evaluated whether these materials are truly aligned with pedagogical goals particularly in the area of environmental education. This study seeks to bridge that gap by providing a focused content analysis using a robust cognitive development model.

2. Methods

This study employed a descriptive analysis method. According to (Wahyuni, 2020), descriptive analysis refers to methods related to the collection and presentation of a data set to estimate the quality of the data. The analysis was conducted through several procedures, beginning with the selection of the textbook to be analyzed. In this study, the researcher selected an Environmental Education textbook published by Sakura Nusantara Lestari, which is the textbook used by junior high school teachers in South Tangerang City. Unlike national or generic textbooks, this textbook embeds local environmental problems, values, and sustainability goals relevant to South Tangerang students, fostering a deeper connection and more meaningful learning experience. The textbook is officially mandated by South Tangerang's Education Office under policy number 800/KEP 1222-

dikdas/2014, ensuring coherence with regional educational goals and integration with the broader Indonesian curriculum frameworks.

The second stage involved analyzing each sub-chapter contained in the textbook. In the third stage, the results of the analysis were presented. The fourth stage consisted of interpreting the findings using the criteria from the model developed by Beck, McKeown, and Kucan. Given the importance of textbook quality, it is necessary to analyze textbook content using the following instrument: Book Information: *Environmental Education for Junior High School Level* (Official Textbook for the Local Content Subject in South Tangerang City). Authors: Dr. Yanti Herlanti, M.Pd.; Dr. Suroso Mukti Leksono; Henny Kristianti, M.Pd.; Lusiana, M.Pd.; Nita Marginingsih, M.Pd., et al. Publisher: PT. Sakura Nusantara Lestari Grade Level: VII–IX

Table 1.
Content Analysis of the Environmental Education Textbook

Frequency of Fulfilled Features

Code	Theme I	Theme II	Theme III	Theme IV
I	6	3	3	1
II	34	48	31	12
III	2	26	9	3
IV	4	5	7	7
V	15	17	6	3

Description:
Code I: Availability of contextual examples related to both general vocabulary and specific vocabulary associated with environmental concepts.
Code II: Availability of thought-provoking questions and activities that require analysis and synthesis, as well as opportunities to connect new information with prior knowledge.
Code III: Availability of content that encourages students not only to recall facts but also to analyze information, make inferences, and evaluate arguments.
Code IV: Availability of adequate context to understand vocabulary and concepts, as well as content presentation that connects material with students' experiences or real-world applications.
Code V: Availability of instructions and vocabulary that are easy to understand.

The table presents the number of fulfilled features observed in each theme based on five analytical codes adapted from Beck, McKeown, and Kucan's cognitive development model. A total of IV themes were reviewed. Each item was assessed against the five criteria. The numbers indicate how many times each criterion was successfully present (fulfilled) in the analyzed content. For example, Code II which relates to thought-provoking questions and prior knowledge connection was fulfilled 48 times in Theme II, suggesting that this theme most strongly supports critical thinking.

The collected data were then analyzed from pedagogical and instructional perspectives using Cognitive Load Theory, originally developed by Sweller and later expanded upon by various scholars (Lovell, 2020). This theory is particularly suitable for textbook analysis, as it enables the classification of content according to three types of cognitive load: intrinsic, extraneous, and germane, based on the complexity, presentation, and learning relevance of the material (Sweller, J., et al., 2011). By applying this framework, the study evaluates how well the textbook supports students' cognitive processing and comprehension during learning.
Textbook Content Digestibility Rubric for Environmental Education (*Analytical Digestibility*):

Code I: Contextual Vocabulary Integration
Category: Availability of contextual examples related to both general and subject-specific vocabulary.
Description: The textbook should present vocabulary related to environmental concepts in context, enhancing students' reading comprehension and scientific literacy. The absence of such integration limits students' understanding of key terms and reduces the textbook's instructional validity.

