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Development of Ecosystem-Based Educational Tourism Oriented Learning Tools in Elementary Schools Supporting SDG 4

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ABSTRACT

Objective: To develop ecosystem-based educational tourism-oriented learning tools for elementary schools to strengthen students' understanding of ecosystem concepts and promote environmental awareness. This initiative supports Sustainable Development Goal (SDG) 4 by encouraging quality and contextual learning experiences, while also contributing to SDG 15 through environmental conservation education. **Method:** The study employed a development research method with a qualitative approach. The research was conducted in elementary schools located in Pamona Puselemba District, Poso Regency. Data were collected through observation, questionnaires, and interviews involving students, teachers, and relevant stakeholders. Based on the needs analysis, ecosystem-based educational tourism learning tools were developed in the form of learning modules, teacher guides, and interactive teaching materials aligned with the elementary school curriculum. The implementation process involved classroom application and observation of student and teacher responses. **Results:** The developed learning tools provide opportunities for students to learn ecosystems through direct experiences by integrating local tourism potential and environmental resources. The learning approach improves students' engagement, environmental understanding, and appreciation of natural ecosystems. **Novelty:** The study introduces an ecosystem-based educational tourism learning model that connects elementary education with local environmental potential. The developed learning tools provide an alternative approach to supporting sustainable education by integrating academic learning, environmental awareness, and local tourism resources.

INTRODUCTION

Pamona Puselemba has tourism potential and attractiveness that can be developed to improve the economy of the region. Pamona Puselemba has natural resources that can be managed, so it has economic potential, especially regarding the benefits obtained. Generally, this potential is related to Pamona Puselemba's capacity as a rural area in addition to its large population also has large lake water resources (Mamondol, 2018). Pamona Puselemba as an educational center in the future and an industrial city based on environmentally friendly, so that the community will certainly benefit greatly (Bangguna et al., 2021). In addition to economic potential, the Pamona Puselemba area can also be used as a source of learning for students. According to Dzulkarnain et al (2021), the economic and social activities of the community in coastal areas will be a source of contextual learning that can be observed and felt directly by elementary school students to achieve the desired learning competencies (Syaharuddin et al 2020). This is in line with the characteristics of elementary school students who are at the age of 7-13 years. At that age range, all aspects of children's intelligence development are extraordinary. The stage of intellectual development of children at this age greatly affects how to understand a new object (Jandrić et al., 2020). The learning process still depends on concrete objects and experiences experienced directly. Educators must be able to design learning activities that accommodate this. Learning activities that are designed (Kumar et al., 2021)

contextually in accordance with the student environment can facilitate students in achieving the planned competencies (Hamid, 2022).

Therefore, it is necessary to present a learning tool needed in managing the learning process in the form of a syllabus, Learning Implementation Plan, Teaching Module, Learner Activity Sheet, and evaluation instruments by developing an Ecosystem-based Educational Tourism-oriented learning tool (Mulyani et al., 2024). Because the learning tools developed by others are often not in accordance with the characteristics of the students being taught (Wardani & Yuanita, 2020). The incompatibility of these learning tools, among others, is influenced by different geographical and cultural conditions, so that the learning resources developed are irrelevant to the lives of students (Mehrabi et al., 2021). Thus, it is necessary to develop learning tools based on contextual learning approaches and strategies, which emphasize the importance of the role of the environment in realizing effective and optimal learning in achieving learning objectives (Amershi et al., 2014). Development of ecosystem-based educational tourism-oriented learning tools at Elementary School, Kec. Pamona Puselemba is expected to improve students' ability to understand a concept holistically (Lestari et al., 2023).

Ecosystem-based educational tourism oriented learning

Environmental education has become an important topic in the context of global education due to the increasing awareness of environmental issues. The use of ecosystem-based educational tourism approaches in learning is one of the effective ways to introduce students to environmental concepts directly (Dwivedi et al., 2023).

