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LEARNING MEDIA DEVELOPMENT OF BIOLOGY

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ABSTRAK

Penelitian ini dilatarbelakangi oleh siswa kelas XI MIPA yang mengalami kesulitan dalam memahami materi sistem pernapasan manusia. hasil wawancara dengan guru biologi diperoleh data bahwa belum adanya media pembelajaran berupa buku biologi berbasis peta pikiran materi sistem pernapasan manusia untuk siswa kelas XI MIPA SMA sebelas kota jambi. Oleh karena itu diperlukan media pembelajaran yang dapat membantu siswa dalam memahami materi sistem pernapasan manusia. Penelitian ini bertujuan untuk mengembangkan, mengetahui kelayakan dan mengetahui tanggapan guru dan tanggapan siswa terhadap produk yang dikembangkan. Jenis penelitian ini adalah penelitian pengembangan dengan menggunakan model pengembangan ADDIE. Jenis data penelitian berupa data kuantitatif dan data kualitatif. Instrumen yang digunakan adalah angket terbuka dan angket tertutup berupa skala Likert. Sedangkan analisis data yang digunakan berupa teknik analisis deskriptif. Hasil validasi oleh ahli materi diperoleh skor rata-rata 3,27 termasuk dalam kategori “layak”. Hasil validasi oleh ahli media diperoleh skor rata-rata 2,95 termasuk kategori “layak”. Selanjutnya, tes respon guru biologi memperoleh skor rata-rata 91,29 termasuk kategori “baik” dan tes respon siswa memperoleh skor rata-rata 90,43 termasuk kategori “baik”.

Kata kunci: Buku pengayaan biologi, peta pikiran, sistem pernapasan manusia

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ABSTRACT

This research is based on students class XI Mathematics and Natural Sciences, who have difficulty understanding the material of human respiratory system. the results of interviews with biology teachers obtained data that the absence of instructional media in the form of biology book based on mind map on human respiratory system materials for students class XI Mathematics and Natural Sciences for senior high school eleven of Jambi city. Therefore it is necessary media of learning that can help student to understand material of human respiration system. This study aims to develop, determine the feasibility and know the teacher response and student responses to products developed. The type of research is development research using the ADDIE development model. Types of research data in the form of quantitative data and qualitative data. The instrument used is an open questionnaire and closed questionnaire in the form of Likert scale. While the data analysis used in the form of descriptive analysis technique. The results of validation by the material expert obtained an average score of 3.27 included into the category "feasible". The results of validation by the media expert obtained an average score of 2.95 including the category "feasible". Furthermore, the test of biology teacher's response obtained an average score of 91.29 including the "good" category and the student's response test obtained an average score of 90.43 including the "good" category.

Keywords: Biology enrichment book, mind map, human respiratory system

INTRODUCTION

The development of science and technology increasingly encourages renewal efforts in the utilization of technology results in the learning process. Teachers are required to be able to use the tools that can be provided at school, and the possibility that they are in line with the development and demands of the times. In addition to using the tools available, teachers are also required to be able to develop the skills to create learning media that will be used if the media is not available (Arsyad, 2016: 2).

Some of the elements that become the basic capital to become creative and innovative designers or lecturers need to have the basic capital of mastering the material, using various methods and study aid, using various media and learning tools, and accurately estimating the learning time in minutes. Likewise, there is freedom of choice of media and tools available at the place of learning. When ideal media and tools are not available, designers can create their own media and tools from available materials (Atwi, 2012: 243).

Textbooks are one of the main learning resources of students and are generally adapted to the applicable curriculum. Textbook plays an important role in the learning process, which is a source of learning, support the implementation of school curriculum, help improve reading interest of students and facilitate the occurrence of analytical thinking process. In the Regulation of the Minister of National Education of the Republic of Indonesia number 2 of 2008 on the Book mentioned in Article 6 paragraph 2 that in addition to the textbook lessons used as a mandatory reference by teachers and students in the learning process, teachers can use educator manuals, enrichment books, and reference books in the learning process (Anonymous, 2008a).

Initial conditions at school are obtained by performing material analysis as well as needs analysis. Based on the result of the material analysis, the average percentage of students of class XI Mathematics and Natural Sciences, who had difficulties in understanding the material is 46%. Students who have difficulty understanding the material of the human respiratory system, seen in the value of its completeness have not fulfilled the Criteria for completeness of teaching <75. Factor (1) biology textbook student class XI Mathematics and Natural Sciences, contains a wide range of material. (2) students tend to be passive in the learning process. (3) students are not accustomed to develop creativity in recording a more concise and solid.

