



Interactive Integrated Science Module with Coastal Tourism Context: A Feasibility Study on Students' Scientific Literacy

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This study was conducted in response to the limited utilization of local potential as a contextual learning resource in junior high school science instruction. The research aimed to develop an interactive science module integrated with the theme of Madura coastal tourism and to examine its feasibility for junior high school science learning. The study employed a Research and Development (R&D) approach using the ADDIE model, consisting of analysis, design, development, implementation, and evaluation stages. The development process was based on observations conducted at several coastal tourism sites in Madura, including Lobuk Beach and Siring Kemuning Beach in Bangkalan, as well as Nepa Monkey Forest Beach and Loan Malang Beach in Sampang. Data were collected through expert validation instruments involving subject matter experts and media experts. The feasibility of the developed module was analyzed using descriptive quantitative techniques. The validation results showed that the interactive science module achieved a feasibility score of 95.50% from the subject matter expert and 94.88% from the media expert, both categorized as very feasible. These findings indicate that the developed module is pedagogically and technically appropriate for use as a contextual science learning resource in junior high schools. The integration of Madura coastal tourism into science learning provides meaningful local-context content and may support the development of context-based science learning experiences.

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INTRODUCTION

Science learning is closely related to conceptual understanding and inquiry skills ([Brownstein & Horvath, 2016](#); [Yamin, 2020](#)). Science instruction emphasizes providing students with direct learning experiences to develop competencies that enable them to explore and understand the natural world scientifically ([Kementerian Pendidikan dan Kebudayaan, 2016](#)). This can be achieved when students are trained to connect scientific concepts and apply them to everyday life ([Yamin et al., 2019](#)). In other words, science learning is expected to be directly linked to the surrounding environment or local wisdom ([Yamin et al., 2020](#)). Research findings indicate that science learning integrated with local wisdom has a positive impact on learning outcomes ([Nufus et al., 2023](#); [Yamin et al., 2024](#)). One form of local wisdom that can be utilized as a learning resource is the tourism potential of coastal areas in the surrounding region. However, current science learning practices have not fully utilized the local environment or local wisdom as learning resources.

Science learning is also expected to function as an agent for fostering scientific literacy. Teachers are encouraged to employ various approaches, strategies, methods, and learning models in each lesson to develop students' higher-order thinking skills ([Yamin et al., 2017a](#)). Based on international comparative data, Indonesia ranks 107th out of 189 surveyed countries in the Human Development Index (HDI) ([Nations, 2020](#)). This low HDI ranking is also reflected in the relatively low levels of scientific and mathematical literacy among Indonesian students. Referring to the 2022 Programme for International Student Assessment (PISA) data, the performance of Indonesian students remains low. The average achievement scores of Indonesian students rank 69th in science, 70th in reading, and 71st in mathematics out of 79 participating countries ([OECD, 2023](#)). These findings indicate that Indonesian students' reasoning abilities are still limited. Low reasoning skills contribute to weak problem-solving abilities, which are a key indicator of scientific literacy, and are partly caused by low levels of scientific and mathematical literacy. This condition is closely related to the overall quality of education in Indonesia, which remains relatively low ([Firman, 2007](#)). Therefore, the low level of scientific literacy in Indonesia, particularly among junior high school students, must be addressed immediately, as improvements in scientific literacy are highly relevant to enhancing the quality of education in Indonesia ([Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi, 2022](#)).

Science learning supported by appropriate instructional media can effectively foster scientific literacy. Instructional media are a crucial factor in the success of classroom learning

processes. Engaging learning media can optimize the learning process ([Weylin et al., 2023](#)). One type of instructional media that can be utilized is an interactive science module. An interactive science module is an innovative form of instructional media in the form of an electronic module that leverages technological advancements to create engaging and effective learning experiences ([Awwalina & Indana, 2022](#)). As a learning medium used in science instruction, interactive science modules have the potential to support science learning and facilitate the development of students' scientific literacy skills ([Awwalina & Indana, 2022](#)). Interactive science modules function to facilitate science learning that is simple, practical, effective, and efficient ([Ayuardini, 2023](#)), and they help present learning materials in a more accessible manner, making them easier for students to understand ([Ayuardini, 2023](#)).

One instructional medium that can be developed based on students' surrounding environment is an interactive science module with an integrated approach themed around coastal tourism. The integrated type of integration is one of the science integration models proposed by Fogarty. This type of integration does not only emphasize content or students' cognitive potential but also trains thinking skills, enabling students to develop their full potential progressively across cognitive, psychomotor, and affective domains ([Fogarty, 1991](#)).

