

# Developing a Meaningful Learning Module Integrating Wasaka Character to Promote Environmental Awareness

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**Abstract:** Integrating local wisdom into learning is considered an effective strategy to strengthen character education and support meaningful learning. However, the integration of local cultural values into environmental learning materials for elementary school students remains limited. This study aimed to develop and evaluate a meaningful learning-based module integrating the Wasaka character (*Waja Sampai Kaputing*) to enhance students' environmental awareness and environmental care attitudes. This study employed a Design-Based Research (DBR) approach adapted from Reeves' model, consisting of problem analysis, solution development, iterative implementation, and reflection. The participants were 60 fifth-grade students of SDN Handil Bakti, Barito Kuala Regency, Indonesia. Data were collected through expert validation sheets, environmental awareness questionnaires, environmental care attitude scales, learning outcome tests, and teacher and student response questionnaires. The results showed that the developed module achieved high validity, with material validation of 91.42%, media validation of 88.57%, and language validation of 92%, indicating that the module was feasible for classroom implementation. The implementation results also showed positive learning outcomes and high levels of students' environmental awareness and environmental care attitudes. These findings indicate that integrating meaningful learning with local cultural values can support environmental character education in elementary schools.

**Keywords:** Character Education; Environmental Awareness; Meaningful Learning; Learning Module; *Wasaka* Character

## Introduction

Since ancient times, the noble values and cultural traditions of a society have played an important role in guiding social behavior and shaping individual character. In the context of education, these values are closely related to character education, which aims to develop not only students' intellectual abilities but also their moral attitudes and social responsibility. In Indonesia, character education has become a fundamental component of the national curriculum, where the education system is expected to produce individuals who are not only knowledgeable but also

possess good character and attitudes appropriate to social life (Kementerian Pendidikan Nasional, 2011; Khodijah, 2017; Sholekah, 2020).

However, the implementation of character education in schools often emphasizes cognitive achievement more than the development of students' attitudes and character. In many learning practices, local cultural values that should support character formation are rarely integrated into classroom learning. This condition is further influenced by the increasing interaction between local and global cultures, which gradually reduces the practice of traditional cultural values in everyday learning activities. As a result,

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various social problems among students, such as bullying and inappropriate behavior, have become increasingly visible (Karina et al., 2013; Yuyarti, 2018).

One potential approach to strengthening character education is by integrating local cultural values into learning activities. Local wisdom provides meaningful contexts that allow students to internalize character values through real-life experiences. Local cultural traditions also play an important role in shaping social values and community identity, particularly in regions such as Kalimantan where cultural heritage remains closely connected to daily life (Usman, 1998). Previous studies have shown that the integration of cultural values into education can contribute positively to students' character development. For example, Nadila (2017) demonstrated the integration of Banjar cultural values in history learning, while Amin (2018) implemented a humanistic-existential counseling approach based on Banjar cultural values to support character formation.

In addition to integrating local cultural values, meaningful learning is considered an important approach in promoting deeper understanding and positive attitudes among students. Meaningful learning emphasizes active and constructive learning processes in which students connect new knowledge with prior experiences (Shuell, 1992). In environmental education, such learning processes can encourage students to develop environmental awareness and responsible behavior toward their surroundings (Asmani, 2013; Padmanabhan et al., 2008; Rahmawati & Suwanda, 2015).

In the context of South Kalimantan, one important cultural value is the Wasaka character (Waja Sampai Kaputing), which reflects perseverance, responsibility, and commitment in completing tasks (Sarbaini et al., 2012; Sari et al., 2022). Integrating this cultural value into

learning activities has the potential to support the development of environmental awareness and positive character among students.

Although previous studies have discussed character education and the integration of local cultural values in learning, most of these studies focus on conceptual discussions or counseling approaches rather than the development of structured learning materials. Studies that specifically develop meaningful learning-based modules integrating local cultural values to promote environmental awareness among elementary school students remain limited. In particular, the integration of the Wasaka character (Waja Sampai Kaputing) into meaningful learning-based instructional modules has not been widely explored.

Therefore, this study aims to develop and evaluate a meaningful learning-based module integrating the Wasaka character (Waja Sampai Kaputing) and to examine its potential in supporting environmental character education in elementary schools.

### Method

This study employed a Design-Based Research (DBR) approach adapted from the model proposed by Reeves (2006). DBR is widely used in educational research to develop and refine learning interventions through iterative cycles of design, implementation, analysis, and revision. The Reeves model consists of four main stages: (1) problem identification and analysis, (2) development of solutions informed by theory and design principles, (3) iterative testing and refinement of the solution in practice, and (4) reflection to produce design principles and improve implementation. The flow of the Reeves model is as follows (Figure 1).