The result of requirement analysis is obtained that there is no learning media in the form of biology enrichment book based on mind map on human respiratory system for students of class XI Mathematics and Natural Sciences, for senior high school eleven of Jambi city. In addition, the need for the addition of material information on human respiratory systems whose scope of material is arranged in a focused, concise, and has an attractive design appearance so easily understood by students. This is based on the average number of percentage needs of students and teachers of mind-based biology enrichment book by 98%.

The purpose of instructional media developed is to enrich the knowledge and creativity of students in the learning process because of the presentation of complex and compact material that contains the value of mind mapping techniques that seem to record the material more dense and clear so that students can focus on understanding the material of the human respiratory system.

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Buzan (2006: 14) explains that one of the functions of mind map in learning is to help students remember the material better and help students become more creative. If students are more creative in recording the material of the human respiratory system during the learning process takes place, then students will become more easily understand the material of the human respiratory system.

Based on these descriptions it is necessary development of learning media in the form of biology enrichment book based on mind map which can be an alternative learning media. Based on what has been stated before, then conducted a research title "Learning media development of biology"

METHODOLOGY

Development Model

The development model used in this research is the development model of ADDIE. The process of ADDIE development steps undergoes a sequential and interactive phase. evaluation can take place at each of the four stages, with the aim of revision requirements, where the evaluation of each stage can lead to the development of learning media to the previous stage (Richey, et al, 2011: 19).

The ADDIE model was selected based on several reasons, (1) the ADDIE model illustrates the flow or clear procedure steps for producing the product, (2) the ADDIE model has been widely used in development research, and (3) the ADDIE model provides an opportunity for the designer to work together with the validator team so as to produce a final product that has decent and good quality.

Development

The development procedure in this study refers to the model of ADDIE development. The description of the steps of the model is described as follows.

Analysis

This stage performs material analysis, needs analysis, field observation and literature study. The product developed is a learning media in the form of biology book based on mind map on human respiratory system material for students of class XI Mathematics and Natural Sciences for senior high school eleven of Jambi city. Steps to be taken: (1) to determine the purpose and benefits of developing learning media in the form of biology book based on mind map on human respiratory system material for students of class XI Mathematics and Natural Sciences. (2) preparing study materials and collecting references containing material on the human respiratory system.

Design

The product design stage has several stages, among others.

1. Product Development Schedule
2. Specification of biology book based on mind map
3. Product component structure

Development

There are several steps in this development stage include:

1. Product creation
2. Validation of products
3. The final revision

Implementation

This stage is performed after the revised product is declared feasible to be tested by the validator. Implementation on the development of mind-based biology enrichment book is done by testing the response of biology teacher as much as 3 people and the test of student class XI Mathematics and Natural Sciences as 15 people.

Evaluation

The evaluation stage is a process to show the product developed successfully and in accordance with the targeted. The results of evaluation of the respondents in the form of improvement suggestions can be used as a description of points that need to be revised. The evaluation phase consists of formative and summative evaluations.

Test Products

The finished product in the form of mind-based biology enrichment book will be tested for teachers and students to test the feasibility and attractiveness of the product. Implementation of this trial aims to evaluate and revise the products that have been made.

Test design

Trial of product to be done through three stages (1) Phase I is validation stage by material expert twice and validation of media expert three times, followed by data analysis of validation and revision result. (2) Phase II is a test by teacher consisting of 3 biology teachers at senior high school eleven of Jambi city and continued data analysis and revision. (3) Phase III is a test phase by the students of class XI Mathematics and Natural Sciences in senior high school eleven of Jambi city consisting of 15 people, followed by data analysis and revision.

Subject of trial

The test subjects in this study:

1. Response of biology teacher in senior high school eleven of Jambi city which amounted to 3 people.
2. The response of the students of class XI MIA in senior high school eleven of Jambi city, which amounted to 15 people.

Determination of the subject of student response test using random technique or random sampling. The desired sample is 15% of 100 students of class XI Mathematics and Natural Sciences. According Arikunto (2006: 135) if the subject of research <100 sampling can be taken between 10-15%.

Data type

In this research development type of data used in the form of quantitative and qualitative data.

Data collection instrument

Instruments in this study are open questionnaire and closed questionnaire in the form of Likert scale. According to Widoyoko (2014: 104) Likert scale is the scale used to measure the opinions/perceptions of respondents and contains items of statements or questions provided, ranging from very positive to very negative. The use of questionnaires for product trial subjects, while validators use validation sheets.

