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The Development of Module of Plant Species Resources in Kreo Cave Area of Semarang as a Source of Biodiversity Learning Materials in High Schools

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Article Info	Abstract
	The purpose of this study is to analyze the plants species resources and the validity of Module according to the material experts, media experts, and teacher experts, to analyze the practicality, as well as the effectiveness of learning outcomes. This research used the R&D method. This research was conducted using the ADDIE method which was conducted at Islamic High School of Baitussalam involving 2 classes with 62 students in total. Descriptive data analysis was used. The results of the research on biodiversity in the Kreo Cave area which included the levels of genes, species, and ecosystems, found the results of each of the three levels of biodiversity totaling 24 types of plants which are the gene level 2 species, at the species level 7 species and at the ecosystem level at 15 species. The Module of plant species resources in the Kreo Cave area is theoretically feasible by means of validation sheets for material experts, media experts, and teacher experts with respective scores of 76%, 80%, and 81%, or are in the valid category. Student responses to the Module as a learning resource indicate that the Module is very valid. This is proven from the results of small-scale trials that reach an average value of 72% or are in good criteria. Student learning outcomes assessed during the learning process using Modules showed very good results. This is proven by the increase in students' cognitive from an average of 44.18 to 79.6.

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INTRODUCTION

In Biology learning, high school students are expected to be able to achieve basic competence 3.1 in which students describe the concept of gene, species, and ecosystem diversity through observation activities; and basic competence 3.2 in which students communicate Indonesia's biodiversity as well as the efforts to conserve and utilize natural resources. To achieve these basic competencies, it is necessary to utilize the diversity of plants which exist in nature/surroundings with a roaming approach. This approach leads students to be able to learn from experiencing and discovering by utilizing the surrounding natural environment, both the physical, social, technological and cultural environment as objects of biology learning whose phenomena are studied through scientific work (Sari et al., 2013).

The results of observations in 2018 showed that learning biology, especially in biodiversity material at Madrasah Aliyah (MA) / Islamic High School of Baitussalam, Mijen District, Semarang City, was dominated by the traditional approach, which was the teacher-centered approach focusing on the lecture method and did not use existing learning resources in the surrounding area. In the subject of biodiversity, contextual learning is needed by utilizing the natural environment as learning resources, so that students can construct their own knowledge and they can be able to provide more understanding. Thus, the learning experience of students becomes an important part of learning.

One of the local potentials that can be utilized in learning at Islamic High School of Baitussalam was Kreo Cave located nearby (13 km) from the location of the Islamic High School of Baitussalam. Kreo Cave Tourism Forest enabled teachers to show various plant and animal phenomena according to environmental conditions. Plant species found in the tourist area of Kreo Cave could be used as a source of learning about biodiversity, especially plants (Sofiah et al., 2013).

To conduct directed learning in the tourist forest area of Kreo Cave, a Module which is a designed teaching materials is needed so that students learn independently and interactively. The Module is packed with strategies which make students more active in learning by applying the scientific method. The content of the Module includes a description of the competencies to be achieved, material written in good and interesting language, equipped with illustrations or examples, written in a coherent way so that it is easy to understand, and equipped with worksheets and answer keys (Prasetya, 2012).

A Module will be meaningful if students can easily use it. Learning with Modules allows students with high speed in learning to achieve basic competencies. Thus, the Module must describe the basic competencies that will be achieved by students, presented using good and interesting language, and equipped with illustrations (Wenno, 2010).

According to the 2013 Curriculum, the material on biodiversity contains the concept of gene, species, and ecosystem diversity; Indonesia's biodiversity, and efforts to conserve and utilize natural resources. Examples of biodiversity material should be known or recognized by students. This is an important factor in teaching critical thinking skills to students because skills in critical thinking are best achieved when related to topics that are known to students.

The description is in accordance with research conducted by Haris & Osman (2015). The results showed that teaching and learning strategies using the Virtual Field Trip (VFT) Module have a positive effect on student achievement in all forms of questions, both objective questions (lower level), structured and essay (high level) compared to the conventional method which only showed good results. The research results by Ali et al. (2010) showed learning using Modules is a more effective process in Biology teaching and learning compared to traditional teaching methods.

One type of biodiversity from the flora group in the Kreo Cave area is plants. The abundance and distribution of plants in the Kreo Cave area is very high, especially in artificial forest.

