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Development of local-based biology teaching modules: Conservation of Tapanuli orangutans (*Pongo tapanuliensis*) in the Batang Toru area as support for biodiversity material

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Abstract

In the 21st century, valid, practical and effective learning media innovations are needed to improve understanding of biodiversity and conservation. The Tapanuli Orangutan Conservation field survey supports the understanding of protecting this species in its natural habitat. This study aimed to develop a biology module based on the conservation of the Tapanuli Orangutan (*Pongo tapanuliensis*) in the Batang Toru area as a support for valid, practical, and effective Biodiversity material. The module was developed with the 4D development model by Thiagarajan (Define, Design, Develop & Disseminate) The instruments used in the study were in the form of a questionnaire sheet analyzing the needs of biology teachers and students, material expert validation sheet, media expert validation sheet, biology teacher response questionnaire and students to measure the ability to use presest and posttest. The validation results show that the module is included in the valid criteria with validity in media experts 78.75% and material experts 92.30% so it is feasible to use in biology learning. The results of the response questionnaire showed that the module was included in the very practical criteria with practicality in the biology teacher's response of 100% and the students' response of 96%. The module is included in the effective criteria with an N-gain achievement of 0.81. Based on these results it can be concluded that the module that has been developed is declared feasible to use in learning biology. So that the resulting module can be an innovative teaching material for teachers and can be used in the learning process and future research.

Abstrak: *Di abad ke-21, diperlukan inovasi media pembelajaran yang valid, praktis, dan efektif untuk meningkatkan pemahaman biodiversitas dan konservasi. Survei lapangan Konservasi Orangutan Tapanuli mendukung pemahaman perlindungan spesies ini di habitat aslinya. Penelitian ini ditujukan untuk mengembangkan modul biologi berbasis konservasi Orangutan Tapanuli (Pongo tapanuliensis) yang ada di daerah Batang Toru sebagai penunjang materi Biodiversitas yang valid, praktis, dan efektif. Modul dikembangkan dengan model pengembangan 4D oleh Thiagarajan (Define, Design, Develov & Disseminate) Instrumen yang digunakan pada penelitian adalah berupa lembar angket analisis kebutuhan guru biologi dan peserta didik, Iembar validasi ahli materi, lembar validasi ahli media, angket respon guru biologi dan peserta didik untuk mengukur kemampuan menggunakan presest dan posttest. Hasil validasi menunjukkan bahwa modul termasuk dalam kriteria valid dengen kevalidan pada ahli media 78,75% dan ahli materi sebesar 92,30% sehingga layak digunakan dalam pembelajaran biologi. Hasil angket respon menunjukkan bahwa modul termasuk dalam kriteria sangat praktis dengan kepraktisan pada respon guru biologi sebesar 100% dan respon peserta didik sebesar 96%. Modul termasuk dalam kriteria efektif dengan capaian N-gain sebesar 0,81. Berdasarkan hasil tersebut dapat disimpulkan bahwa modul yang telah dikembangkan dinyatakan layak digunakan dalam pembelajaran biologi. Sehingga modul yang dihasilkan dapat menjadi bahan ajar yang inovatif bagi guru serta dapat digunakan dalam proses pembelajaran dan penelitian kedepannya.*

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A. Introduction

In the learning process, teachers must use some of their skills, such as explaining skills, questioning skills, reinforcement skills, material mastery skills, skills in using learning media, and skills in opening and closing lessons (Achdiani & Rusliyani, 2017). Teachers have a role in the educational process that cannot be ignored. Teachers are expected to be able and competent to present information to students (Ratnasari & Nugraheni, 2024; Ramanda et al., 2024). Therefore, both the skills possessed and the role experienced by the teacher will have significant implications for the learning process felt by students (Widyastuti, 2020). The learning process in class can run well if supported by learning media (Nurfadhillah et al., 2021). Learning media is everything that is able to provide messages through various methods that can stimulate the feelings, thoughts, and desires of students and can improve the learning process so that learning objectives can be easily achieved (Susilo et al., 2016).

