JOURNAL OF NATURAL SCIENCE AND LEARNING

p-ISSN 2963-1041, e-ISSN 2962-9837
Vol 3. No.1. 2024. pp. 1-14
Availble online.
https://journalng.uwks.ac.id/jnsl/

The Development of Popular Scientific Book Mangrove Diversity Base on Contextual Learning Material of Biodiversity in Senior High School

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Abstract

The biology of learning closely related to human life, so that in the learning process process can be implemented in the natural environment, in other words learning not only predicated on the provided text books in school but can also utilize the surrounding environment as a learning resource. Learning that so called contextual learning. One of the environment that can be used as a source for learning is the mangrove. Therefore, the need for innovation learning resource utilization is around students who could potentially be used as an ingredient for the manufacture of learning media for students. In addition to the availability of the media has not discussed the specifics about the mangrove. The media is a popular scientific book on Mangrove Diversity which discusses mangrove diversity that is clearly packaged in an interesting way to overcome the limitations of space and time. This popular scientific book developed to help students better understand about the diversity of mangroves around its environment. This type of research is research development using development model ADDIE. ADDIE development model consists of several stages, namely analysis, design, development, implementation, and evaluation. The subject of the tests in this study consisted of 2 biology teachers and 8 students of class X SMA Maqwa and 2 biology teachers of SMA Maqwa. Data collection instrument on this research is questionnaire. Shape data obtained quantitative data and qualitative data. The results of the validation by an expert of the material retrieved percentage 78.7% with the "good" category and the results of the validation by an expert media obtained the percentage of 91% with the category "very good". Furthermore, the test by the teacher obtained percentage 84.58% by category "very good" and small group trials obtained percentage 81.76 % by category "very good". Based on the results of the study it can be concluded that the media of popular scientific books learning diversity of mangrove is worth is used in the process of learning both in schools as well as self learning. This media can be used as an alternative media learning material on biodiversity.

Keywords: *Scientific Book, Mangrove , Biodiversity, Contextual Learning Senior High School*

Article History:Submitted 08-12-2023; Received in revised from 24-03-2024; Accepted 31-03-2024, Available online 31-03-2024

p-ISSN 2963-1041, e-ISSN 2962-9837
Vol 3. No.1. 2024. pp. 1-14
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INTRODUCTION

Biology is a field of study that is closely related to human life, so the learning components used can be associated with connecting learning material with its application. However, students tend to only record the information they hear, memorize the theory without understanding the concept and are unable to relate the theory to its application. This can make students' critical thinking skills less developed. Therefore, it is necessary to apply learning that can connect the knowledge possessed with the application in life. In the context of its application in everyday life, the learning process cannot be separated from the concept of contextual learning. According to Sagala (2013:87), contextual learning (Contextual Teaching and Learning) is a learning concept that helps teachers link the material they teach with the real world situation of students and encourage students to make connections between the knowledge they have and their application in life. Based on this concept, the learning process is not only based on textbooks provided by the school, but can also utilize the surrounding environment as a learning resource.Lingkungan yang dapat dimanfaatkan sebagai sumber belajar salah satunya adalah hutan mangrove. Hutan mangrove merupakan vegetasi jenis tumbuhan yang berada di muara sungai yang dipengaruhi pasang surut air laut dan memiliki kemampuan terhadap salinitas yang tinggi (Noor., dkk, 2006:2).

Surabaya City is one of the districts located on the east coast of East Java Province located on the east coast of East Java Province with basic physical environmental conditions easily flooded, swampy and is an area of acidic organic deposits because it is located in the lowlands less than 100 meters above sea level. Based on its environmental conditions, the Surabaya City area in the mangrove area includes residential and school buildings. Based on observations, it shows that mangroves have been utilized in the learning process at Maqwa High School class X in the biology subject of biodiversity material, but only generally discusses the introduction of plant species in the school environment. To be more familiar with the types of mangroves, the teacher must take students outside the school environment. However, this is very risky because the teacher must supervise students in learning activities. In addition, the textbook used for the learning process still discusses in general about this

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biodiversity material. So that the use of the environment as a learning resource is less maximized. Therefore, it is necessary to innovate the utilization of learning resources around students which will potentially be used as material for making learning media for students. One of the appropriate learning media developed to introduce mangroves to students that are attractively packaged is in the form of popular scientific books. Popular scientific books are books that contain knowledge based on research results presented scientifically using simple, concise and clear language so that they are easily understood by the public and students.