Data analysis techniques

Data analysis in this research using descriptive analysis technique. Qualitative data and quantitative data are collected and analyzed thoroughly. Data obtained from the validation sheet provided by the material expert and the media expert use the Likert scale consisting of 4 (Very Eligible), 3 (Eligible), 2 (Not Eligible) and 1 (Very Inappropriate). While the data obtained from the responses of teachers and students also use Likert scale with category 4 (Very Good), 3 (Good), 2 (Not Good) and 1 (Very Not Good).

The data analysis technique is done in the following way (Widoyoko (2014: 110):

a. Transform score data into value
b. Specify a range of values.

$$\text{Value range} = \frac{\text{Maximum value} - \text{Minimal value}}{\text{Class interval}}$$

c. Arrange the value categories based on the questionnaire assessment obtained from the test subjects.

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RESULT OF DEVELOPMENT AND DISCUSSION

1. Development Results

This research uses ADDIE development model with the steps of Analysis, Design, Development, Implementation, Evaluation.

a. Analysis

The analysis phase was conducted on November 11th to December 20th, 2017. In the material analysis result, it was found that the average percentage of senior high school eleven Mathematics and Natural Sciences students who had difficulties in understanding the material of human respiratory system was 46%. While on average percentage of requirement of student and teacher to biology book based on mind map on material of human respiration system is 98%.

b. Design

The first step of the design step is to determine the schedule of product creation, determine the title, reference collection, writing, evaluation of writing results and improvements to the enrichment of the material to spend about 5 months.

The second step determines the specifications of the Mind Map Based Biology Enrichment Book as the type of paper used Art Paper and HVS SIDU 80 GSM paper. book size: B5 (17.6 cm x 25 cm) and font size: 10,12,16 points with 1.5 lines spacing. Type font type Times New Roman, Arial Black, Berlin Sans FB. Margin margin for Top, Bottom, Right is 2 cm, and for margin margin Left is 3 cm. Software used Microsoft Office Word 2016, Imindmap 9, Adobe Photoshop, Canva and Corel Draw X7. The developed products have different characteristic elements with biological textbooks.

The third step is to structure product components such as front cover, introduction, table of contents, list of drawings, what is a mind-based biology enrichment book ?, usage manual, learning objectives, outline of human respiration system, gallery, competency test, glossary, , answer key, image source list, referral list and back cover.

c. Development

The procedures undertaken at the development stage are product creation, product validation and product revision.

Products are made in printed form using Microsoft Office Word 2016 applications, Imindmap 9, Canva, Corel Draw X7 and Adobe Photoshop.

Validation of product, On material validation done 2 times. Expert material validator, Mr. Tedjo Sukmono, S.Si., M.Sc. Percentage validation by material experts can be seen in Figure 4.1 as follows.

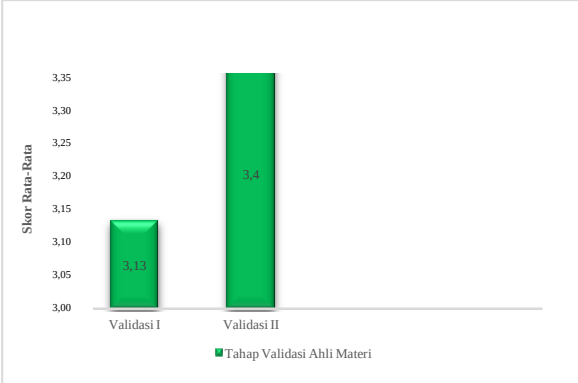

Figure 4.1 Percentage of Validation by Expert Material

Expert media validation is done 3 times. Validator of media expert Mr. Nasrul Hakim, S.Pd., M.Pd. Percentage validation by media experts can be seen in Figure 4.2 as follows.

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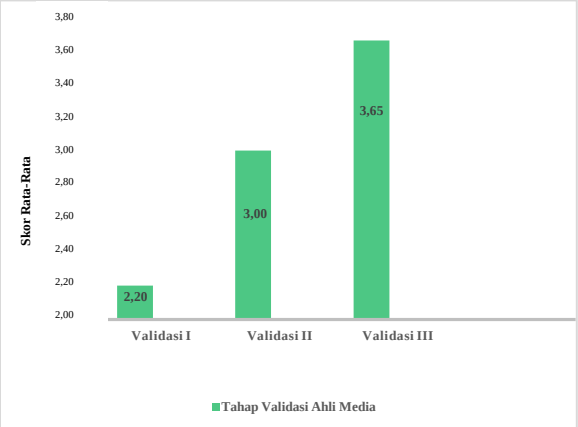