One of the problems that can be solved is the students' low awareness of the importance of Tapanuli orangutan conservation and biodiversity protection in Batang Toru. One of the learning media that can support the teaching and learning process is modules. Modules are a form of printed teaching material that aims to assist teachers and students in the process of learning activities. Through modules, teachers are able to convey material to students according to indicators or learning objectives in a measurable and proportional manner (Saifudin, 2020). With this module, it helps teachers to educate students to learn independently and helps make it easier for students to understand the material well (Lastri, 2023). According to Li et al. (2023), the module is one of the learning media that functions to assist students in learning. Modules become a means of learning in written or printed form that is systematically arranged, contains learning materials, methods, learning objectives based on basic competencies or indicators of achievement of competencies, instructions for self-study activities (Self Introduction) and provides opportunities for students to test themselves through practice questions presented in the module.

The teaching module in this study was developed through the results of the Tapanuli Orangutan conservation. Tapanuli Orangutan conservation is a field survey activity to find out about the protection of orangutans in their natural habitat through wild research, capacity building, education and public awareness programs, and by supporting various field efforts to save the only great ape in Southeast Asia. Through conservation, the biology module developed in this study contains the results of data collection and data collection from conservation areas in the research location. Conservation aims to collect data from an area about the Tapanuli orangutan (Rachman, 2012). Through conservation, the biology module developed in this study contains the results of data collection and data collection from conservation areas in the research location. Conservation aims to collect data from an area about the Tapanuli orangutan. In this context, conservation allows the collection of accurate data on the population, behavior and threats to the Tapanuli orangutan in the Batang Toru area. In addition, data collected directly in conservation areas are more valid because they reflect real conditions in the field, so the results are more accurate. One of the materials that must be explained in the biology module as a result Orangutan conservation is the biodiversity material.

Biodiversity is an essential element in the living system, and to maintain the stability of the ecosystem, it is important to conserve it. With today's technological advancements, society can maintain the balance of resources through conservation efforts. Biodiversity, which includes plants and animals around the world, shows different variations in different regions. Biodiversity in Indonesia is valuable and needs to be protected. Therefore, to maintain this biodiversity can be done by conservation measures (Fauziah, 2019).

Conservation is the effort to protect and sustain natural resources, including plants, animals, and ecosystems, so that they can be sustained and enjoyed by future generations. It includes a variety of actions, such as habitat protection, resource management, research, and public education, with the aim of preventing environmental damage and maintaining ecosystem balance. In addition, conservation also involves efforts to restore ecosystems that have been degraded. In Indonesia, in the face of threats to biodiversity, conservation can be done by encouraging the process of ecological succession to create a naturally heterogeneous environment for all animal species. These measures are in line with the development policy stipulated in Law No. 32/2009 on environmental protection and management (Febrian et al., 2024).

Based on the results of interviews with biology teachers in one of the Tapanuli regions, the learning of biodiversity material explained at the school is limited to general concepts and examples in biology textbooks only. Conducting exsitu and insitu conservation along with learning resources is still lacking. And there is no module on biodiversity that reveals examples around students. Biodiversity is the diversity of life on earth that refers to the variation of life that includes the form, number and other characteristics found at the genetic, species and community levels. Biodiversity functions as part of an important role in providing needs in the form of goods and services, regulating ecosystem processes and functions, so that survival can be maintained (Rohman et al., 2021).

There have been many studies related to the development of teaching modules on biodiversity material. One of them in research Yuliastrin et al.

(2024), developed a module combined with Quick Response Code on biodiversity material with the results of the feasibility of the QR-based module of 88.60 (very valid), the student response rate of 90.46% (very good), and overall prospective reliability of 0.7475 (reliable). Other results from Angela & Aprianto (2018) with module development based on CTL (Contextual Teaching learning). However, of the two studies no one has developed a biology module on Biodiversity based on the conservation of the Tapanuli Orangutan directly in Batang Toru. Therefore, the originality of this research lies in the substance of the research place, object and subject to be studied. The unique thing about the Tapanuli orangutan that led to the development of the conservation-based biology module of the Tapanuli Orangutan in the Batang Toru Area as a Support Material for Biodiversity is that the Tapanuli Orangutan is a species that is only found in the Batang Toru area, Sumatra, so it is very vulnerable to the threat of extinction. This condition makes them highly dependent on the protection of their remaining habitat. In addition, the Tapanuli orangutan is one of the icons of the ecosystem. By protecting the Tapanuli orangutan, we are also protecting other species and the entire interdependent ecosystem.