Educational-based tourist destinations are becoming increasingly important in Indonesia because they have many benefits. Several previous studies related to educational tourism have been studied by previous researchers, in his research Devi et al. (2019) outlined that this study aims to describe the potential of educational tourism in Gianyar Regency and provide information to the surrounding community about tourist attractions that can be visited. This study used *cluster sampling* technique with 4 samples and data collection method through observation and questionnaire with Guttman scale (bhattacherjee et al., 2019). The results showed that there were 4 educational tourism objects in Gianyar Regency, namely Elephant Safari Park, Keramas Park, Nusa Park, and Butterfly Park, with a high educational tourism potential (anaverage of 76%) because it met the criteria as an educational tourism object. This study proves that Gianyar Regency has a lot of educational tourism potential that can be visited.

The second study conducted by Gorter (2023) aims to examine the development of conservation-based educational tourism in the K.G.P.A.A Mangkunegoro I Forest Park as a natural tourist destination in Central Java. Conservation-based educational tourism is implemented as an effort to realize sustainable tourism.

The research method used is a qualitative descriptive method with data sources obtained from interviews with interviewees, observations, archives/documents, and literature studies. Based on the results of the research, the development of appropriate conservation-based educational tourism in TAHURA K.G.P.A.A Mangkunegoro I is through the creation of *jungle school* packages, *trekking* tour packages, photography packages, birdwatching attractions, procurement of data centers for research and learning, as well as the addition of facilities and infrastructure and human resources that can support the destination. In terms of conservation, it is necessary to carry out visitor management to limit the number of tourists visiting TAHURA in order to preserve nature. This research contributes to the development of sustainable tourism in Central Java.

The third study conducted by Prasetyo (2021) aims to strengthen the function of museums as a means of education outside the classroom as part of co-curricular education programs or educational tourism activities. This research is a descriptive qualitative study that uses data collection methods through literature studies. The results showed that museums have educational functions that must be explained and used as sources, media, and places of learning. It is necessary to improve the role, quality, and professionalism of teaching staff as well as the role of museum managers and related policy makers to optimize quality and accessibility so that museums are easily accessible to tourists and open to educational programs. In managing museum tourism, innovation is needed in order to attract tourists. Synergy is needed between museum managers as providers and formal educational institutions as users in the use of museums in educational functions.

In addition to the results of previous research above, some theoretical foundations that can support this statement are as follows: The study by Sobral (2019) highlights the importance of utilizing the potential of the natural environment as a source of learning to improve students' understanding of the environment. Ecosystem-based educational tourism in the open provides real experiences that can strengthen students' understanding of the interrelationship between humans and the environment.

The study by Chen et al. (2020) highlights the importance of using educational tourism to improve students' understanding of ecosystems and biodiversity. Educational tourism provides hands-on experience that allows students to thoroughly understand environmental concepts and develop a caring attitude towards nature.

In addition, research by Lai et al. (2019) shows that integration between classroom learning and activities outside the classroom, such as educational tourism, can increase students' interest in learning and strengthen the relationship between theory and practice. This confirms that the use of educational tourism as part of learning in elementary schools has great potential to increase the effectiveness of learning.

Research by Diba et al. (2020) shows that the use of educational tourism approaches in learning in elementary schools can increase students' interest and motivation to learn and broaden their understanding of the ecosystem. This shows that the integration between education and tourism can be an effective strategy in improving environmental learning in elementary schools.

Currently, the development of ecosystem-based educational tourism-oriented learning tools is still fairly limited, especially in rural areas such as Pamona Puselemba District, Poso Regency. Many of the available learning tools tend to be conventional and less integrated with natural education tourism (Widyastuti & Susiana, 2019).

RESEARCH METHOD

This research was conducted from April to August 2024 at an elementary school located in Pamona Puselemba District. The type of research conducted was research and development (Research and Development) using the Addie model. The Addie model is a systematic approach in the development of learning tools that aims to overcome learning problems by paying attention to learning resources that are in accordance with the needs and characteristics of students (Umm et al., 2015). The model consists of five stages.

