

Analysis of Ability to Understand the Concept of Space Building Volume in Elementary School Students in South Palu District

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Abstract

This study aims to describe the types of amphibians in Wera Nature Park, to develop and produce a research-based booklet on amphibian species in Wera Nature Park which is suitable for use as a medium for studying animal taxonomy. The research consists of 2 types of research; purposive sampling technique and visual encounter survey (VES), ADDIE Development. The results of the descriptive research in WNTP obtained 10 species of Amphibians of the Anura order from 5 families, development received a standard booklet containing scientific names, pictures, and media validation of 80.00% meaning that the good category was "Eligible". Material expert validation with a final score of 91.66% in the "Very Good" category. So that the product developed is feasible to be tested. The percentage of small group trials was 84.55% in the "very good" category. The percentage of the results of the large group trial was 90.08% in the "very good" category. Based on media expert validation, material, and small and large group test results, it can be concluded that amphibian species booklets in WNTP are suitable for use as animal taxonomy enrichment material in the Biology Education Study Program FKIP Tadulako University.

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Introduction

Education is one of the things that is very important for the development of a country. Quality education will produce quality human resources. The world of education always strives to improve and improve the quality of education. One of the efforts to improve the quality of education in Indonesia is to improve the education system. This improvement is in order to create a society that is able to compete and adapt to the times. Several efforts to improve the quality of education include improving facilities and infrastructure, changing curriculum, improving the quality of teachers in the learning process, improving the assessment system and other efforts that include the education component (Paramita, 2018).

The Biology Education Study Program is one of the Study Programs at the Teaching and Education Faculty of Tadulako University, learning in the Biology Education Study Program currently uses a tertiary education curriculum which has a student-centered learning system. During the learning process, students are required to be more active in looking for problems and finding answers

to these problems. The lecturer as the teacher acts as a facilitator. To carry out student-centered learning, it should be equipped with various learning media so that it makes it easier for students to find problems and find answers to these problems skillfully (Hanik, 2018).

The media is an intermediary or liaison between the source of the message and the recipient of the message or information (Anitah, 2010). The availability of learning media will facilitate interaction between teachers and students so that learning activities will be more effective and efficient (Puspita, 2017).

Based on the results of observations in the animal taxonomy course on Amphibian material in the 5th semester of the 2018 class of the Biology Education Study Program, FKIP Tadulako University, learning media as a learning resource is still limited to textbooks and power points only. This causes students to still experience difficulties in learning. In addition to learning biology which is still focused on lecturers, class conditions are also not conducive, as a result, students feel bored and the class atmosphere tends to be passive and less focused on the material presented. This is also

influenced by the media and learning resources used that are less diverse and tend to be monotonous using textbooks and power points only.

Based on the results of the questionnaire response to student needs that had been given to students of the 2018 batch of Biology Education Study Program FKIP Untad, which programmed the animal taxonomy course, it was found that one of the materials that needed to be developed was Amphibious material. To get representative examples of local Amphibians in Central Sulawesi, especially in Wera Nature Park, it is necessary to conduct research that can be developed as a learning medium. The available learning media are still not many and less varied so understanding of concepts and student participation is still lacking. Therefore, students want attractive learning media, with material that is concise and easy to understand that can be used as a source of independent learning.

Learning media has several types, namely; Print media, exhibition media (Display), audio media, visual media, video media, multimedia, and computer equipment, and booklets are one of the printed media that can be used as learning media (Yaumi, 2012).

Booklets are educational media in the form of small books containing writing, pictures, or both (Rehusisma, 2017). According to Ghazali (2009), booklets can be chosen as learning media because they can contain a lot of writing and pictures. Furthermore, the biology education research journal conducted by Imtihana et al. (2014) it shows that the use of booklets is very effective in improving student learning outcomes. This is evidenced by his research which obtained from student learning outcomes on environmental pollution material achieving $\geq 80\%$ completeness learning with a value of ≥ 80 and suitable for use, with an average result of the material and media validator assessment of 91.5%.