Based on empirical evidence and the description of the problems that have been described, it is necessary to develop a biology module based on the conservation of the Tapanuli orangutan in the Batang Toru area as a support for biodiversity material. This research is expected to produce learning media that are feasible, practical, and effective.

B. Material and method

This research method is development research. The product developed in this study is learning media in the form of modules with the 4D development model by Thiagarajan. The 4D model by Thiagarajan which consists of four stages, namely the definition (Define), design (Design), development (Develop), and dissemination (Disseminate) stages (see Figure 1).

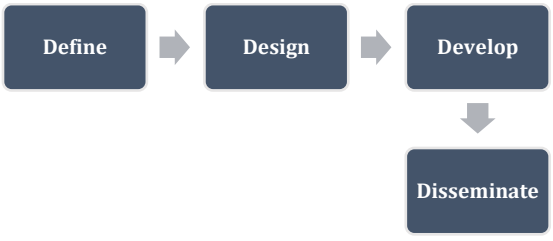

Figure 1 4D model design

The instruments used in this study include interview guidelines for teachers and questionnaires for students, which serve to collect data related to problems and needs of teaching materials. In addition, the validity of the module was measured through a validation sheet that included validation from teaching material experts and material experts, used to obtain data on the review of learning media by validators. The practicality sheet was also used to determine teacher and student responses to the developed module. The measurement scale for each indicator on the teacher and student response validation sheet was assessed using a Likert scale with a score range of 1-4.

The data collected in this study consisted of qualitative and quantitative data. Qualitative data includes the results of interviews with teachers as well as input and suggestions from validators. While quantitative data includes validator assessment scores, assessments from teachers and students, critical thinking skills scores, and student collaboration skills scores. The data were then analysed and processed using descriptive qualitative and quantitative methods. The validity of the TGT-based interactive digital module was obtained from the expert validator's assessment score, while its practicality was assessed based on scores from teachers and students. Quantitative analysis was conducted using the Formula 1.

$$P = \frac{f}{n} x100\% \text{.....Formula 1}$$

Description:
P = Final presentation
f = Total average score of assessment aspects
n = Total maximum score of assessment aspects

The results of data analysis related to the validity and practicality of the module are interpreted based on the criteria contained in Table 1.

Table 1 Criteria for validation assessment results

Percentage (%)	Criteria	
	Validity	Practicality
81-100	Very valid	Very practical
61-80	Valid	Practical
41-60	Less valid	Less practical
0-20	Not valid	Not practical

Furthermore, data related to the effectiveness of video scribe learning media is obtained from pretest and posttest scores, which are analysed using N-Gain. This calculation aims to measure the extent to which improvement occurs before and after the use of videoscribe learning media. The effectiveness of this media is calculated using the Formula 2. Then the interpretation of the results of the N-gain calculation refers to Table 2.

$$\text{N Gain} = \frac{\text{skor postest} - \text{skor pretest}}{\text{skor maksimal} - \text{skor pretest}} \text{ x } 100\% \text{.....Formula 2}$$

Table 2 Criteria N-Gain

Score	Criteria
N-Gain $\geq$ 0.7	High
0.3$\leq$ N-Gain <0.7	Medium
N-Gain <0.3	Low

(Source: Hake, 1999)

C. Results and discussion

The product developed is a module based on the conservation of the Tapanuli orangutan which aims to support Biodiversity material. The module was developed in four stages that refer to the 4D model. The following are the results of the stages of developing a module based on the conservation of the Tapanuli orangutan in this study.

Define

In the definition stage, there are five main steps, namely, front-end analysis, student analysis, concept analysis, task analysis, and learning objectives analysis. This stage is useful for identifying and defining the needs in the learning process.

In the initial analysis stage (Front end Analysis), observations were made of biology learning at SMA Negeri 1 Batang Toru. This observation focused on the biology teacher using a needs questionnaire. The observation results showed that the teacher taught using lecture, discussion, and practicum methods, with a conventional learning model. The teaching materials used include learning videos, the environment, and textbooks with the aim of helping students understand the material. However, teachers have never compiled or developed their own learning media. Although the teaching materials at school are adequate, teachers suggest additional teaching materials. Biology teachers also recommended the use of a module based on the conservation of the Tapanuli orangutan because this module has never been used in learning before.

