Experiment: Journal of Science Education
Volume 6 (1), 2026 (Page 36, 47)
DOI: doi.org/10.18860/experiment.v6i1.42073

Needs Analysis of Integrated Ethno-Socioscientific Multimedia to Enhance Elementary Students' Environmental Awareness

Helga Salsabila[1], Agus Mukti Wibowo[1], Samsul Susilawati[1]

Correspondence:
helgasalsabilaaa@gmail.com

Afiliation:
Master's Program in Islamic Primary Education, Faculty of Tarbiyah and Teacher Training, Universitas Islam Negeri Maulana Malik Ibrahim Malang, Indonesia[1]

Received: April, 27th 2026
Accepted: May, 19th 2026
Published: May, 30th 2026

Abstract
This research is driven by the "knowledge-behavior gap" among students at MI Baipas Malang, where high environmental knowledge does not translate into real-world action. The study aims to conduct a need assessment for developing multimedia based on Ethno-Socioscientific Issues (Ethno-SSI) to enhance students' environmental awareness. Adopting the Analysis phase of the Lee and Owens model, this qualitative descriptive study involves analyzing result from 27 student questionnaires. Findings show that students are visual-digital learners who require interactive content linked to Malang's local wisdom, such as water spring preservation (Nadah Banyu). Although school technology is supportive, current materials lack socioscientific dilemmas to trigger critical thinking. In conclusion, developing Ethno-SSI multimedia, which integrates local ecological wisdom with modern scientific dilemmas, is urgently needed to bridge the gap between understanding and action through cultural relevance and digital technology. This analysis serves as the foundation for the upcoming design and implementation stages.

Keywords:
Need Analysis; Ethno-Socioscientific Issues; Multimedia; Environmental Awareness

INTRODUCTION

The Industrial Revolution has accelerated production, resource exploitation, and personal consumption, exacerbating negative environmental impacts, including global warming, biodiversity loss, pollution, and mounting waste. This aligns with the 2021 UNEP report, which asserts that the world is facing a "triple planetary crisis": climate change, biodiversity loss, and pollution and waste, issues that, despite responses from various nations, still demand immediate and systematic action (Yang et al., 2022). Global warming, as a global issue, is also felt at the local level. Elementary school students in various countries have frequently heard the terms "global warming" and "climate change" and view them as serious threats, although their deep conceptual understanding and awareness of the connections to socio-economic aspects remain limited (Goel et al., 2023; A. Widodo, 2023). This situation indicates that the environmental crisis is no longer abstract but is present in students' daily lives, particularly through themes such as climate change, pollution, and waste management.

Findings from various studies indicate that elementary school students' basic cognitive knowledge of the environment is relatively strong. Students can identify forms of pollution, causes of environmental damage, and key terms such as global warming or climate change (Božak et al., 2023; Mohammadian, 2024). However, despite having a fairly solid foundation of cognitive knowledge, environmental awareness that is truly reflected in concrete actions is often still low or inconsistent. One example is at a public elementary school in Bandung, where a school program to foster an environmentally conscious attitude already exists, but has not been fully implemented due to a lack of consistency in students' concrete actions, despite the program being in place (Salma et al., 2025). In addition, a study at SDN Da'iring 1 also found that students demonstrated "fairly good" awareness and concern, yet the majority were still unable to manage the environment effectively (Sintawati et al., 2025).

These literature findings are also consistent with observations at MI Baipas Malang; although students' cognitive understanding is relatively good, their level of environmental awareness is low. This is evident from the large amount of trash scattered around the classroom. Students assigned the scheduled cleaning duty (piket) have made it part of their habit. Additionally, many students prefer packaged drinks to reusable bottles brought from home, stating that carrying them is too heavy and that it is more convenient to buy them near the school. They also appear indifferent to disasters that occur, such as the floods in Malang City. Thus, they lack practical/functional environmental awareness. These findings indicate a gap between "knowing and saying more" and "doing less." Students know a lot and talk about the environment, but their daily behavior still depends on personal comfort, social norms, and structural support such as facilities, school policies, and the example set by teachers and parents.

Integrating environmental education into the curriculum and linking it to concrete actions is an effective way to raise environmental awareness. This approach has been shown to improve students' knowledge, attitudes, and environmentally friendly behaviors (Ilham et al., 2023). Although the curriculum in Indonesia (including the 2013 Curriculum and the Merdeka Curriculum) formally includes requirements for scientific thinking and conceptual mastery, its implementation in the classroom remains heavily focused on textbook content and the mastery of abstract concepts, rather than on students' real-world experiences and local culture (Beliyawati et al., 2025). As a result, this approach leads to homogeneous learning that is less relevant to the local socio-cultural context, making science content feel distant from students' daily lives and cultural identities (Rahmiati et al., 2025; Suryadi & Jasiah, 2023; Zahrika & Semarang, 2023) (Rahmiati et al., 2025; Suryadi & Jasiah, 2023; Zahrika, 2023).

