



# The android-based e-module development about dragonfly diversity around Sri Gethuk waterfall as biodiversity teaching material for X<sup>th</sup> Grade of Senior High School

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Received Date: June 18, 2023

Revised Date: July 6, 2023

Accepted Date: July 17, 2023

Cite This Article:

Lestari, P. & Triatmanto. (2023). The android-based e-module development about dragonfly diversity around Sri Gethuk waterfall as biodiversity teaching material for Xth Grade of Senior High School. *Asian Journal Collaboration of Social Environment and Education*, 1(1), 25-30.

<https://doi.org/10.61511/ajcsee.v1i1.2023.161>



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## Abstract

The aim of the study is to determine the feasibility of an android-based e-Module from dragonfly diversity data at Sri Gethuk Waterfall as biodiversity teaching material for Xth grade of Senior High School based on the results of expert assessment and readability test of biology teachers and students. This Research and Development (R&D) with the ADDIE model (Branch, 2009) which is limited up to the ADD stage. The study subjects consisted of two material experts, three media experts, two high school biology teachers, and 25 Natural Science students of Xth grade. The object of the study was a prototype of android-based e-module about Dragonfly Diversity at Sri Gethuk Waterfall. The data collection assessment instruments for the material experts, the media experts, the biology teachers, and the students. The results show that some BSNP standard assessment criterias have not yet identified in the e-Module. The criterias that have not yet identified are then corrected according to expert advice and verified with credible academic sources, so that the criteria of e-module can be suitable with the standards. All of the criterias of e-Module that suitable with the standards are identified, so the e-Module can be used as teaching material in learning activities

**Keywords:** android; e-modul; dragonflies diversity; sri gethuk waterfall

## 1. Introduction

Sri Gethuk Waterfall is an ecotourism area in Bleberan Village, Playen District, Gunungkidul Regency. As a habitat for dragonflies, the presence of dragonflies in this area can be used as a source of learning biology in senior high schools. Based on research conducted by Sulistiyowati (2015) found around 17 species from 6 families of dragonflies (Ordo Odonata) in the Oyo River fragment located in Bleberan Tourism Village. This number is almost a third of the number of dragonfly species in the Yogyakarta area. In addition to their high diversity, dragonflies have several important roles for the environment, including being bio-indicators of water quality, controlling disease vectors, and being predators or natural enemies for plant pests (Moningka et al., 2012). Their high diversity and their role make dragonflies potential if they are used as learning resources for biology on biodiversity material.

The potential diversity of dragonflies in the Sri Gethuk Waterfall area has yet to be widely used as a learning resource or developed into biology teaching materials at the high school level. In the era before technology developed rapidly, most of the alternative teaching materials developed were printed modules. Whereas at this time, due to the rapid development of technology, the younger generation is experiencing a development trend of the digital native generation (Anwas, 2016). Where the younger generation is familiar with

technology and makes technology an inherent part of everyday life, this impacted reducing the use of printed teaching materials. According to Siregar (2014), the use of the Internet is much higher than the use of textbooks to complete school or college assignments. Thus, even though it is following the Regulation of the Minister of Education and Culture Number 8 of 2016, which confirms that textbooks are the main source of learning to achieve KI and KD, in this digital era, it is still necessary to develop digital-based teaching materials so that they can meet the needs and according to trends. Current development.

In addition, students have used Android-based smartphones for internet access activities in this digital era. By using Android, students tend to access various information more easily, including access to learning materials. This potential has yet to be widely utilized in more systematic learning activities. Based on this, data on the diversity of dragonflies in the Sri Gethuk Waterfall area has the potential to be developed into digital-based alternative teaching materials. Electronic modules or e-Modules are alternative teaching materials that will give the impression of learning that is more interesting for students because of their interactive nature, not limited to text, and open. The interactive nature can be seen from the e-Module, which provides direct feedback. Not limited to text means that e-Module content does not only contain text but can also contain audio and video. At the same time, the open nature means that by using the e-Module, students can access material not in the e-Module via the link provided.

Android-based e-Module Development has been carried out a lot and shown positive results. Based on research conducted by Aminatun et al. (2016) entitled "Development of an Android Mobile-Based e-Module for Nusa Tenggara Local Ecosystem Material to Improve Thinking Skills of High School Students", it can be seen that Android-based modules are effective in improving students' thinking skills shown with a p-value <0.05. Based on this background, research was conducted on developing an Android-Based e-Module on the Diversity of Dragonflies in the Sri Gethuk Waterfall Area as Teaching Materials on Biodiversity Materials for Class X SMA. This study aimed to determine the feasibility of an Android-based e-Module from data on the diversity of dragonflies in Sri Gethuk Waterfall as teaching material on biodiversity material for class X SMA.

## **2. Methods**

### **Types of research**

This research is a Research and Development (R&D) study with the ADDIE model (Branch, 2009) limited to the ADD stage.