In the second analysis stage (Learner Analysis), the analysis of students is based on the results of their needs questionnaire. From the observation through the questionnaire, students stated that learning biology feels ordinary and boring because it uses the lecture method and media in the form of printed books. Grade X students have used modules, but have never used a module based on the conservation of the Tapanuli orangutan. Students felt they understood the material better when using learning media, and they felt happy when the teacher asked questions during the learning process.

In the third analysis stage (Concept Analysis), the development concept is taken from the Basic Competencies (BC) and Core Competencies (CC), which are then formulated into Competency Achievement Indicators. After that, the sub-sub material to be developed is formed. The material developed is about Biodiversity on BC 3.2, which is explained along with the Competency Achievement Indicators as Table 3.

In the fourth analysis stage (Task Analysis), this is carried out to find out activities that are mandatory and relevant for students. This analysis is made by formulating Competency Achievement Indicators based on BC 4.2. The task given was in the form of one learning activity using a module based on the conservation of the Tapanuli orangutan. Details of the learning activities are listed in the appendix of the lesson plan, while the description of the Competency Achievement Indicators can be seen in Table 4.

Activities carried out by students, as described in the competency achievement indicator table, include finding literature about threats and conservation efforts at various levels of biodiversity, discussing threats to the Tapanuli orangutan, and presenting the results of proposals for preserving local potential at various levels of biodiversity. This is in accordance with BC 4.2, which is presenting the results of observations about various levels of biodiversity in Indonesia and proposed conservation efforts.

In the fifth analysis (Specification of Learning Objectives), learning objectives are derived from Competency Achievement Indicators derived from BC 3.2 and BC 4.2. Based on the results of the initial analysis, learner analysis, concept analysis, and task analysis, it was concluded that the use of a Tapanuli orangutan conservation-based module was necessary. The learning objectives are can be seen in Table 5.

Table 3 Indicators of competency achievement

Basic competencies (BC)	Competency achievement indicators
3.2 Analyze the various levels of biodiversity in Indonesia and its threats and preservation and threats to its preservation and conservation	3.2.1 Identify the different levels of Biodiversity 3.2.2 Explain the differences in the various levels of biodiversity 3.2.3 Analyze the various levels of biodiversity in the Tapanuli Orangutan 3.2.4 Present observations of the conservation results of the Tapanuli Orangutan at the level of biodiversity

Table 4 Indicators of competency achievement

Basic competencies	Competency achievement indicators
4.2 Present the results of observations of various levels of biodiversity in Indonesia and proposals for conservation efforts	4.2.1 Find literature related to efforts to threaten and conserve various biodiversities 4.2.2 Discuss the level of threats related to the Tapanuli orangutan at various levels of biodiversity 4.2.3 Present the results of proposals for preserving the local potential of the region at various levels

Table 5 Learning objectives

Competency achievement indicators	Learning objectives
3.2.1 Identify various levels of biodiversity 3.2.2 Explain the differences in various levels of Biodiversity 3.2.3 Analyze the various levels of biodiversity in the Tapanuli Orangutan 3.2.4 Presenting the results of observations of the Tapanuli Orangutan conservation at the biodiversity level	1. Learners can identify various levels of Biodiversity correctly through reading sources and discussing with the teacher. 2. Learners can explain the differences in the various levels of Biodiversity correctly through reading sources. 3. Learners can analyze the different levels of biodiversity in the Tapanuli Orangutan correctly through reading sources. 4. Learners can present the results of observations of conservation of the Tapanuli Orangutan at the Biodiversity level correctly through reading sources and discussing with the teacher.