The discussion contained in this book is based on the results of the identification of mangrove species in Mulyorejo mangrove forest, Surabaya City which is a conservation area of 5,009.82 km2 based on the Decree of the Minister of Forestry Number: 14/Kpts-II/2003 Dated January 7, 2003 (Rusnaningsih, 2012: 2). This popular scientific book can be used as a reference in learning biology in class X high school, especially on biodiversity material. A research has been conducted on the utilization of the environment as a learning resource. The steps in making this learningdevice are carried out by following the Analysis, Design,

Development following the Analysis, Design,

Development or Production, Implementation or Delivery and Evaluations (ADDIE) development model.

Research on learning media in the form of popular scientific books is only about the animal kingdom. Therefore, it is necessary to develop a popular scientific book on biodiversity, especially mangroves. Based on this explanation, a development research was compiled entitled **"Development of Popular Scientific Books on Mangrove Diversity Based on Contextual Learning on Biodiversity Material in High School"**

MATERIAL AND METHODS

This research is classified as development research because it will produce a product development of popular scientific books based on contextual learning (Contextual Teaching and Learning) mangrove diversity. As stated by Sugiono (2014: 407) the development research method is a research method used to produce certain products and test the feasibility of these products.

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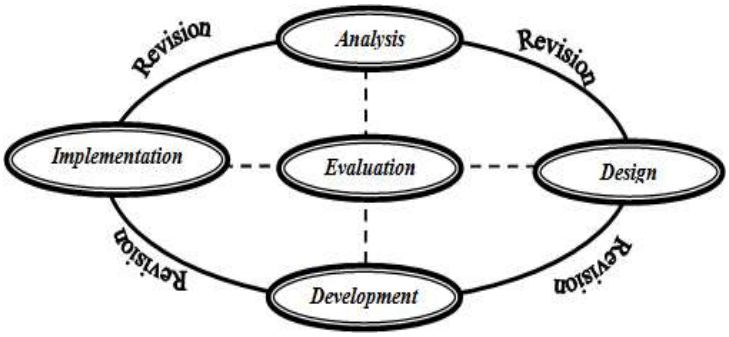

Figure 1 ADDIE Development Concept (Mulyatiningsih, 2014: 200)

Development Concept (Mulyatiningsih, 2014: 200)

1. Analysis

Based on the results of the analysis conducted, it can be concluded as follows: (1) The characteristics of students based on the background that students live in the mangrove area can utilize the surrounding environment to gain knowledge, (2) The unavailability of learning media that discusses specifically the mangrove ecosystem based on the surrounding environment of students, (3) The learning process of biodiversity material, the use of the environment as a learning resource is very necessary. This aims to link the learning material obtained by students with its application.

Design.

The design stage includes mangrove sample collection and popular science book design.

1. Development

The development stage (development) is a stage that contains product design realization activities (design). This stage is done with subject matter validation by material experts and media validation by media experts.

2. Implementation After product revision at the design and development stage and declared feasible, the product will be implemented or tested.

3. Evaluation

At the evaluation stage, an assessment and suggestions were obtained to revise the

p-ISSN 2963-1041, e-ISSN 2962-9837
Vol 3. No.1. 2024. pp. 1-14
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popular scientific book media on mangrove diversity that had been developed

Product Trial

Product trials are an important stage carried out in development research, this is done after the product design is complete. The trial aims to find out whether the product made is feasible or not. The trials carried out included individual trials and small group trials.

Test Subjects

After the media is designed and developed and validated by a team of experts, then the media is tested on students. The small group trial consisted of 8 classX students at Maqwa High School. Students filled out an assessment questionnaire to find out the students' perceptions of the learning media that had been developed.

Types of Data

In this development research, the types of data taken are quantitative and qualitative data. Quantitative data is obtained from the calculation of the criterion value presented in numbers, while qualitative data is in the form of questionnaire entries with comments and

suggestions for improving this media, data from teacher responses in individual trials and questionnaires of students' perceptions of the media

Data Collection Instrument

The instrument used in collecting data for this development research is a questionnaire arranged in the form of a table with a Likert scale with 4 categories of assessment from the highest. The questionnaire used is a validation questionnaire for validators, and a product test assessment questionnaire.

Data Analysis

Data analysis techniques are how the data will be analyzed or processed after the data is collected (Setyosari, 2012: 209). Data analysis in this study was carried out by providing instruments to collect data. The instruments used in this research are validation sheets and questionnaires. The validation sheet was filled in by a team of experts and the assessment questionnaire was filled in by teachers and students to find out the perceptions of teachers and students of learning media.

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Assessment scores from learning material experts and learning media experts in filling out validation sheets, and filling out questionnaires by students are analyzed using a Likert scale.

According to Riduwan (2013: 87), the Likert scale is used to measure the attitudes, opinions, and perceptions of a person or group of people about social events or symptoms.