The first stage is Analysis. At this stage, identification of existing problems is carried out, so that the problem to be studied and the appropriate solution can be selected. The results of this analysis stage will be the basis for the design stage (Juliana et al., 2016).

Analyzing students is very important because it can help determine the knowledge that students need to learn and understand their original attitudes (Ghani & Daud, 2018).

The next stage is Design, where planning is carried out to determine and compile the learning tools to be developed. After that, the Development phase was carried out, which included validation and revision tests by experts (Sofiatin et al., 2016). The validation of the learning tool instrument was carried out by two validators, namely a material expert and a learning tool expert. Validation for material experts includes three aspects of assessment: content feasibility, presentation feasibility, and language assessment. Meanwhile, validation for learning device experts involves six criteria, namely content, presentation, design & layout, illustration & images, student involvement, and trial & revision.

The validation analysis of learning tools was carried out using the Khabibah formula (in Yamasari, 2010). The following are the stages of data analysis activities carried out:

1. Creating a table of validation instruments for ecosystem-based educational tourism-oriented learning devices
2. Find the average of each material and design validation criteria with the formula

$$K_i = \frac{\sum_{h=1}^n V_{hi}}{n}$$

Notes:

K_i = Average score of the i -th validation criterion

V_{hi} = Assessment score given by the h -th validator for the i -th criterion

h = Number of validation

n = Total number of validators involved in the validation process.

The results obtained are included in the average column on the validation sheet.

3. Find the average of the three aspects of assessment by material experts with the formula:

$$A_i = \frac{\sum_{j=1}^n K_{ij}}{n}$$

Notes:

A_i = Average score of the i -th assessment aspect

K_{ij} = Average score of the i -th aspect on the j -th criterion

n = Total number of criteria contained in the i -th aspect

i = Assessment aspect

j = Criterion within the assessment aspect

The results obtained are entered into the average column of each aspect on the validation sheet for material experts.

4. Find the average of the total validation of the six aspects of assessment by learning device experts with the formula:

$$RTVTK = \frac{\sum_{i=1}^n A_i}{n}$$

Notes:

RTVTK = the average total validity of ecosystem-based educational tourism-oriented learning devices

A_i = Average score of the i -th assessment aspect

n = Total number of criteria contained in the i -th aspect

i = Assessment aspect

5. Matching the average total with the validity criteria according to Table 1.

Table 1. Total average with validity criteria

Average Total	Evaluation Criteria
$3 \leq \text{RTVTK} \leq 4$	Valid
$2 \leq \text{RTVTK} < 3$	Moderately
$1 \leq \text{RTVTK} < 2$	Valid invalid

6. If the learning tool is said to be "valid" then the device is feasible to use, if the learning tool is said to be "valid enough" then the learning tool is feasible to use with improvements, if the learning tool is "invalid" then the learning tool is not feasible to use.

RESULTS AND DISCUSSION

Results

Table 2. Material Feasibility Test (RPP, Teaching Module, LKPD and Evaluation Instrument)

Aspects	$\sum K_i$	A_i
Content Eligibility	28	3
Presentation	7	3
Eligibility Language Assessment	19	3
RTVTK =		3

Notes:

K_i = Average of each

A_i = Average score of the i-th aspect on the i-th aspect on the j-th criterion

RTVTK = the average total validity of ecosystem-based educational tourism-oriented learning devices

Discussion

Analyze

Analysis is the first step in the Addie R&D model. In this study, the analysis focused on identifying problems that are often faced by elementary school students when studying ecosystem materials in general. One of the main problems we found related to the ecosystem learning process is the lack of examples or concrete evidence that can explain the relationship between ecosystems and human life. This finding is in line with the opinion of Sofiatin et al. (2016), which states that a common challenge in learning carried out by teachers is a high dependence on textbooks as the main source of information in the classroom.