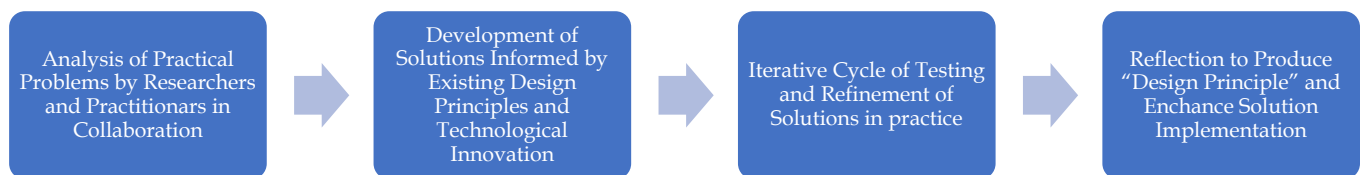


Figure 1. Reeves model

The implementation of the DBR stages in this study was conducted as follows:

**Problem Identification and Analysis:** At this stage, researchers conducted a preliminary study to identify students' environmental awareness and environmental care attitudes. The data were collected using environmental awareness questionnaires and observations of classroom learning. The results of this preliminary analysis were used to identify learning

problems and determine the need for developing a learning module integrating meaningful learning principles and Wasaka character.

**Development of the Learning Module:** Based on the results of the preliminary study and relevant theoretical frameworks, the researchers developed a meaningful learning-based module integrating the Wasaka character (Waja Sampai Kaputing). The module design included learning materials, student activities,

worksheets, and reflection activities aimed at promoting environmental awareness and meaningful learning experiences.

**Iterative Testing and Refinement:** The developed module was validated by experts and practitioners before being implemented in classroom learning. Expert validation was conducted to evaluate the quality of the module in terms of content, media design, and language use. Feedback from validators was used to revise and improve the module before classroom implementation.

**Reflection and Evaluation:** After the implementation stage, researchers conducted reflections based on classroom observations, student learning outcomes, environmental awareness data, and environmental care attitude measurements. The results of this reflection were used to identify strengths and weaknesses of the developed module and to improve the learning strategy for future implementation.

The participants in this study were 60 fifth-grade students of SDN Handil Bakti, Barito Kuala Regency, South Kalimantan, Indonesia. The participants were selected using purposive sampling because the school had characteristics relevant to the research focus on environmental education and local cultural values.

The developed module was evaluated by experts to assess its feasibility before classroom implementation. The validation involved experts in learning materials, educational media, and language. The validation process used an assessment questionnaire with a five-point Likert scale, where the validators assessed several aspects including material suitability, readability, question and reference suitability, module design, and language clarity.

Several instruments were used in this study to collect research data. These instruments included an environmental awareness questionnaire, an environmental care attitude assessment sheet, and an expert validation questionnaire used to evaluate the feasibility of the developed module. In addition, a learning outcome test was administered to measure students' understanding of the learning material. A student self-assessment sheet was also employed to identify students' character development related to environmental awareness. Furthermore, teacher and student response questionnaires were used to obtain feedback regarding the implementation and practicality of the learning module in the classroom.

The scores obtained from the validation questionnaires were converted into percentages to determine the validity level of the module using the formula proposed by Arikunto (2002):

$$P = \frac{\sum x}{\sum xi} \times 100 \tag{1}$$

(Arikunto, 2002)

Description:

P = percentage

$\sum x$  = Number of respondents' answers in 1 item  
 $\sum xi$  = ideal score in item  
 100% = constant

The percentage results were interpreted using validity criteria adapted from Suryabrata in Ismail (2007), which classify the results into valid, moderately valid, less valid, and invalid categories, as presented in Table 1.

**Table 1.** Validity Criteria for the Assessment Questionnaire Data

Value scale	Description
85.94-100%	Valid (not revised)
67.18-85.93%	Quite valid (not revised)
48.44-67.17%	Less valid (revised)
25-48.43%	Invalid (revised)

Source: Suryabrata in Ismail. 2007

In the module trial stage, three aspects were analyzed, namely environmental awareness, environmental care attitudes, and students' learning outcomes. The measurements were conducted in two different classes during the implementation of the developed module. The results obtained from these measurements were used as the basis for reflection and revision of the module. The data were analyzed using descriptive statistical analysis, including the calculation of mean scores and standard deviations to describe the distribution of students' learning outcomes and environmental awareness levels.