Code II: Critical Thinking Engagement
Category: Availability of thought-provoking questions and activities that require analysis and synthesis, along with opportunities to connect new information to prior knowledge. *Description:* Tasks should go beyond rote memorization, encouraging students to reason, analyze, and make meaningful connections between concepts and real-life situations.
Code III: Analytical and Evaluative Content
Category: Availability of content that promotes inferencing, argument evaluation, and deeper reflection.
Description: The textbook should support students in moving from factual recall to analytical thinking by including tasks that involve comparing, evaluating, or drawing conclusions from information presented.
Code IV: Contextual Relevance and Real-World Application
Category: Availability of contextual clues and examples that link content to students' everyday experiences.
Description: Material should be grounded in real-world situations to foster relevance and deepen students' understanding of environmental issues.

Code V: Language Clarity and Accessibility
Category: Availability of clear instructions and vocabulary appropriate to students' developmental level.
Description: The use of accessible language and well-structured text supports students' cognitive processing and prevents confusion or overload during learning.

The content of the junior high school Environmental Education textbook, as shown in Table 1, reflects a high level of alignment with the Cognitive Load Theory proposed by Sweller and further discussed by (Lovell, 2020). This theory distinguishes between three types of cognitive load that influence how students process information: intrinsic load, extraneous load, and germane load.

The textbook effectively manages intrinsic load by structuring content from simple to complex, allowing students to gradually build conceptual understanding. It reduces extraneous load through the thoughtful use of visual representations that are clear, relevant, and not overloaded with text. These visuals are complemented by brief and purposeful explanations. The textbook promotes germane load by incorporating elements that actively engage students in deeper cognitive processing. This includes case studies, open-ended questions, and tasks that integrate new information with students' existing knowledge and experiences.

This pedagogical structure aligns with Beck, McKeown, and Kucan's emphasis on materials that foster comprehension, active engagement, and critical thinking. Overall, the textbook demonstrates characteristics of instructional quality that support the development of higher-order thinking skills, particularly in the context of environmental education.

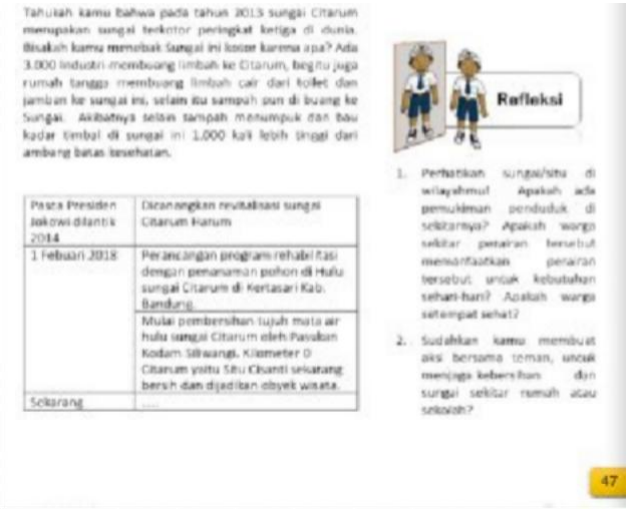
3. Result and Discussion

The analysis of the Environmental Education textbook for junior high schools shows a strong alignment with the objectives of science education (Ilmu Pengetahuan Alam, IPA) as stated in the 2013 curriculum. According to the technical guidance for implementing science learning, students are expected not only to understand environmental facts but also to engage in inquiry- based activities that develop critical thinking and problem-solving skills. This expectation is reflected in the textbook, particularly through its integration of Code II (Learning Support and Activities) and Code III (Cognitive Engagement and Critical Thinking Tasks).

Figure 1
Example of Code II

For example, in Grade VII, Chapter 5 about Water Pollution presents a task in which students must assess water pollution in their area and propose actionable steps to mitigate it. This aligns with Code III, as students are required to interpret real-world data, evaluate causes, and suggest scientifically informed solutions.

Figure 2
Example of Code III



In Grade VIII, tasks shift toward comparing environmental policies at the national and international levels. One example is an activity that prompts students to debate the effectiveness of Indonesia waste management systems. This activity encourages both critical reflection and peer discussion, reinforcing Code II and Code III simultaneously.