However, a critical challenge remains: translating this contextual knowledge into actual environmentally friendly behavior. Literature suggests that cognitive understanding alone does not automatically translate into pro-environmental actions; students must be actively and affectively engaged with the issues (Michael et al., 2025). Presenting complex socio-environmental problems through traditional, text-heavy methods often fails to evoke the empathy and personal agency required for concrete action as concepts are deeply rooted in real-world systems, relying solely on text limits the development of practical environmental problem-solving skills, fails to foster emotional connections to nature, and minimizes hands-on scientific inquiry (Nur & Lubis, 2025).

Therefore, integrating a differentiated learning approach through an interactive website, incorporating educational games, interactive explanations, and quizzes, offers a strategic solution. The use of such interactive multimedia goes beyond merely accommodating diverse learning styles or preventing boredom (Agisni et al., 2023a); it acts as a catalyst for behavioral transformation. Through educational games, students are placed in an immersive, risk-free environment where they can actively make decisions regarding local socio-scientific issues and immediately observe the consequences of their actions (Ghodsvali et al., 2022). This active participation and immediate feedback foster a sense of responsibility and emotional resonance, effectively bridging the gap between abstract cognitive understanding and real-world pro-environmental behavior (Talavera-mendoza et al., 2025).

The use of interactive multimedia such as videos, animations, simulations, e-books, and holograms can significantly improve the quality of learning, including student motivation (Megawangi, 2025), learning concentration (Gulo & Sianipar, 2025) and student learning outcomes (Salsabila, 2025). It is hoped that the use of multimedia can also foster students' environmental awareness and pro-environmental behavior, thereby enabling them to become more engaged and motivated in learning about the environment.

The ethno-scientific approach integrates culture and local wisdom into science, thereby making concepts more relevant to students' realities. Socio-scientific issues related to changes and degradation of the landscape, as well as resource use, are linked to local practices and cultural values, encouraging students to understand and evaluate the impacts

of human actions and seek wise solutions. Research in the field of ethnoscience indicates that contextual learning can foster a love for culture and a commitment to environmental conservation. With interactive multimedia, students will be more emotionally engaged, which can ultimately improve indicators of environmental awareness, such as understanding of environmentally friendly techniques and a commitment to conservation from an early age. Thus, an analysis of multimedia development focused on Ethno-Socioscientific Issues in IPAS (Natural and Social Learning) learning is important to conduct, with the hope of increasing environmental awareness among fourth-grade students at MI Baipas Malang.

METHOD

This study employs a descriptive qualitative approach to thoroughly explore the need for the development of educational multimedia based on Ethno-Socioscientific Issues (Ethno-SSI). including the Assessment/Analysis phase. The research was conducted at MI Baipas in Malang City, a nature-based Madrasah Ibtidaiyyah that leverages the rich local wisdom (ethnoscience) of the surrounding community as the foundation for the multimedia content to be developed. The subjects in this study were selected using purposive sampling, consisting of fourth-grade students at MI Baipas Malang as the primary respondents who provided insights regarding environmental challenges and digital learning experiences, as well as several teachers for the collection of supporting data. Data collection was conducted using an open-ended questionnaire (survey) for 27 students, measuring Likert's score with a scale of 1 (strongly disagree) to 4 (strongly agree). Through this survey, the researcher identified potential controversial socio-scientific issues rooted in local culture (SSI) to be integrated into the media. All qualitative data collected were analyzed inductively following the stages outlined by Miles & Huberman (1984) : data reduction, data display, and drawing conclusions or verification. The data were then presented in the form of descriptive narratives and a matrix of relationships between local wisdom and science content (science reconstruction) to design multimedia instructional objectives.

RESULTS AND DISCUSSION

This study discusses the results of a needs analysis as the foundation for the development of educational multimedia. This analysis was conducted to identify the gap between current learning conditions and the desired ideal conditions, thereby enabling the formulation of appropriate solutions tailored to the learners' needs. According to Lee & Owens (2004), this analysis phase is organized into two main parts: (1) needs analysis and (2) front-end analysis. Needs analysis focuses on identifying the primary needs in learning, while front-end analysis examines various supporting aspects that influence the development of educational multimedia.

Furthermore, the researcher has grouped the front-end analysis in this study into three main sub-sections to facilitate the presentation and in-depth analysis, namely: (a) analysis of user characteristics and needs, (b) analysis of learning and objectives, and (c) analysis of resources and media development.

Need Assessment

A needs assessment is a systematic method for determining whether there is a gap between the current situation and the desired situation. The purpose of this stage is to identify problems and find solutions that align with learning needs. In this stage, the researcher first conducted a pre-study observation at MI Baipas Malang to determine which learning media could serve as a solution to the problems faced.