Questionnaires that are processed using a Likert scale have answer instruments in the form of data with the following answer intervals:

4 = Very good 3 = Good

2 = Less good 1 = Not good

1. Questionnaire analysis by material experts and media experts

The indicators contained in the material expert validation questionnaire are 20 question items. The interpretation of the score is:

• Minimum score = lowest criteria x number of questions x number of respondents = 1 x 20 x 1 = 20

• Maximum score = highest criteria x number of questions x number of respondents = 4 x 20 x 1 = 80

• Category criteria = 4

• Score range = $\frac{\text{maximum score} - \text{minimum score}}{\text{criteria category}} = \frac{80-20}{4}$

Table 3.5 Categories of answer choices for validation of learning materials

No	Rating Scale	Score	Category Level
1.	4	65 - 80	Very good
2.	3	50 – 64,9	Good
3.	2	35 – 49,9	Not good
4.	1	20 – 34,9	Not very good

The indicators contained in the media expert validation questionnaire are 14 question items. The interpretation of the score is:

- Maximum score = highest criteria x number of questions x number of respondents = 1 x 14 x 1 = 14
- Maximum score = highest criteria x

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- number of questions x number of respondents = 4 x 14 x 1 = 56
- Category criteria = = 4
- Score range =

$$\frac{\text{maximum score} - \text{minimum score}}{\text{criteria category}} = \frac{56 - 14}{4} = 10{,}5$$

Table 3.6 Categories of answer choices for learning media validation

No	Rating Scale	Score	Category Level
1.	4	45,5 - 56	Very good
2.	3	35 – 45,49	Good
3.	2	24,5 – 34,9	Not good
4.	1	14 – 24,49	Not very good

2.Teacher and learner test analysis

The test questionnaires were given to 4 teachers and a small group of 8 learners. The teacher test instrument had 15 questions and the small group test instrument had 12 questions.

Analysis of the percentage calculation of each variable according to Riduwan (2013: 89) the percentage for each sub variable is calculated using the formula:

$$\% = \frac{F}{N} X100$$

Description

n = number of scores for each sub variable

N = maximum number of scores

The score interpretation for the teacher test is as follows:

- Minimum score = lowest criteria x number of questions x number of respondents = 1 x 15 x 4 = 60
- Maximum score = highest criteria x number of questions x number of respondents = 4 x 15 x 4 = 240
- Category criteria = 4

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- Score range =

$$\frac{\text{maximum score} - \text{minimum score}}{\text{criteria category}} = \frac{240 - 60}{4} = 45$$

Table 3.7 Categories of interpretation of teacher test scores

No	Rating Scale	Score	Category Level
1.	4	195-240	Very good
2.	3	150-194,9	Good
3.	2	105-149,9	Not good
4.	1	60- 104,9	Not very good

$$\text{Lowest percentage} = \frac{\text{maximum score} - \text{minimum score}}{\text{criteria category}} = \frac{100\% - 25\%}{4} = 18{,}75\%$$

Table 3.8 Percentage categories for teacher testing

No	Rating Scale	Percentage (%)	Category Level
1.	4	81,26-100	Very good
2.	3	62,51-81,25	Good
3.	2	43,76-62,50	Not good
4.	1	25-43,75	Not very good

- The score interpretation for the small group trial is as follows: Maximum score = highest criteria x number of questions x number of respondents = 1 x 12 x 8 = 96 Maximum score = highest criteria x number of questions x number of respondents = 4 x 12 x 8 = 384
- Category criteria = = 4

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- Score range =

$$\frac{\text{maximum score} - \text{minimum score}}{\text{criteria category}} = \frac{384 - 96}{4} = 72$$

Table 3.9 Small group test score interpretation categories

No	Rating Scale	Score	Category Level
1.	4	312-384	Very good
2.	3	240-311,9	Good
3.	2	168-239,9	Not good
4.	1	96-167,9	Not very good

$$\text{Lowest percentage} = \frac{96}{384} X\ 100\% = 25\%$$

$$\text{Score range } = \frac{\text{maximum score} - \text{minimum score}}{\text{criteria category}} = \frac{100\% - 25\%}{4} = 18{,}75\%$$

Table 3.10 Small group test percentage categories

No	Rating Scale	Percentage (%)	Category Level
1.	4	81,26-100	Very good
2.	3	62,51-81,25	Good
3.	2	43,76-62,50	Not good
4.	1	25-43,75	Not very good

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RESULT AND DISCUSSION

Expert Data Analysis of Material Validation Results

In the first validation, the assessment score obtained from the material validator was 54 with a percentage of 67.5%. Based on these calculations, the score obtained is included in the "good" category. In this first validation, the material validator provided many suggestions for improvement of the developed media. The improvement suggestions include media linkage with the intended competencies are less clear, it is recommended to add a description of the biology learning material and some questions so that the media developed can achieve competence, suggestions to improve the use off photos / images that are less focused and suggestions to complete illustrations such as mangrove zoning sketches and captions on the map on the media so that the information conveyed is clear.