Figure 4.2 Percentage of Validation by Media Experts

Product revision. The purpose of the product revision is to maximize the final product output and minimize the product shortage for the better. On the revision of the product by the material expert conducted in accordance with the advice given by Mr. Tedjo Sukmono, S.Si., M.Sc. Material product revision is done 2 times. While the product revision by the media expert conducted in accordance with the advice given by Mr. Nasrul Hakim, S.Pd., M.Pd. A revision of the product by a media expert is performed 3 times. Based on the results of the test data of teacher and student responses no revisions were obtained

d. Implementation

Implementation is a product trial process by biology teacher and XI class MIA students in senior high school eleven of Jambi city. The result of the responses of biology teacher in senior high school eleven of Jambi city which amounted to 3 people obtained the average value of 91.29 and included in the category of "Good". While the results of the responses of students of class XI Mathematics and Natural Sciences, in senior high school eleven of Jambi city which amounted to 15 people obtained an average value of 90.43 and included in the category of "Good".

e. Evaluation

This stage is evaluated on the product regarding its feasibility. This evaluation is done by revising the product based on suggestions and feedback from the validator team through the validation sheet. Further evaluation is done after the product is tested on teacher and student through assessment questionnaire, so that the final product is ready to be used.

2. Analysis

Data analysis in this research is done by using descriptive analysis technique and also use scale measurement "Likert Scale".

2.1 Analysis of Material Validation Result Data

The result of the validation of the material expert of Phase I and II obtained the average validation of material of 3.27 and included in the category of "Eligible".

2.2 Media Validation Data Analysis

The calculation results of validation sheet media expert I, II and III obtained average media validation of 2.95 and included in the category "Eligible".

2.3 Data Analysis Results of teacher responses

The result of questionnaire responses of teachers Biology obtained an average score of teacher responses of 91.29 and included in the category of "Good".

2.4 Data Analysis Results of student responses

The result of questionnaire responses of students obtained the average score of student responses of 90.43 and included in the category of "Good".

3. Discussion

This study aims to develop and determine the feasibility level of learning media in the form of biology book based on mind map on the material of human respiratory system for the students of class

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XI MIA SMA Negeri 11 Kota Jambi and know the response of test subjects to the developed product. This type of research is development research using ADDIE (Analysis, Design, Development, Implementation and Evaluation) model.

Stage analysis. The product was developed based on the results of material analysis and needs analysis in SMA Negeri 11 Kota Jambi class XI MIA. The percentage of XI class MIA students who have difficulty understanding the material of the human respiratory system is 46%. While the percentage of students 'and teachers' needs on mind-based biology enrichment books on the material of the human respiratory system is 98%.

The design phase begins with a production schedule that takes about 5 months. Arranging product specifications, preparing components of products and products developed have different characteristic elements with biological textbooks. Differences in product characteristics developed with biological textbooks can be seen in Table 4.1 as follows.

Table 4.1 Differences in Biology Textbooks with Developed Products

Characteristics	Biological textbooks	Products developed
Benefits	Provide students with material understanding	Increase the knowledge and creativity of students because of the values of mind mapping techniques.
Users	The majority of students	Readers of the general level.
Style of Presentation	Tend to be unidirectional, and formal	Served in both directions, and loose
Purpose	Designed to be marketed widely	Designed according to the needs of students on learning media based on the results of observations in the classroom.
Material coverage	Wider range of material	Material coverage is more complex, focused, and concise.
Language	Contains a language that is sometimes difficult to understand	Language is easier to understand and more clear
Illustration	Images in each sub-material are very simple	Images are more complex and clear
Product View		More interesting because it involves keywords, image elements, lines and colors so it's not boring

Development phase, the procedure is product creation, product validation and product revision. products are made in printed form using Microsoft Office Word 2016 applications, Imindmap 9, Adobe Photoshop, Canva and Corel Draw X7. Type of paper used Art Paper and HVS SIDU 80 GSM paper. Book size B5 and font size: 10,12,16 points with 1.5 lines spacing. Type font type Times New Roman, Arial Black, Berlin Sans FB.

How to design the product using Imindmap 9 and Microsoft Office Word 2016 applications can be seen in Figure 4.3 and Figure 4.4 as follows.