On the other hand, in Kreo Cave area, there is a population of long-tailed monkeys (Macaca fascicularis) that have a very high adaptability to the environment so they can live in various places. The adaptability of long-tailed monkeys, especially in their natural habitat, forests, is supported by the ability of long-tailed monkeys to actively move using their front and back legs to walk and run (Liviviyani, 2018).

METHODS

This study used research and development methods. The product developed is a biology learning Module on biodiversity at the gene, species and ecosystem level. The research was conducted by developing learning media of plant species resources in the Kreo Cave area, then analyzing the teaching materials used and testing the practicality and effectiveness of the device which was made. The subjects in this study were students of class XI MIPA 1, at Islamic High School of Baitussalam and Nuris Mijen High school with a total of 62 students. The Module is to improve student learning outcomes.

Research instrument is a tool used to collect data in a research or work to make it easier to get better findings which are more accurate, complete, and systematic so that it is easier to analyze and process the data. In this study the instruments used were interview, observation sheets, validation sheets, questionnaire sheets, and tests, including a written test.

The data collected in this study was done by initially determining the data source, then the type of data, data collection techniques, and instruments which were used. The types and techniques of data collection in full are outlined in Table 1 as follows.

Table 1. Types and Techniques of Data Collection

Data	Data Types	Data Collection Techniques	Data Collection Instrument
Plants Species Resources	Qualitative	Observation	Interview Sheets
Module Validity	Validation score	Validity Questionnaire	Validation sheet
Module Practicality	Questionnaire Score	Responses questionnaire	Questionnaire sheet
Module Effectiveness	Learning outcomes	Written test	Multiple Choice Questions

RESULTS AND DISCUSSION

Plants Resources in Kreo Cave Area

Based on the results of the research on biodiversity in the Kreo Cave area which includes the level of genes, species, and ecosystems, it was found that each of the three levels of biodiversity amounted to 24 plant species which are the gene level 2 species, at the species level 7 species and at the ecosystem level at 15 species.

The diversity of gene levels found is the variation of Nephelium sp, namely Nephelium sp (*Rambutan si Nyonya*) and Nephelium sp (*Rambutan narmada*). Nephelium sp, a tropical fruit plant, belongs to the Sapindaceae family.

The level of species diversity in the Kreo Cave area found in this study is the level of plant species diversity. Plant species data were taken directly in the Kreo Cave area. In the composition of plant species at the research location in the Kreo Cave area, there are 7 plant species from 2 families. The two families were 1. Euphorbiaceae family, Euphorbia is one of the largest angiosperm genera, with about 2000 species known for their very diverse growth forms (Horn et al., 2012). Several types of plants found in Kreo Cave are Cassava (Manihot esculenta) and Jatropha (Ricinus communis) 2. Family Zingiberaceae, Family Zingiberaceae plants are native to the tropics, especially South and Southeast Asia, growing to Africa and throughout South and Central America (Victório, 2011).

Zingiberaceous plants are characterized by their tuberous or non-tuberous rhizomes, which possess strong aromatic and medicinal properties (Chen et al., 2008). Species from the Zingiberaceae family, including Zingiberaceae (Ginger), Alpinia galanga L (Glang), Curcuma domestica Val (Turmeric) and Curcuma xanthorrhiza Rox (Temulawak), are well known for their medicinal, condimental, ornamental and chemical uses.

Biodiversity at the ecosystem level is generally recognized from the most prominent characteristics of its community, in where for terrestrial ecosystems, the characteristics of plant or vegetation communities are used because the form of vegetation is a reflection of physiognomy or the external appearance of interactions between plants, animals and their environment (Fahmi et al., 2015).

There are two types of ecosystem level diversity in the Kreo Cave area, namely artificial

forest ecosystems and garden ecosystems. In the artificial forest ecosystem there are many plants found such as Cocos nucifera L (Coconut), Syzygium aqueum (Water guava), Ceiba pentandra (Kapok tree), Anacardium occidentale L. (Cashew nut), Parkia speciosa (Stink Bean), Swietenia mahagoni Jacq (Mahogany), Ficus benjamina Linn (Banyan), and Psidium guajava Linn (Guava). Surveys conducted (Desai & Shanbhag, 2012) revealed that the highlands of Goa consisted higher plant species.

The next ecosystem found is the garden ecosystem. This area is located close to residential areas and is very easy to reach. Garden ecosystems have enormous terrestrial and aquatic biodiversity and, especially in the humid tropics, represent the most species-rich habitat types worldwide (Brockerhoff et al., 2017).