**Results and Discussion**

*Results*

This study focuses on Wasaka character values related to environmental care, which in this study focused on environmental awareness among elementary school students in Banjarmasin.

*Initial Module Design*

The initial module design is based on several essential components. First, the standard module format is referenced, which influences the organization of the module's content from the beginning to the end. Second, the module layout represents the visual aspect, wherein the principles of balance and aesthetics are applied to design this section. Third, the module content, which is a crucial element, represents the material or content that constitutes the "soul" of the module itself. The content, which is aligned with the topic and the philosophical foundation of the module, is developed accordingly.

*Module Format*

Regarding the format, the layout of the cover and content is depicted in Figure 2. The cover is designed with a vibrant color scheme, and an image at the center symbolizes the module's content. As shown in Figure 2a, the module's content is centered around environmental change, with the sub-theme "Our Friend's

Environment.” Therefore, the central image is a depiction of the environment in South Kalimantan, which is intended to enhance contextualization and make the content more accessible to students.

Moreover, in terms of content layout, a stronger emphasis is placed on the use of colorful borders and a

white central section, which contrasts with the text and images within the content (Figure 2b and c). The initial section, prior to the core content, includes a “Module Position Map” section, which facilitates an overview of the module’s contents for both teachers and students.

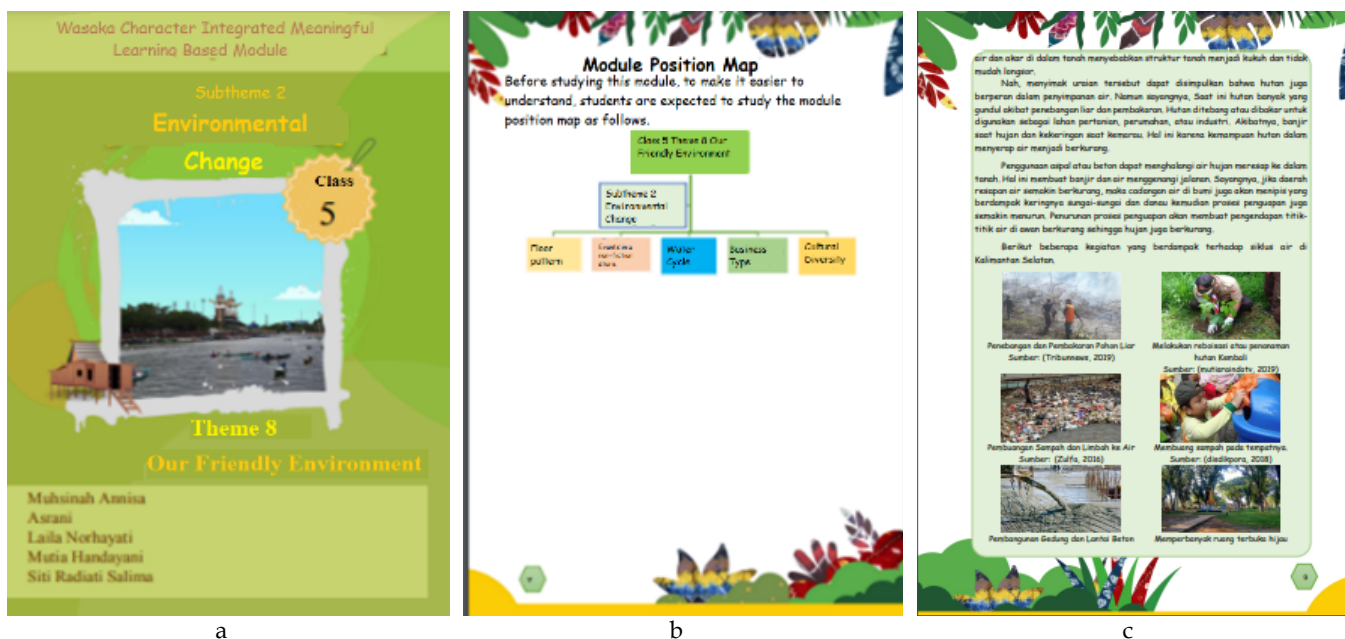


Figure 2. Module Design Format

Module Content

The content of this module is grounded in two important issues: meaningful learning and the Wasaka character. These issues serve as the theoretical foundation for the module’s development. Both issues are consistently addressed throughout the module’s content, both implicitly and explicitly. For instance, in Figure 3, a Student Worksheet for creating a poster is presented. This worksheet exemplifies two principles of meaningful learning: active and constructive. The active principle is demonstrated when students are asked to present information on posters according to their learning styles, while the constructive principle is reflected in the students’ ability to reconstruct information and transform it into something new.