The integrated approach is a model of integrated learning that combines concepts, skills, and attitudes from various subject areas ([Diniya, 2019](#)). By integrating multiple subjects into a single overarching theme, the integrated learning model offers a broader approach to the educational process and allows students to gain deeper and more interconnected understanding across learning materials. This model focuses not only on academic knowledge but also on the development of students' social and emotional skills. Consequently, it is expected to produce better learning outcomes ([Iskandar et al., 2024](#)). Integrated science learning has been implemented in several countries, such as Nigeria and Barbados, and ongoing research continues to examine the effectiveness of its implementation ([Ogunkola & Samuel, 2011](#); [Oludipe, 2011](#)). Several studies have also reported that integrated science learning has a positive impact on students ([Ameyaw, 2011](#); [Edokpayi & Suleiman, 2011](#)).

Previous studies have reported the positive impact of local-wisdom-based science learning and integrated science instruction on students' learning outcomes and engagement. However, most existing studies have focused on general local wisdom contexts, environmental themes, or conventional learning media, while limited attention has been given to the development of interactive integrated science modules specifically based on coastal tourism contexts. In addition, previous module development studies have generally

emphasized content integration or technological aspects without explicitly connecting local coastal tourism potential with integrated science concepts in junior high school learning.

The coastal tourism context in Madura offers substantial potential for science learning because it contains various phenomena closely related to science concepts, such as coastal ecosystems, biodiversity, environmental pollution, heat and temperature, waves, energy transformation, and human interaction with the environment. For example, mangrove ecosystems and coastal biodiversity found in Nepa Monkey Forest Beach can be integrated into ecology and environmental conservation topics, while coastal temperature, sea breeze phenomena, and wave motion observed at Lobuk Beach and Siring Kemuning Beach can support the learning of physics concepts related to heat transfer and waves. Integrating these local tourism contexts into science learning may help students connect scientific concepts with real-life experiences in their surrounding environment.

Therefore, this study offers novelty through the development of an interactive integrated science module that specifically utilizes Madura coastal tourism as a contextual learning resource. The module combines integrated science learning principles with interactive digital media and local tourism contexts to provide contextualized learning experiences for junior high school students. This study focuses on examining the feasibility of the developed module through expert validation involving subject matter experts and media experts.

Based on the identified gap, this study aimed to develop an interactive integrated science module themed around Madura coastal tourism and to examine its feasibility as a contextual learning resource for junior high school science learning through expert validation.

METHOD

The method employed in this study was Research and Development (R&D). R&D is a research method used to produce a specific product and to test the effectiveness of that product (Creswell, 2003). The development of a particular product requires needs analysis-oriented research, while research aimed at testing the product's effectiveness is necessary to ensure that the product can function effectively within a broader context. This development study adopted the ADDIE model. The ADDIE model consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation (Branch & Varank, 2009). Qualitative data were obtained from validation sheets, attitude scales, and student response questionnaires related to the learning process using

the developed interactive science module. These data were then carefully analyzed, after which the researcher interpreted the results and drew conclusions that encapsulate the essence of the entire research process. Expert validation questionnaires involving subject matter experts, media experts, and student response questionnaires were used to determine the feasibility of the developed science learning media. The data were obtained from the results of evaluations conducted by subject matter experts and media experts. The feasibility of the learning media was calculated using the following formula:

[\[Figure 1 about here.\]](#)

The average feasibility score of the media was calculated using the following formula:

[\[Figure 2 about here.\]](#)

Subsequently, the data were interpreted in terms of feasibility levels based on the categories proposed by Aulia (Aulia et al., 2022), as presented in Table below.

[\[Table 1 about here.\]](#)

RESULT AND DISCUSSION

At this stage, the field study conducted in the present research involved observations of coastal tourism sites, namely Lobuk Beach (Bangkalan), Siring Kemuning Beach (Bangkalan), Nepa Monkey Forest Beach (Sampang), and Loan Malang Beach (Sampang). The results of this field study were utilized as the basis for designing an interactive science module with an integrated approach themed around coastal tourism. The findings of the field study are presented in Table 2 below.

[\[Table 2 about here.\]](#)

The initial step following the observation phase was mapping the learning materials related to the coastal tourism theme. The coastal tourism theme encompasses several topics, including Matter and Its Changes, Temperature, Heat, and Thermal Expansion, Motion and Force, Classification of Living Organisms, Ecology and Biodiversity, Earth and the Solar System, Environmental Diversity in the Surrounding Area, Environmental Economic Potential, Community Empowerment, Norms and Justice, and Nusantara Exploration. The results of the material mapping are illustrated in the following figure.