From the results of these observations, it was found that there are still numerous existing problems, evident from the large amount of trash scattered throughout the classroom. Students feel they have no obligation to clean the classroom except during scheduled cleanup duty, as this has become part of their culture. Additionally, many students prefer packaged drinks over using reusable bottles brought from home, citing that carrying them is too heavy

and that it is more convenient to buy them near the school. They also appear indifferent to disasters, such as the flooding in Malang City. Following the observations, the researcher conducted a survey among students to identify potential controversial socio-scientific issues rooted in local culture (SSI) for integration into the media. The survey instrument used is presented in Table 1. The measurement of all items utilized a 4-point Likert scale, with the endpoints being “Strongly Disagree” (1) and “Strongly Agree” (4)

Table 1. Audience Analysis Questionnaire

Variable	Indicator	Item No.	Statement
Environmental Awareness (EA)	Environmental Knowledge	1	I know that plastic is very difficult to decompose when it is carelessly thrown away.
	Environmental Attitude	2	I felt sad when I saw river around my school is full of trash
	Environmental Behaviour	3	I am willing to bring my own water bottle so as not to create a lot of plastic waste
	Environmental Behaviour	4	I am always turn off the lamp and water faucet when it is no longer used
	Environmental Behaviour	5	I dare to call out friends who damage plants or throw trash carelessly
Ethno SSI (ES)	Ethno-Scientific Knowledge	1	I know the ancestral stories about the importance of protecting the *"Punden"* or water sources.
	Local Wisdom/Belief	2	I believe that large trees near springs must be preserved so that the water doesn't run dry.
	Socioscientific Dilemma (Ethical)	3	I prefer maintaining village cleanliness through tradition rather than building large buildings.
	Socioscientific Dilemma (Conflict)	4	I feel confused/conflicted when people destroy nature just to make a lot of money.
	Interest in Ethno-SSI Learning	5	I want to learn Science through stories of environmental heroes from my own region.
Learning Style (LS)	Visual preference	1	I understand lessons more easily when there are colorful videos or images.
	Preference for learning methods	2	I feel sleepy when I only listen to the teacher’s explanation or read long textbooks.
	Technology-based learning	3	I enjoy learning while doing tasks on a computer or smartphone screen.
	Story-based learning preference	4	I prefer learning through stories or storytelling rather than memorizing formulas.
Tech Literacy (TL)	Ability to use devices	5	I can use a smartphone or laptop by myself without assistance from my parents.
	Use of technology for learning	6	At home, I often watch YouTube or TikTok to learn something interesting.
	Experience with learning applications	7	I have used learning applications that include sounds and interactive features.
	Digital self-confidence	8	I feel confident when completing quizzes on digital screens.
Motivation & Interest (MI)	Interest in new technology	9	I would like to try learning applications that can display 3D images on the classroom desk.
	Game-based motivation	10	I feel more motivated when learning science through games.

Interest in characters	11	I enjoy learning applications that include a hero character accompanying me.
Preference for tech-rich environment	12	I prefer learning at school when there are advanced technological tools available.

Front-End Analysis

1. Analysis of user characteristics and needs

This analysis aims to map the baseline conditions of users, particularly elementary school students, as a foundation for designing targeted learning. The researcher conducted several types of analysis to identify user characteristics and needs, namely: audience analysis, situation analysis, critical incident analysis, and issue analysis.

Through audience analysis, it was found that 27 respondents were digital natives with a highly dominant visual-multimodal learning style profile (average 3.10). Data from item LS1 showed a significant increase in comprehension speed when students learned using videos or colored images. This finding aligns with the technology literacy (TL) level, which falls into the "High" category (3.05), where the majority of students are already capable of operating devices independently and feel confident taking digital quizzes (TL4). Such audience conditions demand learning media that is not only informative but also visually appealing and features an engaging narrative to maintain cognitive focus.

This is consistent with the advantages of multimedia-based learning; the use of multimedia in education offers many benefits. Multimedia technology offers an educational process that fosters creativity (Tayirova, 2023), enhances teacher-student interaction (Marjuni & Harun, 2019), reduces boredom (Nurlaili, 2020) and supports diverse student learning styles (Agisni et al., 2023b), therefore, it can be concluded that the use of multimedia in learning will help students maintain their cognitive focus.

Based on the situation analysis, a wide range of individual competencies was identified, indicating the presence of a digital divide in the learning environment. This gap is evident in the difference in TL scores between students at the "Very High" level (4.0) and those at the "Low" level (2.25). The implication of this situation is the need for multimedia with a highly intuitive and user-friendly interface (UI), ensuring it remains inclusive for students with limited access to technological guidance at home and capable of minimizing the risk of learning loss within the digital ecosystem. Similar studies indicate that although access to technology has increased, there remains a gap in digital media skills and utilization in schools (Damayanti et al., 2025; Sartika et al., 2024). The practical implication is that multimedia must have a highly intuitive, simple, and accessible interface, ensuring it remains inclusive for students with limited technological support and can minimize the risk of learning loss within the digital learning ecosystem (Budiarto et al., 2021).