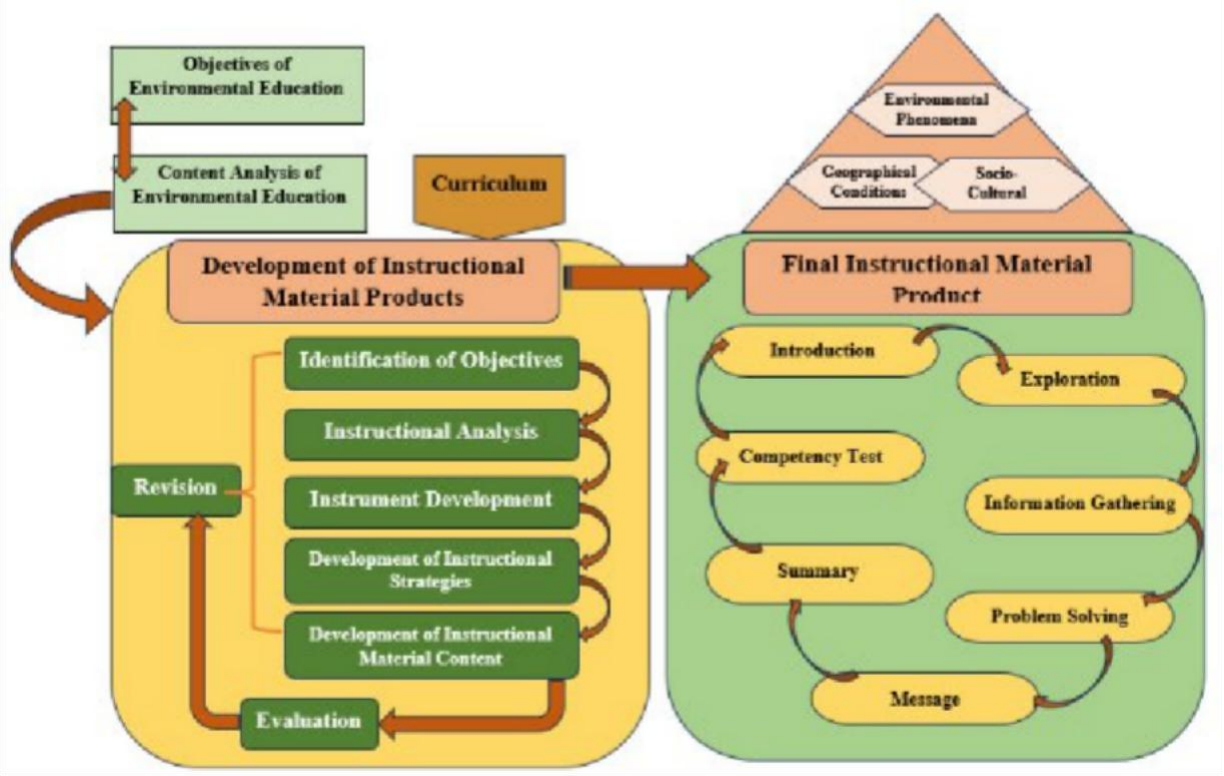
Each chapter deepens students' cognitive engagement by incorporating problem-based learning. For instance, a case study asks students to analyze an area prone to landslides and recommend reforestation or urban planning measures. The task emphasizes decision-making, weighing long-term consequences, and connecting scientific data to civic responsibility.

According to (Huda et al., 2024), in the context of individual tasks, textbooks can encourage students to actively participate in learning, enhance conceptual understanding, and develop critical thinking skills. Additionally, the inclusion of engaging visual within textbooks can significantly boost students' interest by fostering greater curiosity and connection with the material These findings are consistent with studies such as (Irawan et al., 2025), which emphasize the importance of well-structured textbook components, discussion prompts, visual aids, and applied learning tasks in cultivating students' critical thinking. Similarly, (Febrihastatiwi et al., 2025) argue that environmental literacy is strongly linked to students' capacity to critically analyze and respond to real-world environmental issues—further reinforcing the value of thoughtfully designed textbook content.

While the textbook performs well overall. Grade VII materials are more descriptive and focus on observation and identification. Furthermore, the development and approval of this textbook follow official guidelines issued by the Indonesian Ministry of Education, which require textbooks to undergo both content and physical evaluations before receiving publication licenses. These include readability tests, alignment with national regulations such as Law No. 32 of 2009 on Environmental Protection, and references to frameworks like the Tbilisi Declaration.