One of the regions in Indonesia which has a wealth of fauna is Sulawesi (Sultika, 2017). Wera Nature Tourism Park (WNTP). This area is included in the protected forest group which has a fairly high biodiversity wealth, including flora and fauna with various types of wildlife, and has great tourism potential in the form of wild nature. beautiful and Wera Waterfall, there are also forest and river ecosystems that are still very natural (Evanjeli, 2019). Wera Nature Tourism Park (WNTP) as one of the potential habitats for flora

and fauna in Central Sulawesi has never conducted research, especially regarding Amphibians.

Based on the results of observations in the Wera Nature Park (WNTP), there are waterfalls, forests, and rivers that have the potential for various flora and fauna, including Amphibian fauna. (Annawaty, 2009) explains that the main habitat of Amphibians is primary forest, secondary forest, swamp forest, large rivers, medium rivers, creeks, ponds, and lakes. However, in the Wera Nature Park area, there is no scientific information regarding the existence of Amphibian species.

Based on the description above, research on the development of learning media in the form of research-based booklets in Wera Nature Tourism Park as a source of learning material needs to be done as enrichment material for animal taxonomy courses. Booklets can support student needs by providing pictures and explanations related to the actual Amphibian morphology material in Wera Nature Park, attractively designed with images, colors and easy to understand language. Attractive learning media can increase student motivation and student learning outcomes (Cholifatur, 2015).

Materials and Method

This research is divided into 2 research methods, namely the first descriptive research method carried out in the open with the aim of seeing the biological aspects of Amphibians in the Wera Nature Park (WNTP), Balumpewa Village, Dolo Barat District, Sigi Regency, Central Sulawesi Province. Descriptive research aims to obtain information about the current situation (Mardalis, 2008). The second is the research and development research type using the learning design model ADDIE Analysis Design, Development or Production, Implementation or Delivery, and Evaluations (Muswita 2020).

This research was conducted at the Wera Nature Tourism Park (WNTP), Balumpewa Village, Dolo Barat District, Sigi Regency on October 31 to November 2, 2020. The subjects in the study were booklets developed from the results of field research and tested on research objects, the students of the Study Program. Biology Education FKIP Untad which enrolled in animal taxonomy courses.

The samples in this study were taken from all species of amphibians at several research stations, they are forests and rivers in the Wera Nature Park area.

Types and sources of data

- 1) Primary data, which is used in the stages of preliminary studies obtained from lecturers in the form of curriculum analysis, Semester Study Plan and textbooks used, student learning outcomes and learning media needs, then data obtained from the original source, namely data obtained by distributing questionnaires to respondents.
- 2) Secondary data in this study are data derived from previous research, such as articles, theses, books on Amphibian material, and all related literature.

Research instruments

The instruments used in the preliminary study consisted of observation and interview sheets. The product development instrument is the WNTTP environmental observation sheet, the questionnaire sheet validation results of the booklet by material experts and media experts, and the questionnaire sheet on the responses of teachers and students to the effectiveness of the booklets. Data collection techniques are questionnaires, observation, and interviews. In the product development process, the data were analyzed first based on the distribution of Amphibi material based on the semester study plan.

Table 1. Collection techniques and instruments data

Data	Instrument	Collection Technique	Data source
Observation and field	-	<i>Purposive sampling and Visual Encounter Survey (VES)</i>	Wera nature tourism park
Analysis of student needs	Interview sheet	Interview and Questionnaire	Students and Lecturers
The validity of the booklet product eligibility	Validation questionnaire sheet		Material expert and media expert
Student response	Questionnaire sheet	Questionnaire	College student

Data analysis technique

The data analysis of the booklet learning media is as follows:

- Maximum total score = maximum scale score x item descriptor x number of respondents
- Minimum total score = minimum scale score x item descriptor x number of respondents

$$\text{Score range} = \frac{\text{Maximum score} - \text{minimum score}}{\text{Scoring category}}$$

The score obtained from each category is represented by the formula:

$$\text{Percentage of Responses} = \frac{\text{Number of Obtained Score}}{\text{Maximum Score}} \times 100$$

Media expert

The media expert validation questionnaire contained 13 question items, so the following scale of interpretation was obtained:

$$\text{Maximum score} = 5 \times 12 \times 1 = 65$$

$$\text{Minimum score} = 1 \times 13 \times 1 = 13$$

$$\text{Score Range} = \frac{65 - 13}{5} = 10.6$$

Based on the results obtained, the questionnaire result criteria can be seen in Table 2.