### **e-Module Development Steps**

The development of data on the diversity of dragonflies in the Sri Gethuk Waterfall area is developed into an Android-based e-Module concerning the ADD (Analysis, Design, Development) model. The analysis phase includes analysis of research results as learning resources, curriculum analysis, instructional analysis, and analysis of student characteristics. The design stage includes the preparation of the e-Module content framework, the preparation of e-Module systematics, and the design of evaluation tools. The development stage includes six steps: pre-writing, writing the e-Module draft, editing, revision I, testing readability, and revision II.

### **Location and Time of Research**

Product development and validation by material experts and media experts were carried out at FMIPA UNY in February-April 2020. Meanwhile, the readability test by teachers and students was carried out at SMA N 1 Wonosari Gunungkidul in May 2020.

### **Research Objects and Subjects**

The object of this research is an Android-based e-Module on the Diversity of Dragonflies in the Sri Gethuk Waterfall Area. The subjects of this study included two material experts and three media experts as reviewers, as well as two biology teachers and 25 students as product readability test subjects.

### **Data collection technique**

Qualitative data were obtained from the results of the validation and readability tests. The instruments used were assessment sheets for material experts, media experts, and biology teachers and response questionnaires for students. The aspects assessed include aspects of content feasibility, presentation aspects, graphical aspects, independence aspects, contextual aspects, and linguistic aspects. The aspects of the instrument are prepared using the Guttman Scale (Yes/No).

### **Instrument Validity and Reliability**

The supervisor validated the instrument and then used it to develop the instrument used in the data collection process. The instrument was prepared concerning the e-Module criteria according to the BSNP standards.

### **Data analysis technique**

Data were analyzed descriptively. The category of assessment results refers to the e-Module criteria according to the BSNP standard (2014). Aspects or items are considered to have met the criteria if they appear by the assessment criteria. Aspects or items that do not meet the criteria are followed up based on expert correction and verification with credible literature sources so that the e-Module criteria that comply with the standards can be fulfilled.

## **3. Results and Discussion**

The development of data on the diversity of dragonflies in the Sri Gethuk Waterfall area into teaching materials in the form of an android-based e-Module was carried out using the Research and Development method with the ADDIE model (Branch, 2009), which was limited to the ADD stage (Sugiyono, 2015). The research phase begins with analyzing diversity data followed by developing research results into learning e-modules whose form and content have been adapted to the results of the analysis. The following are the results and discussion:

### **Analysis Stage**

The analysis phase includes analysis of research results as learning resources, curriculum analysis, instructional analysis, and analysis of student characteristics.

### **Analysis of Research Results as a Learning Resource**

At this stage, three processes were carried out, including identifying research processes and products as biology learning resources, selecting and modifying research results as biology learning resources, and applying and developing research results as biology learning resources. According to Suhardi (2012), before identifying research processes and products as learning resources, it is necessary to study the requirements for research processes and products to be appointed learning resources according to the high school biology curriculum. The results of the study showed that research on the diversity of dragonflies in the Sri Gethuk Waterfall area met the requirements to be appointed as a source of biology learning in terms of clarity on the potential availability of objects and issues raised, clarity of material objectives and their designation, clarity of the information to be disclosed, clarity of exploration guidelines, and clarity of acquisition. To be obtained.

The next process is the identification of research processes and products. The research results in the form of processes were obtained from the scientific processes used during research conducted in the Sri Gethuk Waterfall area. The process includes identifying and formulating problems, formulating objectives, formulating hypotheses, compiling research procedures, collecting and analyzing data, and drawing conclusions. The research results are products of facts, concepts, principles, laws, or theories. The product obtained from research on the diversity of dragonflies in the Sri Gethuk Waterfall area is in the form of facts that are generalized into concepts. The concepts obtained include the

characteristics of the Order Odonata, the Sub-Orders Anisoptera and Zygoptera, the differences between male and female dragonflies, diversity at the gene, species, and ecosystem levels, and the role of dragonflies in the environment.

The results of identifying research processes and products were then selected and modified. KD in the subject of biodiversity requires students to have the ability to analyze. Thus, the research work procedures developed in learning activities must be adjusted by considering learning activities that can encourage students' analytical abilities. Based on the selection results, activity procedures that can be developed to encourage students' analytical abilities are the process of problem identification, analysis, and synthesis of conclusions. Research products in the form of facts, concepts and principles are adapted to the concepts and sub-concepts in the high school biology curriculum. Because not all research results can fulfil the concepts and sub-concepts required by the high school biology curriculum so that the learning objectives are still achieved, it is necessary to modify and supplement them. Modifications are made by using pictures and descriptions of dragonflies as substitutes for direct objects, while supplementation is done by adding relevant references to complete the material requirements. Based on the selection results, the research products to be developed include the general characteristics of the Sub-Orders Anisoptera and Zygoptera, the differences between male and female dragonflies, diversity at the gene, species and ecosystem level, as well as the role of dragonflies in the environment. The results of the selection and modification are then applied to the developed teaching materials.