Table 6 Results of expert validation of teaching materials

No.	Section name	Score obtained	Maximum score	Percentage	Criteria
1.	Material suitability	4	4	100%	Very valid
2.	Material accuracy	4	4	100%	Very valid
3.	Currency of the material	3	4	75%	Valid
4.	Encourages curiosity	4	4	100%	Very valid
5.	Serving technique	3	4	75%	Valid
6.	Presentation support	4	4	100%	Very valid
7.	Presentation of Learning	4	4	100%	Very valid
8.	Coherence and logical flow	3	4	75%	Valid
9.	Straightforward	4	4	100%	Very valid
10.	Communicative	4	4	100%	Very valid
11.	Dialogical and interactive	4	4	100%	Very valid
12.	Appropriateness to student development	4	4	100%	Very valid
13.	Conformity with language rules	3	4	100%	Valid
	Average			**92.30%**	**Very valid**

Design

Researchers designed modules using Microsoft Office with A4 size (21cm x 29.7cm). The following is an explanation of the developed module:

a. Module cover: The front cover of the module is designed with the name of the learning media, the title of the material, the logo of the agency, images related to the material, the author's name, the origin of the author's agency.
b. Module instructions for use: The instructions for using the module aim to facilitate readers in using the teaching module.
c. Foreword: The author's foreword sheet includes the author's gratitude for compiling the module.
d. Table of contents: This stage intends to make it easier for readers to find material and summarize the sub-material described in the module.
e. Page BC and indicators of competency achievement: Providing the distribution of CC, BC and Indicators has the aim of helping students understand the competencies to be learned and to be achieved.
f. Concept map: The concept map in the module is made to make it easier for students to understand the material to be studied.
g. Description of materials and learning activities: The material used in the module is based on the conservation of the Tapanuli orangutan. The material presented is adjusted to the concept of material that has been determined with BC and Grade Point Average (GPA) to be achieved. The material is equipped with images that are adjusted to the concepts and images included to make it easier for students to expand their knowledge. While learning activities are designed for students to answer questions contained in the module. This activity is after students reading the module.

In addition, researchers also designed reflection activities, competency tests, glossaries and bibliographies. As to fulfill the components that must exist in the module.

Develop

This is the module development stage used to validate the module. This validation test was carried out to find out how valid the interactive digital module made by the researcher was. The results of media and material validation can be seen in Table 6. Based on the table above regarding the results of material expert validation, obtained a validity of 92.30% with very valid material criteria. With the results percentage, the module is said to be feasible in terms of the material developed in accordance with the criteria included in the validation. This is in accordance with research conducted by Thahira & Jayanti (2024) who developed an interactive digital module by obtaining a presentation of 96.73% with valid criteria. Therefore, it is known that if the percentage obtained is above 81%, it is said to be very valid. The same research with Shiyamsyah et al. (2024) explains if score value 1-1.75 not valid, 1.76-2.50 quite valid, 2.51-3.25 valid and 3.26-4.00 very valid. Furthermore, research from

Andearsa et al. (2024) who developed smart cards by getting a material validation score of 91 with a very valid category. Thus, based on the score listed in Table 6, it is concluded that the results of the validation of teaching materials are in accordance with the criteria. This shows that the developed module already includes orangutan conservation-based biodiversity material that can be used as a learning resource. However, the material expert validator provided some input related to the material such as improving concept writing, adding questions that can motivate students, writing adapted to the *Kamus Besar Bahasa Indonesia* (KBBI) or Big Indonesian Dictionary and expanding the content of the material.

Next is the media expert validation where the aspect assessed is the feasibility of graphics. The validation results can be seen in Table 7. The results of media validation were declared very valid with a percentage of 91.66%. This validity is obtained because the score obtained is above the percentage of 88% with very valid criteria. This is like the research conducted by Yana & Khairuna (2024) who developed an animated video with criteria if the validation results obtained show criteria above 81% then the media is said to be valid. However, media expert validators provide some input, namely that it can be used in local schools and continues to be updated following developments. Similar research conducted by Suryanda et al. (2016) which examines the development of multimedia mobile learning modules using Android Studio 4.1 biodiversity material for class x high school students in his research shows that the validation of media experts shows a percentage of 63% with a good category, can be tested and is feasible to use. From these studies, it can be concluded that with this percentage, modules with a validation percentage above 61% can be used.

This is supported Rachmawati et al. (2024) explaining that the percentage of 0-20% is not very impractical, 21-40% is not practical, 41-60% is less valid, 61-80% is practical, 81-99% is very practical, and 100% is very valid. From this percentage it can be seen that from a percentage of 0-60% the module is not yet feasible to use. If the percentage in 61-100%, the module can be used. It is intended that further research can develop similar products that are even better.