In addition to meaningful learning, the Wasaka character is also prominently highlighted in various sections of this module. For example, in Figure 4, within the “Let’s Read” section, the Wasaka character is emphasized not only for its environmentalism but also for its tenacity and hard work.

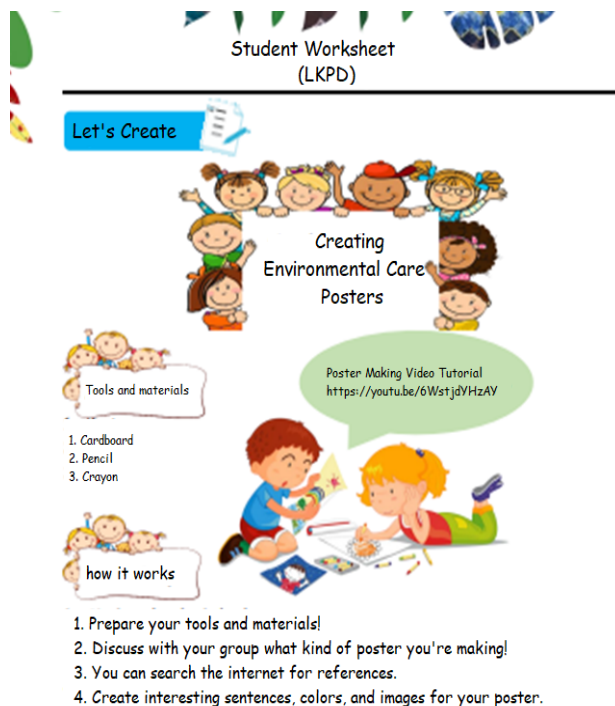
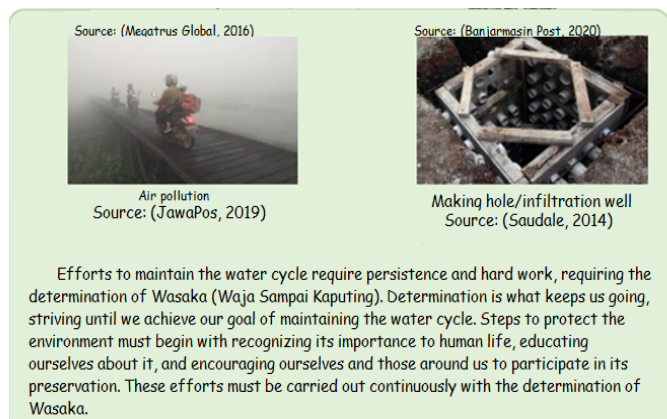


Figure 3. Example of Integrating Meaningful Learning in the Module



**Figure4.** Integrating the Wasaka Character in the Learning Module

*Quality of Learning Modules Based on Meaningful Learning with Wasaka Character Content*

The quality of the developed learning modules must be validated by both experts and practitioners before being piloted with students. The purpose of the validation is to provide an overview of the module’s strengths and weaknesses based on the perspectives of experts and practitioners. A questionnaire containing statements on a Likert scale from 1 to 5 is used for the validation process. The Likert scale scores are then averaged and converted into percentages, which are subsequently categorized according to the classification outlined in the methods section.

**Table 2.** Assessment of material aspects in the module

Assessment Aspects	Percentage score	Criteria
Material Suitability	91.42%	Valid
Readability	88%	Valid
Question and Reference Suitability	80%	Moderately Valid
Interest and Independence	100%	Valid

Next, the media assessment was conducted. The module was assessed based on three types of media evaluation: module size, cover design, and content design. The results of the media assessment are presented in Table 3. The assessment by media experts revealed that the aspect related to module size was categorized as “Moderately Valid,” indicating that it partially met the expected criteria but required some improvements for full validation. Meanwhile, the remaining aspects, including cover design and content, were classified as “valid,” suggesting that these components fully met the established criteria for quality and effectiveness. This assessment provides important insights into areas where the module could be refined to better meet the needs of the target audience.

**Table 3.** Media Aspect Assessment

Assessment Aspects	Percentage score	Criteria
Module Size	80%	Moderately Valid
Cover Design	90%	Valid
Content Design	88.57%	Valid

The next section that was assessed was language. The use of language in the module was considered crucial as it served as a communicative element that needed to be understood by both teachers and students. The language assessment was divided into two evaluations: language use and language accuracy. The percentages of the language assessments are presented in Table 4. Both aspects assessed in the language were found to meet the criteria for “valid.”