Table 2. Validation questionnaire interpretation category

Media		
Score	Percentage (%)	Category
45.5 - 56	81.25 - 100	Very good
35 - 45.49	62.50 - 81.24	Good
24.5 - 34.99	43.75 - 62.49	Poor
24.5 - 34.99	25 - 43.74	Very Poor

$$\text{Percentage of Responses} = \frac{X}{65} \times 100$$

Material expert

The media expert validation questionnaire contained 18 question items, and obtained an interpretation scale:

$$\text{Maximum score} = 4 \times 18 \times 1 = 72$$

$$\text{Minimum score} = 1 \times 18 \times 1 = 18$$

$$\text{Score Range} = \frac{72 - 18}{4} = 13.5$$

Based on the results obtained, the questionnaire result criteria can be seen in Table 3.

Table 3. Validation questionnaire interpretation category

Theory		
Score	Percentage (%)	Category
45.5 - 56	81.25 - 100	Very good
35 - 45.49	62.50 - 81.24	Good
24.5 - 34.99	43.75 - 62.49	Poor
24.5 - 34.99	25 - 43.74	Very Poor

$$\text{Percentage of Responses} = \frac{X}{72} \times 100\%$$

Small group trial

The small group trial questionnaire contained 15 question items, in order to obtain a score interpretation scale:

$$\text{Maximum score} = 5 \times 15 \times 12 = 1,040$$

$$\text{Minimum score} = 1 \times 16 \times 12 = 192$$

$$\text{Rentang Nilai} = \frac{1.040-192}{4} = 212$$

Based on the results obtained, the questionnaire result criteria can be seen in Table 4.

Table 4. Category of group questionnaire interpretation

Small		
Score	Percentage (%)	Category
351 - 432	81.25 - 100	Very good
270 - 350	62.50 - 81.24	Good
189 - 269	43.75 - 62.49	Poor
108 - 188	25 - 43.74	Very Poor

$$\text{Percentage of Responses} = \frac{X}{1.040} \times 100\%$$

Table 6. Species name and number of individuals found and their conservation status according to the IUCN Red List (International union for conservational nature)

Ordo	Family	Species	Station	Number of individuals	Status
Anura	bufonidae	<i>Duttaphrynus melanostictus</i> (Schneider, 1799)	Forest	2	LC
		<i>Ingerophrynus celebensis</i> * (Günther, 1859)	Forest	1	LC
	Dicroglossidae	<i>Ingerophrynus Sp 2</i>	Primary forest	1	LC
		<i>Ingerophrynus Sp 1</i>	Forest	1	LC
	Dicroglossidae	<i>Fejervaria limnocharis</i> (Gravenhorst, 1829)	River	5	LC
		<i>Limnonectes Sp</i>	River	6	LC
	Rhacophoridae	<i>Fejervaria cancrivora</i> (Gravenhorst, 1829)	River	1	LC
		<i>Leucomystax polypedates</i> (Gravenhorst, 1829)	Forest	2	LC
	Microhylidae	<i>Microhyla orientalis</i> (Matsui, Hamidy & Eto, 2013)	Forest	2	VU
	Ranidae	<i>Chalcorana mocquardi</i> (Werner, 1901)	Forest	1	LC

Large group trials

The small group trial questionnaire contained 15 question items, in order to obtain a score interpretation scale:

$$\text{Maximum score} = 5 \times 15 \times 30 = 2,250$$

$$\text{Minimum score} = 1 \times 15 \times 30 = 450$$

$$\text{Score Range} = \frac{2.250 - 450}{5} = 360$$

Based on the results obtained, the questionnaire result criteria can be seen in Table 5.