Several types of garden plants can be found in residential areas such as Dimocarpus longan Lour (Longan), Tectona grandis Linn.f (Teak), Areca catechu L (betel nut), Salacca zalacca (Gaert), Voss (Snake Fruit), Musa paradisiaca (Banana), Phalaenopsis amabilis (Moon orchid).
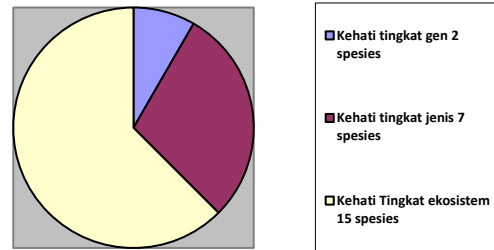
Figure 1. The Composition of Plants Resources in Kreo Cave

The results of research on the resources of plant species in the Kreo Cave area indicate that there is an abundance of plant species with their environment.

The Validity of Module of Plants Species Resources in Kreo Cave Area

Module of the resources of plants species in Kreo Cave area which was developed has been validated by material experts, media experts, and biology teachers. Materials and media experts assess the feasibility component based on their expertise. The teacher assesses all components of the feasibility of the Module because the teacher will use the Module directly in the classroom.

Table 2. The Results of Syllabus and Lesson Plan Validity towards MODULE

Validation Results	Assessed Aspects	Score	Score Total	Value (%)	Criteria
Syllabus	Format	2			
	Contents	8	15	90	Valid
	Language	2			
	Time	3			
Lesson plan	Subject identity	1			
	Indicators formulation	2			
	Learning goal formulation	2			
	Teaching materials selection	3			
	Learning sources selection	3	23	88	Sangat Valid
	Learning media selection	3			
	Learning materials	2			
	Learning scenario	4			
	Assesment	3			

The assessment of the validity of the syllabus as a learning media that is designed to get a percentage value of 90% or is in the valid criteria, and the results of the validation of the lesson plan get a percentage value of 88%, or are in the very valid criteria by biologists. The validation of the syllabus and lesson plans as learning tools is carried out by Biology teachers

The Module of plants species resources in Kreo Cave area that was developed has been

validated by material experts, media experts, and biology teachers. Materials and media experts assess the feasibility component based on their expertise.

The teacher assesses all components of the feasibility of the Module because the teacher will use the Module directly in the classroom.

Table 3. Validation Results by Material, Media, and Practitioner Experts

Validator	Component	Score	Value (%)	Criteria
Material experts	Contents	82		
	Presentation	62	76	Valid
	Language feature	50		
	Learning sources	56		
Media experts	Presentation	107		
	Language	37	80	Valid
	Graphic	77		
Practitioner experts	Correctness and Concepts Broadness.	18		
	Language	15		
	Students' activities	9	81	Valid
	Apperance	14		
	Learning implementation and evaluation	9		

The results of the validation of material experts as learning media developed got a percentage value of 76% or were in the valid criteria. The results of the media expert validation get a percentage value of 80% or are in the valid criteria. The results of the expert teacher validation get a score percentage of 81% or are in the valid criteria. This means that all validation materials, media, and expert education practitioners are suitable for use in learning. This is in accordance with the statement of Yerimadesi et al., (2018) that the Module has very valid validity in the presentation aspect, meaning that the Module is built based on the standards for developing teaching materials according to the Boards of National Education Standards.

Based on validators' recommendations, there are several parts of the Module from each validator to perfect Module as a learning media. Some changes are made by material experts.

The Worthiness of Module of Plants Species Resources in Kreo Cave area

Students were asked to respond to the components of the material, language, appearance, students' activities, the implementation and evaluation of learning. Suggestions and inputs from teachers and students are used as a revision material, so that the Module can be used in Biology learning activities. The students' responses to the Module as a learning resource for biodiversity material show that the Module is very valid.

This is proven from the results of small-scale trials which suggested that students could improve learning outcomes, on the quality of the Module with a total of 20 students consisting of 10 boys and 10 girls achieving an average score of 72% or are in good criteria. The score shows that students easily understand the material presented, because the sentences use simple, short, clear, and effective language.

Comments and suggestions from the students are used as revision material, so that the Module as a learning media can be used at the large-scale trial stage. Some comments and suggestions from students can be seen in Table 4 as follows.