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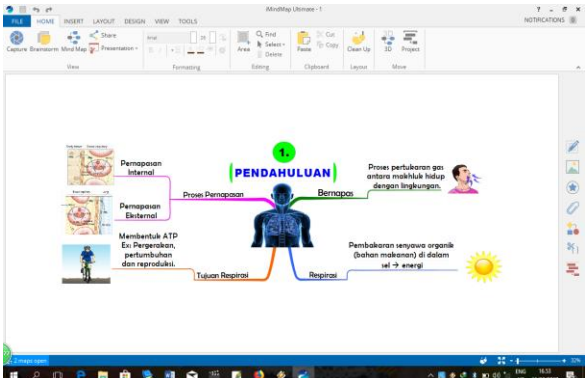

Figure 4.3 Product in *Mind Map* Form

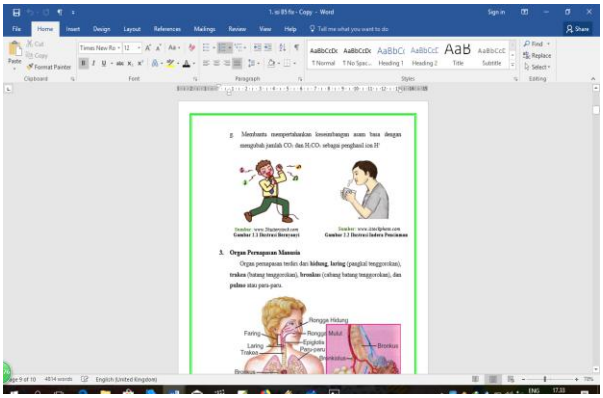

Figure 4.4 Product in Microsoft Office Word 2016 Form

How to design cover using Corel Draw X7 application can be seen in Figure 4.5 as follows.

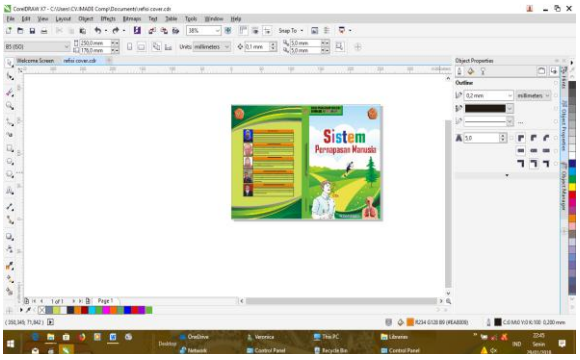

Figure 4.5 Cover View Using the X7 Corel Draw App

Validation and revision of the product by the material expert is done 2 times. The acting as a material expert validator is Mr. Tedjo Sukmono, S.Si., M.Sc. In the first stage, the average score of 3.13 was obtained. In the second stage obtained an average score of 3.4. So that the average material validation is 3.27 and included in the category of "Eligible".

Validation and revision of product by media expert is done 3 times. The acting as a media expert's validator is Mr. Nasrul Hakim, S.Pd., M.Pd. In the first stage, the average score was 2.2. In the second stage obtained an average score of 3.00. In the third stage obtained an average score of 3.65. So that the average media validation of 2.95 and included in the category of "Eligible".

Stage of product implementation is done by the test of biology teacher response as much as 3 people and the test of student response as many as 15 people in class XI MIA SMA Negeri 11 Kota Jambi. In the experimental stage the teacher's response obtained an average score of 91.29 and included in the "Good" category. While in the test phase of student responses obtained score average score of 90.43 and included in the category of "Good".

The evaluation phase of the product is done on its feasibility. Evaluation is done by revising the product based on the suggestion and input from the validator team through the validation sheet, so that the final product is ready to be used.

Conclusion

1. Mind-based biology enrichment books on human respiratory system materials are developed based on ADDIE steps, including analyzing materials and needs for instructional media, designing products using Microsoft Office Word 2016 Software, Imindmap 9, Adobe Photoshop, Canva and Corel Draw X7. Further validate the product by the material experts and media experts,

after the product is declared feasible by the validator then the product tested on teachers and students. The components in the product consist of the front cover, the introduction, the table of contents, the list of images, what is a mind-based biology enrichment book ?, usage guidance, learning objectives, outline material of the human respiratory system, gallery, competency test, glossary, answer key, image source list, referral list and back cover.

2. The products that have been developed are validated by material experts and media experts. Material validation is done twice, so the average score is 3.27 and included in the category of "Eligible". Media validation is done three times, so it can get an average score of 2.95 and included in the category of "Eligible". From the validation result, the learning media in the form of biology based book of mind map on the material of human respiration system stated "Eligible tested".
3. The result of the evaluation of Biology teacher response test at SMA Negeri 11 Kota Jambi to the developed product obtained an average value of 91.29 and included in the category of "Good". This shows that biology subject teachers agree with the development of learning media in the form of biology book based on mind map as one of the learning media on human respiratory system material for MIA class XI students in SMA Negeri 11 Kota Jambi.
4. The result of the evaluation of the class XI MIA students' response test at SMA Negeri 11 Kota Jambi to the developed product obtained an average score of 90.43 and included in the "Good" category. This shows that the learning media in the form of biology book based on mind map on the material of human respiratory system proper to be used in biology learning process in class XI MIA.

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