**Table 4.** Language Aspect Assessment

Assessment Aspects	Percentage score	Criteria
Language use	92 %	Valid
Language accuracy	100 %	Valid

The data in Table 5 summarizes the assessment of four key components of the module: material, ease of use, suitability of module elements, and language use. The percentage scores and criteria for each component are as follows:

**Table 5.** Practitioner Assessment

Assessment Aspects	Percentage score	Criteria
Material	90	Valid
Ease of Use	90	Valid
Suitability of Module Elements	90	Valid
Use of Language	80	Moderately Valid

From the practitioner’s perspective, the components assessed in this module include the material, ease of use, appropriateness of module elements, and language use. The assessment by practitioners is crucial, as the module will be used and implemented by them in the classroom.

The results of the assessment show that three components—material, ease of use, and suitability of module elements—were classified as “valid,” with percentage scores of 90%. This indicates that these aspects were found to align well with the criteria for effectiveness and practicality, meeting the needs of both educators and students.

However, the language use component was classified as “moderately valid,” with a score of 80%. This suggests that while the language used in the module was generally effective, improvements were deemed necessary to enhance clarity, simplicity, or alignment with students’ comprehension levels. The moderate validity indicates that further refinement of the language was recommended to ensure full

accessibility and understanding for all users in the classroom.

*Improving module implementation strategies based on meaningful learning based on the Wasaka character*

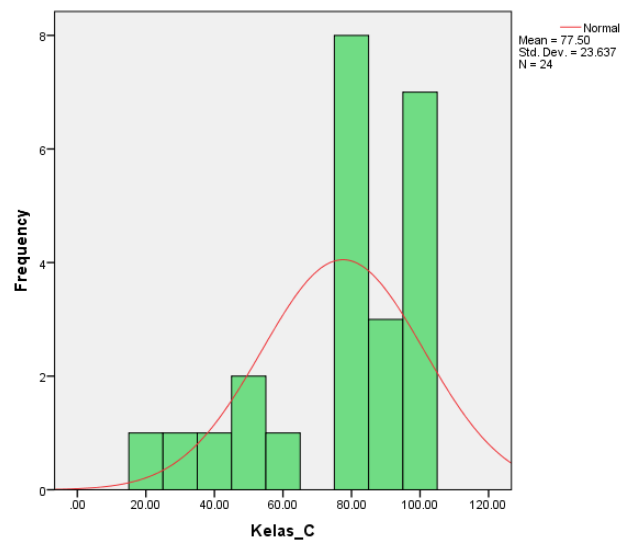
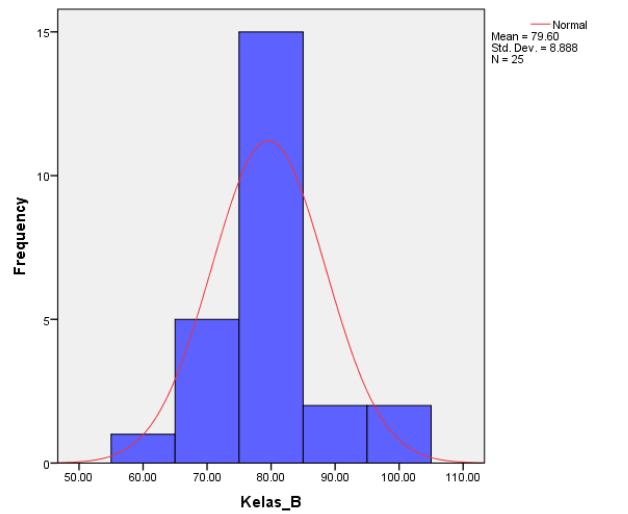
This stage involved a module trial based on the principles of design-based research, where the trial was conducted to assess the potential and weaknesses of the module when used in the classroom setting. The data utilized in this study were derived from classroom observations and quantitative data, including student learning outcomes, measurements of environmental care attitudes, and environmental awareness.

Table 6 presents the data related to the observations made during the first meeting of the module’s implementation, as well as the efforts undertaken in subsequent meetings. The results of the observations include several notes from the researcher regarding the teacher’s implementation of the module, highlighting key aspects that were successfully applied as well as areas requiring improvement. These observations provided valuable insights into the practical application of the module, helping to identify strengths and weaknesses that could guide further revisions. Additionally, the data collected on student learning outcomes, environmental care attitudes, and environmental awareness offered a quantitative basis for evaluating the module’s effectiveness in promoting the desired educational goals.