According to critical incident analysis, the primary issue that emerges is the low level of learning retention in conventional lecture-based methods. Item LS2 ("Feeling sleepy when only listening to the teacher's explanation") serves as an indicator of the failure of one-way learning approaches for this generation. This condition contrasts with the motivation score (MI), which is actually very high (3.39 or 84.75%). This creates a "paradox of awareness": some students possess strong digital motivation but exhibit apathy toward the real-world environment. This aligns with the findings by Hasanah & Kristanto (2025), The importance of media lies in its ability to transform digital motivation into moral responsibility or social agency.

Issue analysis revealed that the Ethno-Socioscientific Issues (ES) variable had the lowest average score (2.98). This indicates an erosion of local wisdom, such as traditions of spring protection, due to the dominance of global narratives in digital media. Nevertheless, student interest in item ES10 regarding learning through stories of local heroes who protect nature is very high. Therefore, the primary user need is for interactive multimedia that integrates gamification and 3D applications with contextual content based on local wisdom, thereby revitalizing cultural values and enhancing students' active engagement in science learning.

The needs analysis revealed a significant 'knowledge-behavior gap' among students, where high theoretical understanding of environmental issues fails to translate into pro-environmental actions. Standard multimedia, while effective in increasing engagement, often merely digitizes abstract concepts without addressing the root cause of this behavioral disconnect: a lack of emotional attachment and moral agency. Therefore, an intervention using Ethno-Socioscientific Issues (Ethno-SSI) is theoretically justified and urgently needed.

The integration of local wisdom (Ethno), such as the Nadah Banyu tradition, serves as a crucial emotional anchor. By contextualizing global environmental crises within local cultural identities, the learning process shifts from abstract memorization to a culturally relevant moral imperative. This place-based approach addresses the affective domain, fostering a strong 'sense of place' that literature suggests is a fundamental precursor to actual environmental stewardship.

Furthermore, incorporating Socio-Scientific Issues (SSI) acts as the cognitive catalyst to bridge the gap. SSI presents students with real-world, open-ended dilemmas, such as the conflict between modern economic convenience and traditional ecological preservation. When integrated into an interactive multimedia format, students are not passive recipients of information; instead, they are forced to engage in critical decision-making and navigate cognitive conflicts. The multimedia environment provides a safe simulation space where students can immediately perceive the consequences of their simulated choices on their local ecosystem. Consequently, this Ethno-SSI framework functions as a pedagogical bridge, transforming passive environmental awareness into active moral agency and tangible pro-environmental behavior.

2. Analysis of learning and objectives

This subsection emphasizes the design of a systematic and focused learning process. Task analysis breaks down the material into simple digital units that integrate local environmental issues and the ethno-scientific knowledge of the Malang community, such as the relationship between the landscape and local conservation traditions (e.g., terraced rice fields and the “Nadah Banyu” tradition), so that the material is not only factual but also socially and scientifically relevant to students (Fiteriani et al., 2021). This approach helps students understand the interconnection between the physical and cultural environments and develops their ability to reason when facing real-world environmental dilemmas, such as conflicts over the conversion of green spaces.

Objective analysis is aimed at formulating success indicators that go beyond mere conceptual understanding, with the ultimate goal of comprehensively enhancing students’ environmental awareness (EA), encompassing environmental knowledge, environmental attitude, and environmental behavior; thus, if all three are achieved, environmental awareness can be said to have enhanced (Orbanic & Kovač, 2021). Interactive multimedia designed to simulate the local landscape helps build a sense of identity with nature, fosters concern for environmental damage, and encourages concrete actions such as reducing waste near water sources. Studies show that learning media that combine local values and environmental issues can increase learning motivation, conceptual understanding, as well as environmental awareness and behavior among elementary school students (Nalinda & Arbarini, 2025).

The Phase B integration of IPAS into the design of this Ethno-SSI multimedia resource serves as an effective strategy for bridging the formal curriculum with the development of environmentally conscious character from an early age. This approach aligns with findings that ethno-science-based learning media and social-scientific issues significantly enhance student engagement and science learning outcomes (Khoiri et al., 2022). Thus, systematic design through task and objective analysis supports the creation of innovative instructional media that are culturally and contextually relevant for elementary school students. With the target objectives and content design established, the final stage of the front-end analysis assesses the practical environment and resources available for development, ensuring the proposed media solution is feasible

3. Analysis of resources and media development.

This analysis focuses on the supporting aspects of educational media development, ensuring the project's logistical and practical feasibility. This was systematically carried out through four interconnected sub-sections: technology analysis (identifying the availability of devices and internet access among students and schools); media analysis (determining the optimal types and formats, such as Android-based or web-based applications); analysis of existing data (evaluating previously available instructional materials to identify their strengths and weaknesses); and finally, cost analysis (estimating resource requirements, in terms of time, manpower, and costs, for effective and efficient media development).