Examples and evidence contained in textbooks are often general in nature and do not reflect local wisdom relevant to the context of the learner. In addition, Sukirno et al. (2020) emphasize that effective biology learning must focus on concepts that can be seen, felt, and analyzed in accordance with students' real environmental conditions. Therefore, this became the main foundation in the development of these teaching materials, with the aim of providing information and examples that are relevant to the surrounding environmental conditions, especially at the elementary school level in Pamona Puselemba District, Poso Regency. This study aims to overcome these shortcomings by presenting more contextual and applicative material, so that students can better understand and relate the concept of ecosystems to their daily lives.

Design

The design stage in the development of learning tools is a crucial step that involves determining the content. This process aims to ensure that the overall initial design can be developed properly. According to Ghani and Daud (2018), a mature design will facilitate the delivery of material to students. In this context, the resulting learning tools are teaching modules that are systematically designed to meet learning needs.

The developed teaching module has a size of A4 (210×297 mm) and consists of 29 pages divided into sections. Each part of the module has a different function and purpose. The first part of this module is structured according to the Merdeka curriculum, which provides flexibility in learning. Next, the second section contains learner worksheets designed to practice their understanding and skills. With a clear structure, it is expected that students can take part in learning more purposefully.

The third part of this module is the observation assessment rubric, which serves to evaluate the teaching and learning process more objectively. This rubric provides guidance for instructors in assessing student development. In addition, the fourth section includes formative tests and answer keys, which are designed to measure learners' understanding of the material that has been taught. With this test, it is hoped that the instructor can find out the extent to which students understand the concepts taught.

The fifth part of this module presents materials or reading materials that focus on ecosystems and local wisdom in Pamona Puselemba District, Poso Regency. This material was chosen because of its relevance to the local context and the importance of understanding the surrounding environment for students. By studying ecosystems and local wisdom, it is expected that students can better appreciate and preserve their environment.

The reason behind the preparation of teaching materials in the form of booklets is to create modules that focus on certain materials and are easy to use. The lightweight and practical module design is expected to not make it difficult for users to access and utilize the learning tool. Thus, this teaching module not only serves as a source of information, but also as a tool that supports the teaching and learning process effectively.



Figure 1. Learning tool cover

Development

At the development stage, a validation test was carried out on the Teaching Module by two validators who were lecturers of the Elementary School Teacher Education Study Program and the Science Education Study Program. This process aims to analyze the results of validation from experts to determine the validity of the teaching materials that have been prepared. Suggestions and input provided by the validator will be used as a

reference for improving the teaching material product. One lecturer acts as a material expert, while the other lecturer focuses on the aspect of learning devices. Suggestions from material experts include the addition of more complete material, accompanied by clear images and contextual problems that can be solved, it is also necessary to add endemic animals and plants that need to be included in the material or reading material. On the other hand, the learning device validator provides input to improve the rubric of observation assessment that needs to be clarified in every aspect, LKPD must refer to what students do, reading materials must be added with pictures because elementary school children are more interested in pictorial reading materials.

After receiving suggestions from the validator, the instruments in the learning device (teaching module) have been repaired. The validation results show that this learning tool is suitable for use in the field after revision. The Teaching Module which focuses on ecosystem-based Educational Tourism is the result of the implementation of research and development (Research and Development, R&D) with the Addie model. This ecosystem-based Educational Tourism-oriented learning tool contains teaching modules tailored to the independent curriculum, student worksheets, observation assessment rubrics, formative tests and reading materials.

The curriculum used in creating this Teaching Module is the 2018 revised version of the 2013 Curriculum. This Teaching Module is intended for students of grade IV of Elementary School. The selection of the Teaching Module format aims to facilitate students' understanding of ecosystem materials through examples that are relevant to their surrounding environment. Thus, it is expected that students can better understand the concepts taught and relate them to everyday experiences.

Teaching materials that have been prepared must be tested for feasibility before they can be used by students. This assessment is carried out by a material expert to assess the feasibility of the contents of the Teaching Module and an expert on learning tools to assess the feasibility of the design, layout, and language used. Based on the assessment conducted by material experts, the average total validation for this Teaching Module is included in the valid category as teaching material with a score of 3 points. This shows that the Teaching Module is suitable for use by learners, although it still requires revision to improve the quality of the material contained therein.