Table 4. Students' Comments and Suggestions on the Quality of MODULE

| No.	Assessed Aspects	Comments and Suggestions
1	Usefulness	This Module is quite interesting because there are pictures and colors that make me interested in learning and it is very useful. In terms of its usefulness, it is in everyday life and this Module has been made in an online format, making it easy for readers to access in any circumstances wherever and whenever.
2	Appearance	The text and writing in this MODULE are easy to read, but there are still contents that are less dense and less neat. The explanation of dicotyledons and monocots is not explained and I'd like to add angiosperm plants explanation.
3	Effectivity	This MODULE is very effective for me, because it trains me to be more active than before, and the availability of pictures makes it interesting for me to learn, but there are some pictures that are not very clear, so my suggestion is to use a clear / bright color image or description of the image.

Comments and suggestions from the teacher are that the Module is very good to be a student reference material in addition to the students' worksheets books. It's just that the motivation of the teacher is also important so that students become diligent to open the books, read and understand them.

The Effectivity of Plants Species Resources Module in Kreo Cave Area

This study aims to examine the effectiveness of using the Module with biodiversity materials to improve student learning outcomes. After using the Module as learning on a wide scale, all students experienced an increase and experienced mastery learning outcomes with scores above the minimum passing grade criteria determined by the school, which is 67 in score, with a total of 62 students.

The method of data analysis of the effectiveness of the product developed in terms of learning outcomes is the impact that a person gets after doing a learning activity which can be in the form of changes in knowledge, attitudes, and skills. By involving students directly in the learning process through Modules and presentations, it is expected to improve students' thinking skills. Assessment of increasing students' thinking skills to obtain students' cognitive scores is done through pre-test and post-test scores. Assessment of improving student learning outcomes to obtain student cognitive scores is done through pre-test and post-test scores as well.
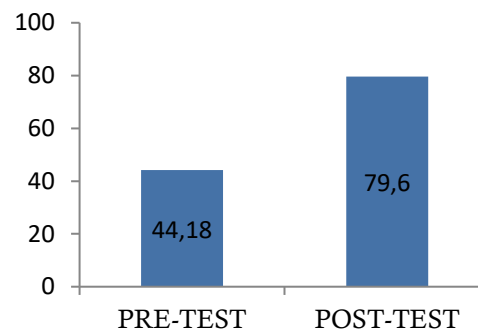
Figure 2. Pre test dan Post test

Based on the scores of student learning outcomes in Figure 4.10 that the acquisition of student learning outcomes scores using the Module for the pretest is 44.18 and the post-test score is 79.6. This shows that there is a difference in the score of students' learning outcomes before and after using the Plant Species Resources Module in the Kreo Cave Area. Alty et al. (2006) stated that the Module can still affect learning outcomes from the perspective of cognitive efficiency. Efficient instructional learning is a learning activity that involves mental activities that exist within the individual who is learning.

The minimum completeness criteria score at Islamic High School of Baitussalam Mijen for the subject of Biology is 67 of the 62 students, 86% of students could pass, while the students who did not

pass are of 14%. Based on these results, it can be concluded that the effectiveness of the Module produced by the researcher is good. The average student learning outcomes are 76.6%, or are in the high category. Students have complied with the observation signs and seem enthusiastic about learning using the Module.

Learning with using this Module can make it easier for students to understand the material presented, because the materials presented in the Module do not only contain questions of which answers are limited, but this Module also contains stages of work that help students to practice students' thinking skills based on the knowledge gained. students have.

CONCLUSION

Based on the results of the research and discussion which have been explained, it can be concluded that: 1. The results of the research on biodiversity in the Kreo Cave area covering the levels of genes, species, and ecosystems found that each of the three levels of biodiversity consisted of 24 plant species. At the gene level 2 species, at the species level 7 species and at the ecosystem level at 15 species. 2. The design of the plant species resources Module in the Kreo Cave Area with materials on biodiversity is declared to be theoretically feasible through a validation sheet of material experts, media experts, and teacher experts with scores of 76%, 80%, and 81%, or are in the valid category. 3. Students' responses to the Module as a learning resource for biodiversity materials indicate that the Module is very valid. This is evident from the results of small-scale trials reaching an average value of 72% or being in good criteria. 4. Students' learning outcomes assessed during the learning process using the Module with material on biodiversity showed very good results. This is proven by the increase in students' cognitive from an average of 44.18 to 79.6.

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