**Table 6.** Observation Results

Observation Results (Meeting 1)	Follow-up (Meeting 2)
In implementing the module, especially in the “Let’s Read” section, the teacher focused solely on reading activities without discussing the students’ reading. Several activities in the module, such as the “independent practice” activity, required students to access videos. This obstacle arose due to a lack of preparation for accessing the internet.	There needs to be a group discussion of the students’ reading results. This will help students better understand the reading material. Prepare videos in digital format and offline on laptops. This way, the videos can be played directly to the class using the LCD.

Quantitative measurements were also conducted to assess the impact of the module on students. Three aspects were measured: learning outcomes, environmental awareness, and environmental care attitudes. For learning outcomes, there are 10 questions, with a maximum value of 100 and a minimum value of 0. For environmental care attitudes and environmental awareness, a Likert scale with a range of 1-4 is used, the measurement results will be expressed as a percentage.



**Figure 5.** Distribution of Learning Outcomes between 2 Classes

Two classes were used to illustrate the results of the module’s implementation for students. The codes used were Class B and Class C. Figure 5 shows that the distribution of student scores was very good based on the module’s implementation. However, there is a significant difference, particularly in Class C, with a relatively wide range, as the lowest score was 20, reflected in the standard deviation of 23.637. Meanwhile, in Class B, the score distribution appears normal.

Furthermore, the questionnaire data related to environmental awareness is presented based on the average student score on a Likert scale of 1-4. The questionnaire consisted of positive and negative statements. The SS score for positive statements was 4, while the SS score for negative statements was 1. The data for both classes are presented in percentage form in Figure 6. The figure shows that both classes were dominated by scores of 4 and 3, indicating a high level of environmental care attitude among students.

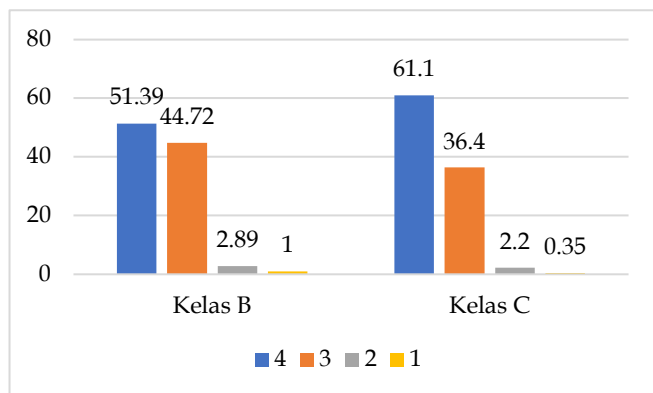


Figure 6. Percentage of Environmental Care Attitudes

Environmental awareness also needs to be assessed to determine the representation of students' attitudes, actions, and perceptions regarding a healthy and clean environment. Environmental care attitudes encompass a broader scope than environmental awareness. The results are shown in Table 6, with the highest percentage being at score 3. Data collection also used a questionnaire, similar to the data collection related to environmental awareness.

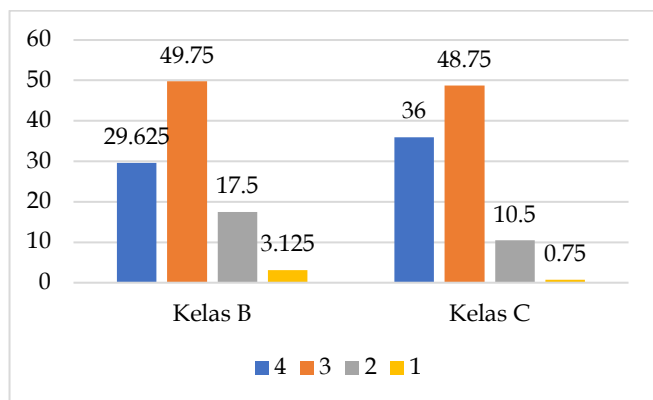


Figure 7. Percentage of Environmental Awareness

Discussion

Initial Module Design

The initial design of the module emphasized both visual and content aspects, including the cover and layout of the learning materials. The cover plays an important role in printed learning media because it represents the content and attracts readers' attention (Gudinavičius & Šuminas, 2017; Iwana et al., 2016). The use of bright colors and environmental imagery in the module cover was intended to increase students' interest while simultaneously representing the environmental theme of the learning materials. Previous studies have also highlighted that attractive visual design can improve students' engagement with instructional materials and encourage their willingness to explore the content (Ambrose & Harris, 2007; Cullen, 2005).