The best aspect of this Teaching Module is the feasibility in terms of the content presented, where the ecosystem material in IPAs subjects is well organized and relevant to the applicable curriculum. In addition, this module also includes various real examples that can be found in the environment around students, so it is expected to increase their understanding of the concepts taught.

However, although the validation results show that this Teaching Module is feasible to use, some revisions are still needed to improve its quality. Suggestions from the learning device validator, such as the clarity of the assessment rubric and the inclusion of the table of contents and the bibliography, are very important to help students in navigating the device better. In addition, the addition of more complete and contextual material from the material validator will also enrich the student learning experience.

By making improvements based on input from validators, it is expected that this Educational Tourism-oriented learning tool not only meets eligibility standards, but can also be an effective tool in the learning process. The use of context-oriented approaches and real experiences of students is expected to increase their motivation and interest in learning the material being taught.

Overall, the development of this learning tool is a positive step in improving the quality of education, especially in teaching about ecosystems. With the validated and improved

modules, it is hoped that students can more easily understand the material and relate it to their daily lives.

CONCLUSION

Fundamental Finding: This study demonstrates that ecosystem-based educational tourism-oriented learning tools can become an effective learning innovation for elementary schools. The developed learning tools integrate ecosystem concepts, local environmental potential, and tourism-based learning experiences to improve students' understanding of environmental issues. The findings emphasize that contextual and experiential learning approaches can support meaningful education while strengthening students' awareness of sustainability. **Implication:** The development of ecosystem-based educational tourism learning tools provides practical implications for teachers, schools, and policymakers in designing environmentally oriented learning programs. These tools can support SDG 4 by improving educational quality through active and contextual learning. **Limitation :** This study is limited to elementary schools in Pamona Puselemba District, Poso Regency, and focuses primarily on the development process and initial implementation of learning tools. The effectiveness of these tools may vary depending on geographical conditions, school facilities, teacher readiness, and available environmental resources. **Future Research :** Future research should examine the effectiveness of ecosystem-based educational tourism learning tools using larger samples and quantitative evaluation methods. Further studies may also explore the integration of digital technology, interdisciplinary learning approaches, and collaboration with local tourism stakeholders to strengthen sustainable education models. Future research should examine the effectiveness of ecosystem-based educational tourism learning tools using larger samples and quantitative evaluation methods. Further studies may also explore the integration of digital technology, interdisciplinary learning approaches, and collaboration with local tourism stakeholders to strengthen sustainable education models.

AUTHOR CONTRIBUTIONS

Rizal contributed to the conceptual framework, research design, methodology development, data collection, analysis of research findings, and manuscript preparation. **Surahman** contributed to literature review, validation of learning tools, interpretation of results, and critical revision of the manuscript. **Muhammad Aqil** contributed to data analysis, research documentation, and improvement of the discussion section. **Asriani** contributed to the development of educational materials, evaluation of learning tools, and manuscript editing. All listed authors have reviewed and approved the final version of this submission.

CONFLICT OF INTEREST STATEMENT

The authors confirm that there are no conflicts of interest, either financial or personal, that may have influenced the content or outcome of this study.

ETHICAL COMPLIANCE STATEMENT

This manuscript complies with research and publication ethics. The authors affirm that the work is original, conducted with academic integrity, and free from any unethical practices, including plagiarism.

STATEMENT ON THE USE OF AI OR DIGITAL TOOLS IN WRITING

The authors acknowledge the use of digital tools, including AI-based technologies, as support during the research and writing stages of this article. Specifically, AI-based language assistance tools were used to improve grammar, enhance academic writing quality, and support manuscript readability. Reference management and digital research tools were also utilized to assist in organizing literature sources and citation management. All outputs generated through digital assistance were critically reviewed, verified, and revised by the authors to ensure academic integrity, accuracy, and compliance with ethical publication standards. The final responsibility for the content, interpretation, and conclusions of this manuscript remains entirely with the authors.

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