[\[Figure 3 about here.\]](#)

The developed interactive science module with an integrated approach themed around coastal tourism was subsequently subjected to a validation process to determine its feasibility. The validation was conducted by two experts, consisting of a subject matter expert and a media expert. The results of the validation are presented in Tables 3 and 4 below.

[\[Table 3 about here.\]](#)

[\[Table 4 about here.\]](#)

The subject matter expert evaluation indicates that the learning aspect achieved a score of 98.75%, the content aspect 95.50%, and the language aspect 92.25%, with an overall average score of 95.50%, all of which fall into the *very feasible* category.

The media expert evaluation shows that the display aspect obtained a score of 96.50% and the feature aspect 93.25%, resulting in an average score of 94.88%, both classified as *very feasible*. Based on the validation results from both the subject matter expert and the media expert, it can be concluded that the interactive science module with an integrated approach themed around coastal tourism is highly feasible for use in science learning and meets the *very feasible* criterion.

CONCLUSION

This study successfully developed an interactive science module with an integrated approach themed around coastal tourism through the ADDIE development model, grounded in systematic field observations of local coastal environments and comprehensive mapping of relevant science learning materials. The integration of science concepts with authentic coastal tourism contexts enables students to connect scientific knowledge with real-life phenomena, thereby supporting meaningful learning experiences and the development of scientific literacy. The results of expert validation by subject matter and media experts show very high feasibility scores across learning, content, language, display, and feature aspects, indicating that the developed module is pedagogically appropriate, conceptually accurate, and technically well designed for use in junior high school science instruction. These findings confirm that the interactive science module meets the criteria of very feasible learning media and is suitable for classroom implementation. Therefore, this module has strong potential to enhance science learning quality and support the improvement of students' scientific literacy through integrated and context-based

learning. Future research is recommended to implement the module in broader educational settings and employ experimental designs to examine its effectiveness in improving scientific literacy, higher-order thinking skills, and student engagement, as well as to further develop the module by integrating other local wisdom themes and advanced interactive features.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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TABLE 1 / Feasibility Categories

Persentase	Interpretasi
$75\% \leq V \leq 100\%$	Sangat layak
$50\% \leq V \leq 75\%$	Layak
$25\% \leq V \leq 50\%$	Cukup layak
$0\% \leq V \leq 25\%$	Tidak layak

TABLE 2 / Field Study Findings

No	Madurese Local Wisdom	Dokumentasi	Field Study Results
1	Siring Kemuning Beach, Bangkalan		<p>Siring Kemuning Beach has various components that can be used as learning resources for the topics of Matter and Its Changes, Temperature, Heat, and Expansion, Motion and Force, Classification of Living Things, Ecology and Biodiversity, Earth and the Solar System, Diversity of the Surrounding Environment, Environmental Economic Potential, Community Empowerment, Norms and Justice, and Exploring the Indonesian Archipelago.</p>
2	Lobuk Beach, Bangkalan		<p>Lobuk Beach has various components that can be used as learning resources for the topics of Matter and Its Changes, Temperature, Heat, and Expansion, Motion and Force, Classification of Living Things, Ecology and Biodiversity, Earth and the Solar System, Diversity of the Surrounding Environment, Environmental Economic Potential, Community Empowerment, Norms and Justice, and Exploring the Indonesian Archipelago.</p>
3	Nepa Monkey Forest Beach, Sampang		<p>Nepa Monkey Forest Beach has various components that can be used as learning resources for the topics of Matter and Its Changes, Temperature, Heat, and Expansion, Motion and Force, Classification of Living Things, Ecology and Biodiversity, Earth and the Solar System, Diversity of the Surrounding Environment, Environmental Economic Potential, Community Empowerment, Norms and Justice, and Exploring the Indonesian Archipelago.</p>
4	Lon Malang Beach, Sampang		<p>Lon Malang Beach has various components that can be used as learning resources for the topics of Matter and Its Changes, Temperature, Heat, and Expansion, Motion and Force, Classification of Living Things, Ecology and Biodiversity, Earth and the Solar System, Diversity of the Surrounding Environment, Environmental Economic Potential, Community Empowerment, Norms and Justice, and Exploring the Indonesian Archipelago.</p>