In addition to the cover design, the layout of the module was also carefully designed to create a balance

between text and visual elements. Balanced layouts are essential in printed learning materials because they improve readability and prevent cognitive fatigue among readers (Turnbull & Baird, 1975). The use of colored borders combined with a white central section allows the content to remain visually appealing while maintaining clarity of the text and images. This design approach is consistent with previous research on instructional media development which emphasizes the importance of layout balance and visual organization in supporting effective learning materials (Ambrose & Harris, 2007; Cullen, 2005; Turnbull & Baird, 1975).

The content of the module focuses on the theme of "our friendly environment," which is closely related to environmental-based learning. Environmental education has long been recognized as an important component of science education, particularly for developing students' environmental awareness from an early age (Malone & Tranter, 2003; Rickinson, 2006). Previous studies have shown that many students still demonstrate relatively low levels of environmental awareness, especially in the context of environmental responsibility and sustainable behavior (Parker et al., 2018; Permana et al., 2020). Therefore, integrating environmental themes into learning materials is considered an important strategy to promote environmental awareness among elementary school students.

Environmental education should not only emphasize knowledge acquisition but also foster students' attitudes and awareness toward environmental sustainability (Littledeyke, 2008). Meaningful learning provides an appropriate approach for achieving this goal because it encourages students to actively construct knowledge through experiences and reflection (Shuell, 1992). In the developed module, several learning activities such as "Let's Reflect," "I Want to Write," and "Let's Be Creative" were designed to support active and constructive learning processes. These activities allow students to connect environmental concepts with their own experiences, which is consistent with the principles of meaningful learning that emphasize active, constructive, and goal-oriented learning processes.

Another important element of the developed module is the integration of the Wasaka character (Waja Sampai Kaputing). The Wasaka character represents perseverance, responsibility, and commitment to completing tasks. Integrating these values into learning activities provides a culturally relevant learning context for students. Previous studies have shown that the integration of local cultural values into education can support students' character development and strengthen their cultural identity (Amin, 2018; Nadila, 2017). In this study, the Wasaka character was embedded in various learning activities, such as reading

activities and environmental discussions. This integration demonstrates that local cultural values can be incorporated into instructional materials to support both character education and environmental awareness (Sarbai et al., 2012; Sari et al., 2022).

#### *The Quality of a Meaningful Learning-Based Module with Wasaka Character Content*

The validation results indicate that the developed module meets the criteria for valid learning materials. One of the important aspects evaluated was the suitability of the module content with curriculum objectives. The alignment between learning materials and curriculum standards is an important factor in ensuring the continuity of learning activities and achieving expected learning outcomes (Murniati et al., 2021; Puspito et al., 2022; Yuniato, 2021). The high validity scores obtained in this study indicate that the developed module successfully aligns learning content with curriculum requirements.

Another important aspect evaluated in the module was readability. Readability is closely related to the clarity of language and the ease with which students can understand the learning material (Sarip et al., 2022). The results of this study indicate that the module has good readability, which supports its usability for elementary school students. Clear and understandable language in learning materials can significantly improve students' comprehension and learning engagement.

The appropriateness of questions and references within the module was also evaluated. Questions play an important role in assessing students' understanding and guiding their learning process (Fauzi et al., 2021). Furthermore, questions should reflect the module's framework of reference (Widyaningsih & Yusuf, 2018). In this module, the questions were designed based on meaningful learning principles and the Wasaka character framework, ensuring that the assessment tasks were aligned with the learning objectives. Furthermore, the use of diverse references helps reduce misconceptions and ensures that the learning content remains accurate and up-to-date (Fitriyati et al., 2015; Nugrahini, 2013).

The attractiveness and independence aspects of the module were also evaluated. Attractive learning materials can increase students' motivation and engagement in learning activities (Chaeruman, 2019; Kurniawan et al., 2020). At the same time, the module was designed to support independent learning, allowing students to explore learning activities autonomously (Bernard et al., 2019). The presence of activities such as "Let's Read" and "Let's Create" enables students to participate actively in the learning process while developing independent learning skills.

Media experts also evaluated the module in terms of size, cover design, and content layout. Appropriate

module size is important because it influences readability and visual balance (Siang & Ibrahim, 2017). The dimensions used in this module are consistent with those used in previous module development studies (Hardini et al., 2013; Permata & Mustadi, 2020; Sugianto et al., 2018). Additionally, the cover design uses green colors and environmental imagery to represent the environmental theme of the module. Color selection is important because visual elements can influence students' perception and engagement with learning materials (Fennell et al., 2019; Josserand et al., 2021).