The availability of technological devices at MI Baipas was assessed as highly adequate at the school, including the availability of computers, laptops, LCD screens, projectors, and sound systems, serving as the primary supporting factors in the implementation of technology-based learning. There are 10 computers with specifications sufficient for learning, 5 laptops running Windows 7 and 10, 1 LCD screen, and 2 projectors; there are 3 smart TVs installed in grades 3 and 5, and Bluetooth speakers for each classroom. The school is also in good condition, including a stable Wi-Fi network with routers distributed throughout the school, which is crucial for supporting teaching and learning activities.

Next is the analysis of the media; based on the results of the technology analysis, the researchers concluded that the school is highly capable of implementing technology-based learning. The researchers determined that multimedia learning is highly suitable for implementation in teaching and learning activities at MI Baipas. This aligns with the results of the analysis of student needs, which identified students with visual and kinesthetic-digital learning styles, students who grasp material more quickly through colorful images and direct interaction with devices. Thus, according to Desyandri et al. (2024), The most suitable form of learning is one that utilizes interactive multimedia based on information technology, dynamically combining text, audio, and visual elements. This is supported by the availability of adequate computers and laptops at MI Baipas to facilitate teaching and learning activities.

The next analysis focuses on existing data. To date, the instructional materials used at MI Baipas have been limited to textbooks and workbooks, and the use of technology-based learning tools remains rare. The use of print-based instructional materials, such as textbooks and workbooks, has several advantages and disadvantages that need to be considered in the learning process. On the positive side, printed teaching materials are easily accessible (Wenny et al., 2022), requiring no electronic devices or internet connection (Babushko et al., 2024), and can be used anytime and anywhere (Komariah & Halimah, 2022). Textbooks and workbooks also help students learn independently, facilitate note-taking, highlighting, and reviewing material, thereby enhancing understanding and information retention (Mayembe & Nsabata, 2020). Additionally, printed instructional materials are typically organized systematically according to the curriculum, providing structured and comprehensive content, and supporting teachers in delivering lessons in a more focused manner (Hanifa, 2018). Many students and teachers feel more comfortable using printed books because they offer a more focused learning experience free from digital distractions, and allow for physical interactions such as underlining or highlighting important sections.

However, there are also several drawbacks to using printed instructional materials. One of the main drawbacks is the limited ability to present interactive or multimedia content that can enhance student motivation and understanding (Megawangi, 2025). Printed books are also often heavy and impractical when carrying a large volume of materials at once (Budnyk et al., 2021). Additionally, the production and distribution costs of printed books can be quite high, especially when they include colorful illustrations or engaging images (Nurbaiti, 2019). The content in textbooks is often information-dense and uses rigid scientific language, which can cause students to become bored quickly or struggle to understand abstract concepts (Puspitarini & Hanif, 2019). Books are also prone to damage or loss if not properly maintained (Mas'odi & Alma, 2024).

Thus, although printed instructional materials remain highly relevant as the primary learning resource due to their practicality and ease of access, their use should be supplemented with more varied learning resources to make learning more engaging and effective. Combining printed instructional materials with digital media or active learning methods can optimize student learning outcomes while addressing the limitations of each format.

The final analysis is a cost-benefit analysis, which is crucial in designing multimedia-based Ethno-Socioscientific Issues (Ethno-SSI) resources for science education in elementary schools. Cost estimates generally include subscriptions to premium applications such as Canva Pro, printing of guidebooks, and administrative costs such as printing validation instruments and research questionnaires. On the other hand, the strategic benefit gained is the availability of innovative instructional media capable of concretely visualizing environmental dilemmas, thereby significantly enhancing students' environmental awareness (W. Widodo et al., 2021). Recent research indicates that Ethno-SSI-based digital media is not only effective in improving learning outcomes and environmental awareness but also in strengthening students' character, cultural identity, and motivation to learn (Noviyanti et al., 2024; Rofiqoh & Kiptiyah, 2024). Based on these findings, the development of such media is considered highly worthwhile, as its potential impact far exceeds the resources allocated to it.

To evaluate the existing learning resources, an analysis was conducted on the current science textbook used by the students at MI Baipas, namely "Cerdas IPAS untuk SD/MI Kelas IV" specifically on the environmental themes. The content analysis reveals several specific pedagogical limitations that contribute to the students' knowledge-behavior gap.

Firstly, the textbook's presentation of environmental issues is highly abstract and decontextualized. When discussing topics such as water conservation or environmental degradation, the book predominantly relies on generic national culture, such as telling that Bugis peoples move their home instead of building a new home (Mapplette Bola), and where Yogyakarta peoples do the Mertikali tradition, where they work together to clean up the rivers. It lacks representation of local ecological realities in Malang, such as the critical condition of local water springs or the cultural traditions of Nadah Banyu. Consequently, the material fails to build the cultural relevance (Ethno) necessary to foster a strong emotional attachment or 'sense of place' among the students.