TABLE 3 / Results of Subject Matter Expert Validation

No	Aspect	Score	Category
1	Learning	98,75%	Highly Feasible
2	Content	95,50%	Highly Feasible
3	Language	92,25%	Highly Feasible
	Average	95,50%	Highly Feasible

TABLE 4 / Results of Subject Media Expert Validation

No	Aspect	Score	Category
1	Appearance	96,50%	Highly Feasible
2	Features	93,25%	Highly Feasible
	Average	94,88%	Highly Feasible

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$$V = \frac{TSe}{TSh} \times 100\%$$

Keterangan:
V = Validitas
TSe = Total skor dari validator
TSh = Total skor maksimal yang diharapkan

FIGURE 1 / Formula to Calculate Validity

$$V = \frac{\sum R}{N}$$

Keterangan:

V = Validitas rata-rata
 $\sum R$ = Jumlah total validitas ahli
N = Banyaknya data

FIGURE 2 / Formula to Calculate Average Validity

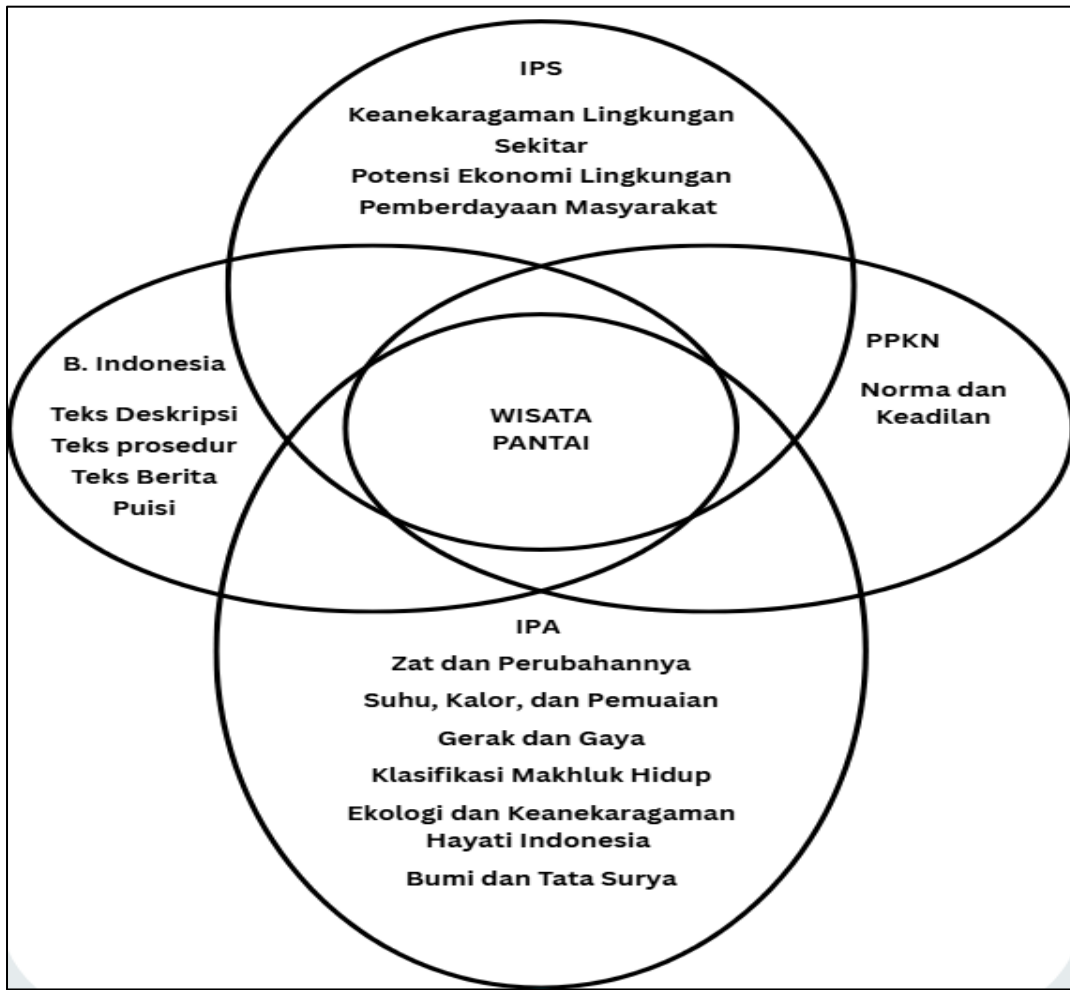


FIGURE 3 / Concept Map of the Coastal Tourism Theme