After the teaching materials are said to be valid, a small-scale trial is carried out by distributing questionnaires containing teacher and student responses. The results of the teacher response questionnaire can be seen in Table 8.

Based on the results obtained in Table 8, the average percentage obtained is 100%. The percentage shows that the module from the point of view of the biology teacher of SMA Negeri 1 Batang Toru is very practical and suitable for use in learning activities. This is in line with Silaban & Manalu (2024) that the three aspects of teachers' responses obtained the same results as Table 8, namely 100% with very practical criteria. This is in line with research conducted by Sari & Adlini (2024) who developed a biology magazine with reproductive system material which obtained teacher response results with a percentage of 92.5% with a very practical category. It is said to be very valid if the validation results score above 90%. This is also in line with research conducted by Nanda & Ulfa (2024) who developed videoscribe which received a percentage of 97.92% with a very practical category. Thus, it can be seen if the score obtained above 81% can be said to be very valid.

Table 7 Media expert validation results

No.	Section name	Score obtained	Maximum score	Percentage	Criteria
1.	Module size	3	4	75%	Valid
2.	Accuracy of material	4	4	100%	Very valid
3.	Up-to-date material	4	4	100%	Very valid
Average				**91.66%**	**Very valid**

Table 8 Results of teacher response questionnaire

No.	Section name	Score obtained	Maximum score	Percentage	Criteria
1.	Interest	4	4	100%	Very practical
2.	Material	4	4	100%	Very practical
3.	Language	4	4	100%	Very practical
Average				**100%**	**Very practical**

Table 9 Results of student response questionnaires

Number of respondents	Score obtained	Maximum score	Percentage	Criteria
26 Students	1.405	1.456	96%	Very practical

Table 10 Pretest and posttest N-Gain results

Pretest	Posttest	N-Gain	Percentage	Criteria
49.1%	90.96	0.81	81%	High (Effective)

Based on the results of Table 9, the percentage of the module is 96% with very practical criteria. This shows that students are interested in learning with modules developed by researchers. It can be seen that the aspect of interest amounted to 96.3%. For the material, the percentage is 96.8% and the language gets a percentage of 96.1% with a very practical category. The students gave a positive response to the use of the module based on the conservation of the Tapanuli orangutan and is suitable for use in learning activities. This is in line with the research of Silaban & Manalu (2024) on the results of student response as many as 18 students. The results obtained are 95% with very practical criteria. The same results as the research. Further research conducted by Damayanti & Jayanti (2024)who developed biology smart cards with 87% student response results in a very valid category. This is in accordance with the criteria which explain that if the percentage obtained is above 81% then it is said to be very valid. Furthermore, research conducted by Tika et al. (2024) who developed Augmented Reality Assisted Assemblr Edu with a percentage of 90% with a very good category. Therefore, based on existing research, if the student response is above 81%, it is categorized as very valid.

Disseminate

After making revisions to the aspects of teaching materials and materials, and testing on a small scale, then the product can be disseminated. The distribution of this product was carried out at the Islamic Center Foundation in class X IPA 1 Batang Toru with a total of 26 students. This trial was conducted to be able to assess its effectiveness. The results of its effectiveness can be seen in Table 10.

Based on Table 10, the results of the pretest and posttest assessment by students become the benchmark for the N Gain value. The acquisition of the N-Gain value is 0.81 where the N-Gain category has a high category and a percentage of 81% is obtained through the acquisition of values, so that it can be stated that the use of modules is effective as a support for Biodiversity material. The stages of testing the effectiveness of this module are obtained based on the results of pretest and posttest assessments. The implementation of the pretest before the application of the module, while the posttest is carried out after the application of the module.

It can be seen from the results that have been presented that the final product produced in research and development is a module based on the conservation of the Tapanuli orangutan which is valid, practical and effective. The development of a module based on the conservation of the Tapanuli orangutan aims to increase learning media, due to the lack of availability at SMA Negeri 1 Batang Toru.