Table 5. Category of group questionnaire interpretation

Big		
Score	Percentage (%)	Category
351 - 432	81.25 - 100	Very good
270 - 350	62.50 - 81.24	Good
189 - 269	43.75 - 62.49	Poor
108 - 188	25 - 43.74	Very Poor

$$\text{Percentage of Responses} = \frac{X}{2.250} \times 100\%$$

Results and Discussion

Species of amphibians on the surface of the research location

Based on the results of research on Amphibians in Wera Nature Park and identification, there were 10 species of Amphibians from the Anura Ordo, consisting of 5 families, they are; the Bufonidae, Dicroglossidae, Rhacophoridae, Microhylidae, and Ranidae families.

The distribution of species obtained at each station is shown in Table 6.

Caudate	-	-	-	-
Sesilia	-	-	-	-
total	4	10	2	23

Information: * = Endemic, VU = Vulnerable (Vulnerable), LC = Least Concern (Low Risk), IUCN: International Union for Conservation Nature

Research results of booklet development using the ADDIE model research and development (R&D)

Booklet development refers to the ADDIE development model which consists of 5 main stages: Analysis, Design, Development or Production Implementation, and Evaluation.

Analysis

The purpose of this analysis is to determine the basic problems required in the development of instructional media. This analysis can be reviewed several things, namely student needs analysis and material analysis. Needs analysis is the initial stage in the research process and the development of the ADDIE model using a questionnaire while material analysis aims to identify, detail, and systematically compile the relevant main concepts, which are taught based on preliminary-to-end analysis (needs and material analysis).

Booklet product design

In this stage, the researcher makes a prototype or initial design of the Amphibian types of booklet products in the Wera Nature Tourism Park that suits the needs of students and the needs, of course, learning outcomes. The content of the booklet design consists of a Cover, remarks from the minister of environment and forestry of the Republic of Indonesia, a foreword, thanks, a table of contents, an introduction, getting to know Amphibi, knowing Amphibi's body parts, Amphibi classification, area map and environmental physical conditions in natural tourism parks Wera, family Rhacophoridae, family Bufonidae, family Microhylidae, family Dicroglossidae, family Ranidae, photo gallery, bibliography, scientific name index, author profile, and Closing. Products are designed using Corel Draw and Photoshop applications. designed using A5 paper size, with the font Bodoni MT Condensed.

The results of the feasibility analysis of research-based booklets on the species of Amphibians as learning media for Amphibian material at the Biology education study program, faculty of teacher training and education, Tadulako University

Analyzing the feasibility of the booklet in the ADDIE model research and development (R&D) research has several stages; development, implementation, and evaluation

Development

This stage is an advanced stage of the design stage, after obtaining the booklet prototype, the next stage of the development of the learning media booklet product by measuring the validity will be validated by expert validators (material and media) with the assessment instrument provided.

Implementation

The products of learning media development in the form of research-based booklets of Amphibian species in Wera Nature Park have been revised by material experts and media experts. The next stage is implementation by testing it on small group students consisting of 12 students and a large group trial consisting of 30 students, semester 5 of the year 2018 who enroll in animal taxonomy courses using a questionnaire, that consists of 15 questions in this trial.

Evaluation

The last stage is to conduct an evaluation which includes formative evaluation and summative evaluation. Formative evaluation is carried out to collect data at each stage used for improvement, then revise and evaluate at each stage, then summative evaluation is carried out at the end of the program to determine its effect on student learning outcomes and learning quality in general. However, in this study, only formative evaluation was carried out, because this type of evaluation was related to the development research stages to improve the development products produced. The results of the evaluation are revisions at each stage that have been described in the previous stages.

The species of Amphibians found at research sites

Amphibians are vertebrate animals that have a number of about 4,100 species (Halliday & Adler 2000). The results of observation and identification of Amphibian types carried out in the Wera Nature Park (WNTP), Sigi Regency, Central Sulawesi for 3 days and 3 nights, which were divided into 2 stations; forest and river stations, obtained 10 species from 5 families and 1 The ordos are from the Anura ordo of the family Bufonidae, Dicroglossidae, Rhacophoridae, Microhylidae and Ranidae while for the Urodela/Caudata Ordo and the Ordo of Caesilia/Apoda, none of the species from these two ordos were found. Based on the

distribution of the species found, there are 4 types of habitats including terrestrial, aquatic, semi-aquatic, and arboreal.