In the second stage of validation, the assessment score of the material validator was 63 with a total percentage of 78.7%, including in the "good" category. % included in the "good" category. In this second validation, there were no suggestions for improvement given by the material validator. So it can be concluded that the popular scientific book media of mangrove diversity is suitable for testing.

1. Data Analysis of Media Expert Validation Results

In the first stage of media validation, the number of scores obtained was 47 with a percentage of 83.9%. Based on these calculations, the score obtained is included in the "very good" category. However, in this first stage of media validation, there were suggestions for improvements to the media developed. Suggestions given by media validators related to spacing consistency in the table of contents, the use of the word "method" is suggested to be replaced with

The writing of sources taken from the internet initially written the address of the site is recommended to be replaced with anonymous initials that are adjusted to the order of the reference list and the writing of mangrove benefit points initially in the form

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of letters and bullets is recommended to replace the writing of points in the form of numbers and letters. Furthermore, in the

second stage of validation, the assessment score from the media validator was 51 with a total percentage of 91%, including in the "very good" category. In this second validation there were no suggestions for improvement given by media validators. So it can be concluded that the popular scientific book media of mangrove diversity is suitable for testing.

2. **Data Analysis of Media Expert Validation Results**

In the first stage of media validation, the number of scores obtained was 47 with a percentage of 83.9%. Based on these calculations, the score obtained is included in the "very good" category. However, in this first stage of media validation, there were suggestions for improvements to the media developed. Suggestions given by media validators related to spacing consistency in the table of contents, the use of the word "method" is suggested to be replaced with The writing of sources taken from the internet was originally written as the address of the site is recommended to be replaced with anonymous initials adjusted to the order of the reference list and the writing of mangrove benefit points initially in the form of letters and bullets is recommended to replace the writing of points in the form of numbers and letters.

Furthermore, in the second stage of validation obtained an assessment score from the media validator of 51 with a total percentage of 91% including in the "very good" category. In this second validation, there were no suggestions for improvement given by media validators. So it can be concluded that the popular scientific book media of mangrove diversity is suitable for testing.

3.Data Analysis of Test Results by Teachers

After the learning media in the form of a popular scientific book of mangrove diversity that has been developed is validated by a team of experts consisting of material experts and media experts, then the media is ready to be tested. In the test by teachers involving 2 biology teachers from SMA Maqwa and 2 biology teachers from SMAN 1 Tulungagung, obtained a score of 203 with a percentage of 84.58% including the

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Vol 3. No.1. 2024. pp. 1-14
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category "very good". This shows that biology teachers strongly agree with the

development of popular scientific books on mangrove diversity as one of the learning

media on class X biodiversity material in high school.

4. **Data Analysis of Trial Results by Learners**

The learner assessment questionnaire used in the small group trial consists of several indicators, namely the use of media, media functions and media display. Based on the results of the data interpretation of the respondents in the small group trial, the total score obtained was 314 with a percentage of 81.76%, including the category "very good".This shows that students strongly agree with the development of popular scientific books on mangrove diversity as one of the learning media on class X biodiversity material in high schoo

Conclusion

Based on the results of development research and discussion of popular scientific books on mangrove diversity based on contextual learning on biodiversity material in high school, there are several things that can be reviewed, namely

1. The popular scientific book of mangrove diversity based on contextual learning on biodiversity material in high school developed through several stages, namely analysis of student characters, needs analysis, and subject matter analysis, then designing popular scientific books which include collecting samples by documenting and identifying mangroves on the East Coast of Jambi and designing popular scientific books, validating products by material experts and media experts, after the product is declared feasible by a team of product experts then tested on teachers and students.
2. The development of a popular scientific book of mangrove diversity based on contextual learning on

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biodiversity material in high school was validated by a team of experts, namely material experts and media experts. Material validation was carried out twice with the final result obtained a score of 63 or 78.7% including the "good" category. Furthermore, media validation was carried out twice with the final result obtained a score of 51 or 91% including the "very good" category.

3. Popular science books that have been validated by a team of material experts and media experts are then tested on teachers and students. The test by teachers involved 2 biology teachers at Maqwa High School and 2 biology teachers at SMAN 1 Tulungagung. The results of the teacher test obtained a score of 203 or 84.58 % including the category "very good". In the small group trial involving 8 students from class X MIPA at Maqwa High School obtained a score of 314 or 81.76% including the category "very good". Based on this description, it shows that this popular scientific book is suitable for use in the biology learning process on biodiversity material.

Utilization Suggestions

1. This media can be used as an alternative learning media in the field of biology studies on biodiversity and kingdom plantae.
2. The author also suggests further development and research on popular scientific books on other subject matter so as to add learning innovations to increase students' interest and motivation for independent and guided learning.

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