This research is in line with the research of Firdani et al. (2024) who developed E-Module material on the human reproductive system with accurate results with the results of this study, namely obtaining the calculation of N-gain of science literacy in the medium category, and learning outcomes in the high category with very significant t-test results. The same thing in the research of Yuliastrin et al. (2024) which also examined the module with the results of the QR-based module feasibility level of 88.60 (Very Valid), the student response rate of 90.46% (Very Good), and the overall prospective reliability of 0.75 (Reliable). Therefore, QR-based modular products from biodiversity materials are suitable for use in improving teaching standards.

Based on the comparison of several previous studies that tested module products on students and were declared valid. Therefore, teaching materials in the form of modules were developed and obtained very strong eligibility criteria, it can be concluded that the module affects the learning process and helps students in understanding the material, especially in biodiversity material.

The developed module has the advantage of being able to bridge the abstract concept of biodiversity with a concrete example from a local ecosystem, the Batang Toru forest. Through this module, students can see first-hand how various species, including the Tapanuli orangutan, interact in the ecosystem and understand the importance of diversity in maintaining the balance of nature. The Tapanuli orangutan, a very rare primate species found only in Batang Toru, is the main focus of this module. Students are invited to learn about the species in depth, from its ecological role to the threats it faces, so that they can understand the importance of protecting endemic species that are threatened with extinction. This study is not only about education, but it is also a context for international efforts to conserve endangered animals in their respective regions and to contribute to the global coverage of endangered animals in Indonesia. When it comes to rare orangutans, several countries are also conserving rare orangutans in their own countries. This is shown in the study by Santika et al. (2022) which looks at orangutan species in several countries. The Tapanuli orangutan, a very rare primate species found only in Batang Toru, is the focus of this module. Students are invited to learn about the species in depth, from its ecological role to the threats it faces, so that they can understand the importance of protecting endemic species that are threatened with extinction.

With a focus on conservation in the Batang Toru area, this module also invites students to explore various elements of the ecosystem, such as flora, fauna, and interspecies interactions. This allows students to better understand the diversity of species and interdependent relationships within ecosystems, as well as how damage to one part can affect the balance of the ecosystem as a whole. The material presented in this module is directly related to the conditions of the students' surrounding environment, so that learning

becomes more contextualized. Students can easily connect the knowledge they gain with real conditions in the field, strengthening their understanding of the importance of biodiversity conservation.

This module also teaches the concept of ecosystem balance and sustainability. This can be seen in the biodiversity and ecosystem material section contained in the module which discusses the definition of biodiversity, including the number of species and the relationship between species that support each other. This material will invite students to understand the important role of each species in maintaining the balance of the ecosystem as a whole. Students learn that biodiversity includes not only the number of species, but also the complex interactions between species that support life on earth. This module also emphasizes the importance of protecting endangered species such as the Tapanuli orangutan, maintaining the balance of the Batang Toru forest ecosystem, and build awareness that conservation is an important part of nature's sustainability.

By using local species such as the Tapanuli orangutan, the module provides real-life examples that are closer to students' daily lives. This helps them understand the real impacts of human actions, such as deforestation and climate change, on endangered species. Not only that, the module also helps foster a sense of empathy and responsibility in students towards the preservation of endangered species. They not only understand conservation theoretically, but are also motivated to get involved in local conservation actions. This increased awareness not only affects the students, but can also extend to the communities around them, so that more and more parties care about the conservation of the Tapanuli orangutan and the ecosystem Batang Toru.

D. Conclusion

The Tapanuli orangutan conservation-based learning module developed is feasible, practical, and effective based on several indicators that have been obtained, where this module is declared feasible to use because it received very high validation results from material experts (92.30%) and media experts (91.66%). The high percentage indicates that this module has met the standards and criteria set by the media and material experts. Meanwhile, based on practicality, this module is considered practical by teachers with a percentage of 100%. This means that this module is very easy to use in the context of classroom teaching. For effectiveness, this module also proved effective in improving student learning outcomes, with an N-Gain value of 0.81 which is included in the high category. This shows that the use of the module succeeded in improving students' understanding of the material contained in this module. The use of this Module helps students understand the importance of biodiversity and interspecies interactions in maintaining the balance of nature. This module also raises awareness of the importance of conservation, both for endangered species and ecosystem sustainability, so that students are more concerned and involved in local conservation actions.

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