Types found in terrestrial habitats include *Duttaphrynus melanostictus*, *Ingerophrynus celebensis*, *Ingerophrynus* sp. 1 and *Ingerophrynus* sp. 2, these four species belong to the Bufonidae family. Morphologically, this species does not support living in the other 3 types of habitat, such as the type of foot that does not have a swimming membrane which allows it to live in aquatic habitat types. Pough (1998) states that most of the species of Bufonidae are terrestrial (living on the forest floor).

In the semi-aquatic habitat type there are 3 species of Amphibians consisting of 2 families, they are *Fejervaria limnocharis* and *Fejervaria cancrivora* from the Dicroglossidae family and the *Microhyla orientalis* type from the Microhylidae family. This matter. In accordance with the explanation (Annawaty, 2009) states that the semi-aquatic habitat type is a habitat where amphibians live on land in areas with calm and shallow fresh water.

In the type of aquatic habitat, there is only 1 type of Amphibian, namely *Limnonectes* sp from the family Dicroglossidae. This type has widened hind limbs so that it can help it swim in moderate or swift river flows. This is in line with what was stated by (Annawaty, 2009) that the type of aquatic habitat is the habitat that Amphibians live in and spend their life cycle in water or always close to rivers and water areas.

Two types of arboreal habitat were found; *Chalcorana mocquardi* from the Ranidae family and *Polypedates leucomystax* from the Rhacophoridae family. This species is found on trees or leaves, and its life is more often spent in the trees. The arboreal habitat type is the type of habitat inhabited by Amphibians who live in trees and reproduce in tree basins where there are stagnant water. (Annawaty, 2009) also states that the Family Rhacophoridae is a family that is often found in tree areas.

Among of 10 species of Amphibians found in WNTP, 22 individuals are included in conservation status Two categories based on the IUCN Red List (International Union for Conservation Nature) include: Conservation status LC = Least Concern (Low Risk) and status VU = Vulnerable (Vulnerable).

The diversity of Amphibians, especially the Anura ordo, was found a lot influenced by environmental physical conditions such as the average air temperature of 26.7°C. This temperature is classified as good for the existence of Amphibians in an environment. This is supported by Berry's (1975) statement that at a temperature of 26-33 °C Amphibians can grow optimally. Whereas for the average water temperature of 23.25 °C, the water temperature is very suitable for the life cycle of Amphibians who live in the range of 20-35 °C (Kanna, 2005). The average humidity is 78.5%. Iskandar (1998) states that, Amphibi prefers high humidity. Meanwhile, the average acidity level is 6.9 which is in the neutral category. This is in line with Darmawan (2008) that the pH range in the tropics is between 4.3-7.5. The pH measurement is a good condition for Amphibian life.

Wera Nature Tourism Park is classified as having a high diversity of species compared to other research locations in Central Sulawesi. As previous research conducted in Lore Lindu National Park by Annawati (2009) found 5 types of Amphibians from the Ordo of Anura. Wahyuni et al. (2020) in the lore lindu sub-district, Sigi regency, there are 8 types of 3 families including Bufonidae, Dicroglossidae, and Ranidae, while Hisyam (2018) only reports 5 types from 2 families, including the Bufonidae family, and Dicroglossidae in the Ampera Village area, Palolo district district Sigi. The research results from April (2020) have a fairly high level of species diversity with 13 species from 3 families including, Bufonidae, Dicroglossidae, and Ranidae.

All data (10 species 23 individuals) were obtained using a purposive sampling technique and Visual Encounter Survey, this method has the advantage of having an active nature with several variations of search that can be adjusted to the search area and flexible search times so that it is suitable for use in tropical areas (Kusrini, 2013).

Development of research-based booklets on the species of Amphibians as learning media for Amphibian material in the Biology education study program, faculty of teacher training and education, University of Tadulako

The process of developing research-based booklet learning media uses the ADDIE development model which consists of five main stages, namely: Analysis, Design, Development or Production, Implementation, and Evaluation. The stages carried out began with an analysis that aimed

to identify and determine the basic problems faced in the learning process by providing a questionnaire about the needs sheet to 30 students in the year 2018 who randomly enroll in animal taxonomy courses.