The development of a high-quality textbook—especially in the context of science education must consider various aspects systematically to enhance learning effectiveness. According to (Djudin & Hadari Nawawi, 2017), there are five key criteria for selecting and developing textbooks: (1) logically organized and sequential content structure; (2) development of non-content objectives such as critical thinking and scientific attitudes; (3) inclusion of experimental activities, demonstrations, and science process skills; (4) mechanical aspects such as design, illustrations, readability, and layout; and (5) author competence. Based on *Evaluating Learning Outcomes* by (Artama et al., 2023), important steps in the textbook development process include defining instructional objectives, formulating indicators and learning goals, creating a content blueprint, developing assessment instruments, and conducting validity and reliability testing to ensure the book's measurability and readability. In addition, a quality textbook should function as a pedagogical tool that supports the achievement of meaningful learning.

Figure 3
Flowchart of the Book Development Procedure (Karyadi, 2016)



Overall, the Environmental Education textbook contributes significantly to students' scientific literacy and critical thinking. However, to enhance its impact, future iterations should ensure clearer progression in task complexity, more balanced use of codes across all levels, and greater transparency in linking textbook activities with expected cognitive outcomes.

4. Conclusion

The *Environmental Education* textbook for junior high school demonstrates a strong alignment with the goals of environmental literacy and science education as outlined in national policy (Law No. 32 of 2009) and international frameworks such as the TBILISI Declaration. Beyond providing factual knowledge, the textbook promotes higher-order thinking skills including critical analysis, logical reasoning, and informed decision-making through contextualized content,

thought-provoking activities, and supportive visual aids. Supporting this, (Jemi et al., 2025) concludes that the implementation of Pendidikan Lingkungan Hidup (PLH) textbooks plays a vital role in strengthening local content learning in schools. The provision of environmental books, especially to all schools in South Tangerang, is recognized as a key strategy in fostering students' awareness and responsibility toward environmental issues. Together, these findings underscore the importance of high-quality environmental textbooks as tools not only for content delivery but also for building students' environmental consciousness and critical thinking capacity.

A notable strength of this textbook lies in its integration of interactive components like "Thinking Corners" and project-based tasks that allow students to connect new knowledge with real-life environmental issues in their surroundings. These elements not only enhance students' engagement but also foster collaborative problem-solving and a sense of environmental responsibility. Teachers also benefit from the clear structure and inquiry-based approach, which can support diverse instructional strategies in the classroom.

Furthermore, a recent study by (Lutfauziah et al., 2024) reveals significant correlations between students' environmental knowledge, attitudes, and behaviors, as well as between their sense of cooperation, responsibility, and environmental care. These findings underscore the interconnected nature of environmental education and affirm that deep, reflective learning facilitated by well-designed textbooks can have a tangible impact on students' behavior and sense of responsibility. Together, these insights emphasize the crucial role of high-quality environmental textbooks not only as instructional tools, but as catalysts for fostering holistic environmental awareness and lifelong stewardship among learners.

Further research is recommended to: Compare multiple textbooks across publishers to evaluate consistency in cognitive engagement and environmental literacy support. Investigate how students and teachers actually use these textbooks in classrooms, including how effectively the activities support learning outcomes. Explore digital textbook supplements or teacher guides that can enhance the implementation of critical thinking tasks, especially in under-resourced schools. In conclusion, the Environmental Education textbook plays a crucial role in shaping students' scientific literacy and ecological awareness. By refining the cognitive sequencing of tasks and supporting its use with teacher training or digital tools, the textbook can serve not only as an information source but also as a transformative medium for sustainable education. It's aligned with (Woodward, 2006) , he states that textbook overly standardized, ideologically biased, and limiting to creativity for both teachers and learners. He asserts that textbooks may provide a misleading sense of curriculum coherence while constraining innovation, fostering compliance rather than critical engagement. Woodward highlights the need for educators to exercise reflective and flexible use of textbooks, adapting and supplementing them to support richer, more context-sensitive learning experiences. That is why having the textbook that provide a lot of

creative and innovative thinking is important to support learning journey especially about environmental education since it's important to build students awareness about this issue.

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