### **Curriculum Analysis**

The high school biology curriculum contains KD 3.2, Analyzing various levels of biodiversity in Indonesia and its threats and conservation. On the other hand, the potential objects and biological problems raised from the research results on the diversity of dragonflies in the Sri Gethuk Waterfall Area are biodiversity problems based on the similarities and differences in the morphological characteristics of the identified adult dragonflies. Thus, the research results on the diversity of dragonflies in the Sri Gethuk Waterfall area follow the needs of the Basic Competency (KD) in biology material for class X SMA.

### **Instructional Analysis**

The instructional analysis is carried out by describing Basic Competencies into indicators and learning objectives that must be achieved in the material on biodiversity. Based on the results of the elaboration, the results of research on the diversity of dragonflies in the Sri Gethuk Waterfall area can be used to study biodiversity material, which includes diversity at the gene, species, and ecosystem level, along with its values, benefits, threats and conservation efforts.

### **Analysis of Student Characteristics**

The results of the analysis of student characteristics stated that according to [Jean Piaget's theory \(2003\)](#), high school class X students had entered the formal operational stage. This stage means that students can independently synthesize information from the facts they see so that it can be assumed that they are capable when given teaching materials that require the ability to think abstractly. In addition, the survey results also show that students already have an Android-based smartphone. Thus, it is possible to develop an Android-based independent teaching material.

### **Design Stage**

Based on the analysis results, the product design to be developed is teaching material in the form of an android-based e-Module on the diversity of dragonflies in the Sri Gethuk Waterfall area. From the research results, curriculum analysis, and instructional analysis, data on dragonfly diversity could be used to study biodiversity material. On the other hand, the analysis of student characteristics shows that high school class X students have been able to learn independently, think abstractly, and have an Android-based smartphone.

Therefore, in this era of digitalization of education, this potential will be supported if a teaching material is developed as an Android-based e-Module.

The design stage includes storyboard preparation, e-Module content framework, e-Module systematic preparation, and evaluation tool design. The preparation of the e-learning module content framework includes the design of the homepage menu, introductory menu, manual user menu, introduction menu, learning activities menu, game menu, glossary menu, bibliography menu, profile menu, and exit menu design. The researcher performs the stage of compiling the systematics of the learning module to determine the order in which the material is presented, the suitability of the layout and writing layout, the selection of content, and the appropriate layout of the e-Module. The preparation of the content framework and systematics refers to the systematics of the modules that have been adapted to the needs of the development of teaching materials. The evaluation tool design stage is carried out by compiling the instrument. This instrument is used to assess and test the legibility of e-Module quality in terms of material and media quality.

### **Development Stage**

The development stage includes six steps: pre-writing, writing the e-Module draft, editing, revision I, testing readability, and revision II. In the pre-writing stage, references and content are collected to support material requirements. The IT team then compiles the content based on the storyboard, content outline, and the systematic presentation of the e-Module that has been prepared. Material experts and media experts validate the finished product. Assessment by material experts includes three aspects: aspects of the correctness of the concept, aspects of presentation, and aspects of language. In general, the results of the assessment show that most of the concepts contained in the e-Module are following the references. Concepts considered incorrect are corrected according to expert advice and verified with credible sources.

Assessment by media experts includes three aspects, namely presentation aspects, graphical aspects, and linguistic aspects. In general, the assessment results by media experts show that several aspects have appeared following the assessment criteria. The aspects assessed have yet to appear following the assessment criteria and then corrected so that the e-Module criteria according to the BSNP standards can be met. The results of the assessment, input, and suggestions by material experts and media experts at the editing stage were then used as a basis for researchers to improve the e-Module draft that had been prepared. After being revised, the e-Module was tested for readability at SMA N 1 Wonosari by biology teachers and students of class X MIPA.

The biology teacher assesses the feasibility aspects of content, presentation, graphics, independence, contextuality, and language. Based on the results of the readability test by the biology teacher, all assessment criteria are considered to have appeared in the e-Module, so the e-Module criteria according to the BSNP standard have been met. Even so, the biology teacher provides input and suggestions for improving the e-Module. Students provide responses or responses to the feasibility aspects of content, presentation, graphics, independence, contextuality, and language. In general, the results of the readability test by students showed that several aspects that were responded to appear following the assessment criteria. The aspects that were responded to did not appear under the criteria and were corrected so that the e-Module criteria following the BSNP standards could be fulfilled. Researchers used the assessment results and responses from the readability test as the final revision to perfect the developed e-Module product.

### **4. Conclusions**

Based on the results of the Android-Based e-Module Development research from Dragonfly Diversity Data in the Sri Gethuk Waterfall Area as Teaching Materials in Class X High School Biodiversity Materials, it can be concluded that the Dragonfly Diversity e-Module in the Sri Gethuk Waterfall Area has met the assessment criteria so that it is suitable for use as

material teaching materials based on the results of assessments given by material experts and media experts as well as readability tests by biology teachers and students.

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