Furthermore, the material analysis aims to identify, detail, and compile the main materials and then develop them to be studied by students, the selection of booklet learning media criteria is intended so that the design or design of the learning media content is in accordance with the learning curriculum material. The booklet learning media contains material on the classification and characteristics of Amphibians so that students can understand according to the Course learning outcomes of Animal Taxonomy.

At the design stage, the researcher made a prototype / initial design, namely the selection and determination of the learning media format according to the needs of the learning objectives, especially the Amphibi material in the semester study plan, the booklet design prototype starting from the Cover, remarks from the minister of environment and forestry of the republic Indonesia and so on until closing. As explained by [Arikunto \(2000\)](#), a learning medium is said to be valid if the results are in accordance with the criteria, in the sense that they have parallels between the test results and the predetermined criteria. At the final stage of the design, 1 standard booklet product is conceptual which will be taken to the next stage, namely the product feasibility test.

Feasibility analysis of research-based booklets on the species of Amphibians as learning media for Amphibian material in the Biology Education Study Program, Faculty of Teacher Training and Education, Tadulako University

After going through the previous stages, a conceptual standard booklet product design was obtained which was further developed through the development stage. At the development stage, validation is carried out by material and media expert validators to test the feasibility of the product.

The first validation process for material experts got a score of 66 with an average of 3.66 with a percentage of 91.66%. Based on the calculation, the booklet is in the "very good" category, meaning that the booklet developed is feasible but there are still some things that need to be revised. Furthermore, the second validation to the media expert validator, based on a

questionnaire, there were 7 items evaluated in the form of comments and suggestions given by media experts who supported the product revision process. Media validation obtained a score of 48 with a percentage of 80.00%. This indicates that the media is in the "good" category. Therefore, it is stated that the booklet is feasible to be tested without revision.

The development stage was completed with the aspect of media and material assessment being in the feasible category, so the booklet was tested at the implementation stage by means of small and large-scale trials. The results obtained in the small group trial were obtained with an overall score of 84.55% with an average of 4.48. Based on this assessment, it can be said that the booklet can be very well received and is suitable for use as an enrichment material for animal taxonomy courses and then tested in large groups.

The second trial was a large group trial consisting of 30 students. The results obtained in the large group trial obtained an overall score of 2,027 with an average of 4.49 with a percentage of 90.08% which is included in the "very good" category.

[Pralisaputri et al. \(2016\)](#) showed that using booklets increased student learning outcomes. The media is an intermediary or liaison between the source of the message and the recipient of the message or information ([Anitah, 2010](#)). Learning media can also improve critical thinking skills ([Hakim, 2018](#)). The same thing was also explained by [Suryani, \(2019\)](#) that the use of booklets can improve student learning outcomes.

After the product has passed the implementation stage and is declared feasible, it is taken to the final stage, namely evaluation, at this stage a revision or improvement of the final stage is carried out as a whole related to the shortage of booklets based on suggestions and input from various parties including media and material experts and students. In the ADDIE model research and development method, the evaluation and revision stages have been carried out at all stages depending on the needs of the booklet media product. In the end, the product has gone through all stages of research and development of the ADDIE model of research and development starting from Analysis, Design, Development, or Production.

Conclusions

Based on the description of the discussion, the conclusions of this study are: (1) There were 10

species of amphibians, from five families 1 ordo, the anura ordo, while the Urodela/Caudata and the Caudian/Apoda ordos were not found in the Wera Nature Park area, Sigi Regency, Central Sulawesi Province. (2) Based on the results of development research, it can be concluded that the Amphibian species of booklets in Wera Nature Tourism Park, obtained standard booklets based on the analysis and design stages, but they need to be tested for their feasibility in the development, implementation, and evaluation stages. (3) The results of the booklet feasibility test show that the booklet is very suitable to be used as a learning medium for Amphibi material. Based on the evaluation of media experts, it was 80.00% with the "Good" category. Validation of material experts was 91.66% with the "Very Good" category. This product being developed is feasible to be tested. The percentage of small group trials on booklets was 84.55% in the "very good" category. The percentage of large group trials on the result booklet was 90.08% in the "very good" category.

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