Secondly, the current instructional material presents environmental science strictly as a set of absolute facts to be memorized, lacking Socio-Scientific Issues (SSI) integration. The book explicitly states what is 'right' for the environment but does not expose students to complex, real-world moral dilemmas. For example, there are no scenarios discussing the conflict between modern economic convenience and traditional ecological preservation. Without these open-ended dilemmas, students are not trained in critical decision-making or ethical reasoning.

A specific analysis of the existing science materials, particularly the chapter on landforms (bentang alam), reveals a profound lack of socio-scientific integration. The current textbook strictly limits its scope to the rote memorization of conceptual definitions, such as identifying highlands, valleys, lowlands, rivers, and lakes, along with their basic utilitarian benefits to humans.

However, it completely lacks cognitive triggers or open-ended dilemmas that challenge students to think critically about environmental conservation. For instance, while the book explains the functional use of a river or a highland, it provides no narrative regarding how to utilize these natural resources sustainably without causing ecological degradation. By presenting nature merely as a list of vocabulary and exploitable resources, the current material fails to stimulate the moral reasoning and problem-solving skills necessary for pro-environmental behavior.

This absence of critical conservation dilemmas perfectly illustrates why students experience a knowledge-behavior gap: they know what a landscape is, but they are not trained

on how to ethically interact with it. Consequently, this specific deficiency strongly justifies the necessity of implementing an SSI-based multimedia approach, which shifts the learning focus from passive memorization to active, ethical decision-making regarding local environmental sustainability.

The specific limitations of the existing textbook, namely its lack of localized context and absence of socio-scientific dilemmas, make it insufficient to bridge the gap between theoretical knowledge and practical behavior. This specific deficiency strongly justifies the urgency of developing an interactive Ethno-SSI multimedia platform to replace the passive learning experience with an active, context-rich simulation.

CONCLUSION

Research at MI Baipas Malang revealed a gap between students' cognitive understanding of ecology and their actual conservation behaviors (the knowledge-behavior gap), as evidenced by the culture of using single-use plastics and apathy toward local flooding. Through the need assessment and front-end analysis phases of Lee and Owens' model, it was concluded that the development of multimedia based on Ethno-Socioscientific Issues (Ethno-SSI) for landscape-related materials is urgently needed. The research findings establish product criteria for integrating students' visual-digital learning styles with local wisdom values (such as water source conservation traditions) to foster critical thinking skills and an environmentally conscious character. The implications of this research emphasize the importance of contextual media to bridge the formal curriculum with students' socio-cultural realities. However, a limitation of this needs analysis is that it was conducted exclusively at one elementary school (MI Baipas), meaning the identified user characteristics and needs may not be fully representative of schools located in areas with differing digital infrastructure or local contexts. Future researchers are recommended to proceed to the design and development stages, as well as to implement the product on a large scale to empirically test the effectiveness of the media in changing students' pro-environmental behavior in the field.

REFERENCES

Agisni, A., Novari, D., Leander, G., Prawirawan, B. U., & Pohan, A. H. (2023a). The effectiveness of multimedia learning : A study on student learning. 3, 9–11.

Agisni, A., Novari, D., Leander, G., Prawirawan, B. U., & Pohan, A. H. (2023b). The effectiveness of multimedia learning: A study on student learning. Priviet Social Sciences Journal, 3(7). https://doi.org/10.55942/pssj.v3i7.215

Babushko, S., Solovei, M., & Solovei, L. (2024). Students On Advantages And E-Textbooks In Higher Education. Grail of Science, 43, 440–444. https://doi.org/10.36074/grail-of-science.06.09.2024.057

Beliyawati, Pahrudin, A., & Rahmi, S. (2025). Model, Konsep, Desain, Pendekatan Dan Model Pengembangan Kurikulum. Social: Jurnal Inovasi Pendidikan IPS, 5(2), 317–325.

Božak, S., Hegediš, P. J., & Hus, V. (2023). Ecological Awareness among 3rd Grade Students of Primary School. 367–376. https://doi.org/10.4236/ce.2023.142024

Budiarto, M. K., Rejekiningsih, T., & Sudiyanto, S. (2021). Students ' opinions on the need for interactive multimedia development for entrepreneurship learning. 10(4), 1290–1297. https://doi.org/10.11591/ijere.v10i4.21411

Budnyk, O., Kachak, T., & Blyznyuk, T. (2021). Printed and e-book : problems of choice of modern students of the Livro impresso e digital : o problema de escolher dos estudantes da universidade moderna Libro impreso y digital : el problema de elegir en estudiantes universitarios modernos. 1–10.