Language aspects were also evaluated, including language use and language accuracy. Clear and accurate language is essential in learning materials because it helps students understand instructions and learning concepts more easily (Utomo et al., 2019; Wresniati, 1997). The results of the language validation indicate that the module meets the criteria for effective communication in learning materials.

#### *Implementation of the Meaningful Learning Module with Wasaka Character*

The implementation of the developed module in classroom learning provided insights into its practical application and effectiveness. The classroom observations revealed several challenges during the initial implementation. For example, in the "Let's Read" section, teachers initially focused on reading activities without facilitating discussion among students. However, in subsequent learning sessions, teachers encouraged students to discuss and summarize the reading materials collectively. This approach is important because reading and summarizing activities help students develop critical thinking skills and deeper comprehension of learning materials (Susilo & Garnisya, 2018).

Another challenge encountered during implementation was related to the use of video-based learning resources. Internet connectivity issues prevented students from accessing the videos during the learning process. Such technical challenges are commonly encountered in technology-based learning environments, particularly in regions where internet infrastructure remains limited (Gafar, 2017). To address this issue, the videos were downloaded and prepared in offline format to ensure smoother classroom implementation.

The implementation results also demonstrated positive outcomes in terms of students' learning outcomes and environmental awareness. The analysis of learning outcomes showed that most students achieved satisfactory scores after using the module. Although variations in scores were observed between the two classes, the overall results indicate that the module supported students' understanding of environmental concepts.

In addition to learning outcomes, the module also contributed to students' environmental awareness and environmental care attitudes. Environmental awareness reflects students' understanding and perception of the importance of protecting the environment (Purwanti, 2017). The results indicate that students demonstrated relatively high levels of environmental awareness after participating in the learning activities using the module. This finding suggests that meaningful learning activities integrated with environmental themes can effectively promote environmental awareness among elementary school students.

Environmental awareness and environmental care attitudes are theoretically interconnected. Studies have shown that students who possess higher levels of environmental awareness are more likely to demonstrate environmentally responsible behaviors (Özden, 2008; Panth et al., 2015). The findings of this study support this relationship, as students who showed high levels of environmental awareness also demonstrated positive environmental care attitudes. It is defined as a set of knowledge, behaviors, and attitudes related to preserving the environment based on science and prevailing values in society (Feijoo & Moreira, 2020; Neolaka, 2008).

Overall, the results of this study highlight the potential of integrating meaningful learning principles with local cultural values in the development of instructional materials. The integration of the Wasaka character into a meaningful learning-based module provides a culturally responsive approach to environmental education. This study therefore contributes to the development of culturally based learning materials by demonstrating how local wisdom can be systematically integrated into instructional modules to support environmental character education among elementary school students.

## Conclusion

This study developed a meaningful learning-based module integrating the Wasaka character (Waja Sampai Kaputing) to support environmental character education among elementary school students. The results show that the developed module meets valid criteria in terms of material, media, and language aspects based on expert evaluations. Its implementation also indicates positive outcomes in students' learning results as well as their environmental awareness and environmental care attitudes. These findings demonstrate that integrating meaningful learning principles with local cultural values can provide contextual learning experiences that support both cognitive understanding and character development. The integration of the Wasaka character within instructional materials also highlights the potential of

local wisdom in strengthening environmental character education in elementary schools. Practically, this study suggests that teachers can utilize culturally based modules as an alternative strategy to integrate environmental education and character education in classroom practice. Future research is recommended to explore the effectiveness of similar culturally based learning materials in different educational contexts and to examine their long-term impact on students' environmental behavior.

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## Author Contributions

F. M. A., M. A., T. P., and HP. were responsible for the conceptualization of the research. The methodology was designed by F. M. A. Validation of the study was carried out by F. M. A., M. A., T. P., and R. performed the formal analysis and contributed to the investigation alongside E. C. S. P., and H. P. The resources for the research were provided by T. P. and E. C. S. P., and H. P. also handled the data curation. The original draft preparation of the manuscript was completed by F. M. A. and T. P., while the writing—review and editing were managed by M. A. and F. M. A. Finally, the visualization of the study was created by E. C. S. P and R. All authors have read and agreed to the published version of the manuscript.

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## Conflicts of Interest

The authors declare no conflict of interest.

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