Damayanti, A., Hartiningsari, D. P., & Setiawan, A. (2025). Needs Analysis Of Local Wisdom-Based Digital. 23, 1–16. https://doi.org/10.31571/edukasi.v21i1.8163

Desyandri, -, Agustina, Y., Yeni, I., & Parmadi, B. (2024). Multimedia-Assisted Elementary School Learning Materials Innovation Using STEAM Learning Approach. JOIV : International Journal on Informatics Visualization, 8(3–2), 1959. https://doi.org/10.62527/joiv.8.3-2.2238

Fiteriani, I., Ningsih, N. K., & Santi, K. (2021). Media Poster dengan Pendekatan Etnosains : Pengembangan Bahan Ajar IPA Siswa Sekolah Dasar Pendahuluan. Jurnal Pendidikan Sains Indonesia, 9(4), 540–554. https://doi.org/10.24815/jpsi.v9i4.20984

Ghodsvali, M., Dane, G., & Vries, B. De. (2022). An online serious game for decision-making on food-water-energy nexus policy. Sustainable Cities and Society, 87(May), 104220. https://doi.org/10.1016/j.scs.2022.104220

Goel, A., Iyer-raniga, U., Jain, S., Addya, A., Srivastava, S., & Pandey, R. (2023). Student Perceptions of Environmental Education in India. Cc, 1–22.

Gulo, M., & Sianipar, R. (2025). Pengaruh Multimedia Interaktif dalam Pembelajaran Pendidikan Agama Kristen terhadap Konsentrasi Belajar Siswa. 14(2), 453–470. https://doi.org/10.46495/sdjt.v14i2.310

Hanifa, R. (2018). Advances in Language and Literary Studies EFL Published Materials : An Evaluation of English Textbooks for Junior High School in Indonesia. 2009, 166–174.

Hasanah, U., & Kristanto, A. (2025). Integrating Local Wisdom into Interactive Multimedia to Foster Digital Literacy in Primary School Students. 4(4), 3044–3054.

Ilham, A. J., Kusuma, A. T., Putri, F. R., & Selsia, B. (2023). Peran Pendidikan Lingkungan Dalam Meningkatkan Kesadaran Dan Tindakan Berkelanjutan Di Sekolah Dasar. Masaliq : Jurnal Pendidikan Dan Sains, 3, 907–917. https://doi.org/https://doi.org/10.58578/masaliq.v3i5.1500

Khoiri, A., Irma Sukarelawan, M., Fauzi Sedon, M., Nidzam Che Ahmad, C., Sukarmin, S., Agussuryani, Q., & Misbah, M. (2022). Socioscientific Issues (SSI) Strategy Adjacent to Ethnoscience: A Critical Analysis of Science Reconstruction. Jurnal Penelitian Pendidikan IPA, 8(5), 2380–2386. https://doi.org/10.29303/jppipa.v8i5.2128

Komariah, A., & Halimah, N. (2022). Ragam Pemanfaatan Buku Teks Sebagai Media Pembelajaran Bahasa Inggris di Kota Bitung Sulawesi Utara. Jurnal Ilmiah Iqra', 16, 180–196.

Lee, W. W., & Owens, D. L. (2004). Multimedia-Based Instructional Design Computer-Based Training Web-Based Training Distance Broadcast Training Performance-Based Solutions Second Edition,.

Marjuni, A., & Harun, H. (2019). Penggunaan multimedia online dalam pembelajaran. III(36), 194–204.

Mas'odi, M., & Alma, I. P. (2024). Characters and Non-Digital Media : Case Study Trends in English Language Learning in Secondary Schools. Assyfa Journal of Multidisciplinary Education, 1(June), 95–103.

Mayembe, E., & Nsabata, S. (2020). Print-Based Learning Media. 1(1), 1–7.

Megawangi, R. (2025). Pengembangan Multimedia Pembelajaran Interaktif Berbasis Android untuk Meningkatkan Motivasi Belajar SIswa Kelas VI di MI NU Hidayatul Mubtadiin Malang.

Michael, H., Diana, L., & Tri, A. (2025). Exploring the environmental awareness : Knowledge , attitudes , and behaviors in Indonesia ' s academic community. 11(1), 218–227.

Miles, M. B., & Huberman, A. M. (1984). Qualitative data analysis. Beverly Hills. Ca: Sage.

Mohammadian, S. (2024). Investigating the Impact of Environmental Education on Improving the Environmental Awareness of Elementary School Students. 48(3), 1179–1197.

Nalinda, H., & Arbarini, M. (2025). Pengembangan Multimedia Interaktif Berbasis Problem Based Learning (PBL) untuk Meningkatkan Minat dan Hasil Belajar Siswa Sekolah Dasar Universitas Negeri Semarang , Indonesia yang menekankan pada penyelesaian masalah nyata , memungkinkan siswa untuk. Khatulistiwa: Jurnal Pendidikan Dan Sosial Humaniora, 5(2).

Noviyanti, Sutopo, Y., & Yuwono, A. (2024). Inovasi Media Pembelajaran Berbasis Literasi Ekologi untuk Mengembangkan Kemampuan Berpikir Kritis Siswa Sekolah Dasar pembelajaran mereka , seperti buku cerita bergambar bertema ekologi , dapat mendukung. Khatulistiwa: Jurnal Pendidikan Dan Sosial Humaniora, November.

Nur, B., & Lubis, A. (2025). Multimodal-Based Approaches in Teaching Ecological Literacy : Enhancing Environmental Awareness through Textual , Visual , and Auditory Integration. 6, 53–68.

Nurbaiti, D. (2019). Perkembangan Ebook dalam Industri Penerbitan Buku Fisik Serta Pertumbuhan Minat Menulis Buku. Ikraith Ekonomika, 2(2).

Nurlaili, M. I. (2020). The use of multimedia towards students' learning in an english language classroom.

Orbanic, N. D., & Kovač, N. (2021). Environmental Awareness, Attitudes, And Behaviour of Preservice Preschool and Primary School Teachers. Journal of Baltic Science Education, 20(3), 373–388. https://doi.org/https://doi.org/10.33225/jbse/21.20.373

Puspitarini, Y. D., & Hanif, M. (2019). Using Learning Media to Increase Learning Motivation in Elementary School. 4(2), 53–60.

Rahmiati, D., Suharini, E., & Widiyatmoko, A. (2025). Pengaruh Pembelajaran Kearifan Lokal Di Jawa Barat Dalam Melestarikan Budaya Tradisional Bagi Siswa SD. Fondatia: Jurnal Pendidikan Dasar, 9(2), 318–339.

Rofiqoh, D. A., & Kiptiyah, S. M. (2024). Ethnoscience-based Digital Comic on Plant Material for Grade IV Elementary School Students. Mimbar PGSD Undiksha, 12(1), 163–174.

Salma, F., Putri, D., Sopandi, W., Sujana, A., & Kirana, C. R. (2025). Analysis of Environmental Awarness of Elementary School Students in Bandung City. 11(5), 247–254. https://doi.org/10.29303/jppipa.v11i5.10193

Salsabila, H. (2025). Pengembangan Multimedia Pembelajaran Berbasis Augmented Reality pada Mata Pelajaran Pendidikan Pancasila Materi Kebhinekaan Beragama untuk Meningkatkan Hasil Belajar Siswa Kelas IV di SDN Bunulrejo 1. http://etheses.uin-malang.ac.id/75038/

Sartika, S. B., Suyidno, & Wiguna, A. (2024). The Analysis of Students Needed in Digital Teaching Media. Jurnal Teknologi Pendidikan, 26(April), 44–62.

Sintawati, S., Lestari, S. A., Na'miyah, H., Ruwaida, M., Arifin, H. B., & Rahmawati, I. D. (2025). Analysis of Environmental Awareness Among Fourth Grade Students at SDN Da'iring 1 Through Waste Management; IPAS Subject Matter. Arzusin: Jurnal Manajemen Dan Pendidikan Dasar, 5, 1509–1522. https://doi.org/https://doi.org/10.58578/arzusin.v5i3.5970

Suryadi, S., & Jasiah, J. (2023). Transformasi pendidikan dasar melalui kearifan lokal : Pendekatan kualitatif terhadap pengembangan kurikulum Transforming basic education through local wisdom : A qualitative approach to curriculum development. Wiyata Dharma: Jurnal Penelitian Dan Evaluasi Pendidikan, 11(2), 163–170.

Talavera-mendoza, F., Reyna, N., & Suni, C. (2025). Fostering ecological awareness and pro-environmental intentions through gamification in high school students. November, 1–13. https://doi.org/10.3389/feduc.2025.1650480

Tayirova, M. A. (2023). Possibilities of using multimedia technologies in the educational system. Current Research Journal of Pedagogics, 04.

Wenny, S. J., Fussalam, Y. E., & Dani, R. (2022). Lecturers ' Opinions and Preferences : Printed Book or E -Book for Science Teaching (Lecturers ' Opinions and Preferences : Printed Book or E - Book …). 6(November).

Widodo, A. (2023). Sustainable Awareness About Climate Change on Elementary School Pupils' Perspective: What Wonderful Finding! Cucun Sutinah*. 10, 53–62.

Widodo, W., Yermiandhoko, Y., & Surabaya, U. N. (2021). Gadget-Based Interactive Multimedia on Socio-Scientific Issues to Improve Elementary Students ' Scien tific Literacy. International Journal of Interactive Mobile Technologies (IJIM), 56–69. https://doi.org/https://doi.org/10.3991/ijim.v15i01.13675

Yang, B., Wu, N., Tong, Z., & Sun, Y. (2022). Narrative-Based Environmental Education Improves Environmental Awareness and Environmental Attitudes in.

Zahrika, N. A., & Semarang, U. N. (2023). Kurikulum Berbasis Budaya untuk Sekolah Dasar : Menyelaraskan Pendidikan dengan Identitas Lokal. Pedagogika : Jurnal Ilmu-Ilmu Kependidikan, 3(2), 163–169.