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DEVELOPMENT ENCYCLOPEDIA BIOLOGY AS A REFERENCE FOR STUDENTS OF SENIOR HIGH SCHOOL

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ABSTRACT

The purpose of the development Encyclopedia biology learning tools and materials as a reference for students of Senior High School is knowing the quality of encyclopedia was developed based on the results of the assessment by a validator. This research include research development. The development model which used in this study is 4D model (Define, Design, Develop, dan Desseminate). The instrument assessement of the encyclopedia quality form of sheet check list by using Likert scale. The kind of data which took is validation from the experts, the response of theacher and students. The results of the expert assessement material, media experts, and linguists an average to 81,3% with very decent criteria. Biology teacher's response is 84% and the student's response is 82,06%. Based on the assessment of the validator and responses, so it can be concluded that these materials can be said to deserve be used for the students in the biology learning for Senior High School.

Keywords: Research Development, Encyclopedia, Reference.

1. INTRODUTION

Biology is one branch of Natural Sciences (Science or science). Biology can be studied in various ways, one of which is through scientific work by carrying out laboratory activities. In the laboratory students get learning experience through interaction with lab tools and materials. In this learning activity students are involved directly starting from determining learning goals, preparing materials and practice procedures, doing it themselves, seeing the results, taking notes, analyzing, and making conclusions.

According to Minister of National Education Regulation Number 24 of 2007 concerning School Facilities and Infrastructure standards, the biological laboratory space functions as a place for the ongoing practice of biology learning that requires special equipment. Because in the laboratory there are many types of lab tools and materials that have different functions, so to avoid the occurrence of errors in the use of tools

and materials, students are required to have knowledge of equipment and lab materials in the biology laboratory which includes names, functions and how to use the tools lab materials in the laboratory. Practical learning activities in the laboratory will be different from classroom learning, in order to be able to work in the laboratory students are required to be active and skilled in conducting experiments using a variety of biological laboratory equipment (Sulistiyawati, 2015).

Knowledge about biology laboratory equipment is important given to students from the beginning as basic knowledge in carrying out practical activities and to improve the process skills and student learning outcomes. The results of the initial observations obtained as many as 42.1% of students had difficulty in using a practicum. In addition, biology practicum activities in the laboratory are one form of utilization of the science laboratory in accordance with its functions. Encyclopedias of lab tools and materials are presented in an interesting manner, students in general are expected to be more motivated to take good practice.

From the results of observations to biology teachers by using a closed questionnaire on teaching materials given by the teacher to students, that is obtained by data 66.7% of teachers gave LKS to students, while only 25% of teachers gave additional practical instructions to students. Therefore, the teaching materials used by students are only limited to worksheets and practical instructions from the teacher. Reference limitations are one of the factors that also have an impact on the smooth implementation of biological practicum. In addition, the encyclopedia is a book that contains a description or description of the summary of various things in science that are arranged alphabetically or according to the scientific environment. Apriyadi (2017) reveals that unlike most other books, the encyclopedia has its own peculiarities, which include information accompanied by images that are appropriate to the topic. In addition, in its use, the encyclopedia has its own convenience that allows readers to get the desired information more easily.

Responding to various things above, a learning resource that can be used by students to find various information about the introduction of tools and materials in biology laboratories is needed. Encyclopedias are one form of good learning resources to be developed in the material of biological laboratory equipment and materials. So from that it is necessary to research the development of Encyclopedia of Biological Practicum Tools and Materials for high school students.

2. METHOD

The design of this study is research and development (Research and Development). Research and development (Research and Development) is a research method used to produce certain products, and test the effectiveness of these products (Sugiyono, 2016). The development model used in this study is the 4D model (Define, Design, Develop, and Desseminate). This research develops an encyclopedia of biological practicum tools and materials for high school students.

Product assessment at the initial stage is carried out by material experts, media experts and linguists. After the expert assessment stage was carried out and revised according to needs, then it was continued on the assessment of limited scale trials carried out with readability tests by students and then revised as needed. after being revised then a small-scale trial was conducted with the response of biology teachers and student responses. This development research instrument uses questionnaire validation by experts, student readability questionnaires, teacher response questionnaires and student responses. Data obtained from this study are in the form of qualitative data and quantitative data. Qualitative data is data in the form of input and suggestions from experts who are then analyzed descriptively, while quantitative data is data in the form of scores from experts and readability of students. Quantitative data were analyzed using a Likert scale with the following score criteria.

Score 5 = Very Worthy

Score 4 = Eligible

Score 3 = Fair enough

Score 2 = Less Worthy

Score 1 = Very Less Worthy

The percentage formula used is, as follows:

$$P = \frac{\Sigma x}{\Sigma x_i} x\ 100\%$$

Information:

P = Percentage of validation each aspect

$\sum x$ = Number of respondents' answers each aspect

$\sum x_i$ = Amount of ideal value each aspect

The results obtained are interpreted using Table 1.

Table 1. Criteria for Eligibility

Percentage of validator rating	Qualitative Criteria
80% < x ≤ 100%	Very Worthy
60% < x ≤ 80%	Worthy
40% < x ≤ 60%	Enough
20% < x ≤ 40%	Less Worthy
0% < x ≤ 20%	Very Less Worthy

(Source: Adapted from Sugiyono, 2011)

Products that have been tested are evaluated and refined so that the products developed are in accordance with the needs of students and are worthy of being used as learning books in schools.

3. RESULTS AND DISCUSSION

The 4D development model begins with the define step step at this stage is the front end analysis aims to determine the problems faced in Biology learning and practicum. Analysis of students aims to determine the character of students such as problems faced by students and identify the success of students to a material, not or there is material that still does not meet the criteria. Furthermore, the analysis of the concept, namely

identifying tools and materials, will be elaborated in detail in the Biology practicum material based on the Basic Competency (KD) of Biology High School.

The design phase is the design stage preparing a prototype encyclopedia of biology lab tools and materials. Product design is by presenting biology practicum tools and materials arranged alphabetically. Explanation of the material in the encyclopedia includes the names of tools and materials, building materials, functions of tools and materials, and the dangers of chemicals.

The develop phase is the product development stage developed through validation by 3 material experts, 3 media experts, and 4 linguists. The assessment component for material experts is the feasibility of content and feedback aspects of students. Assessments from material expert validators are presented in Table 2 as follows.

Table 2. Recapitulation of Results of Material Validation

Important Aspects	Assessment by Validator			Scores for each aspect	Ideal score each aspect	Percentage
	X1	X2	X3			
Aspects of eligibility content	24	18	21	63	75	84%
Feedback Aspects	25	18	15	58	75	77,3%
Total Score	**49**	**36**	**36**	**121**	**150**	**161,3%**
Average Percentage				**81%**		
Intepretation Criteria				**Very Worthy**		

Based on the results of the validation of high average material experts. The percentage of validation in the aspect of content eligibility was 84% with the interpretation criteria "Very Worthy" and the feedback aspect the percentage reached 77.3% with the "Worthy" interpretation criteria. The results of the expert validation of the total aspects assessed amounted to a total of 121 with a percentage of 81% so that the "Very Worth" interpretation criteria were obtained.

Table 3. Recapitulation of Results of Media Expert Validation

Important Aspects	Assessment by Validator			Scores for each aspect	Ideal score each aspect	Percentage
	X1	X2	X3			
Attention Aspect	13	12	13	38	45	84,4%
Aspect of feasibility presentation	39	37	35	111	135	82,2%
Total Score	**52**	**49**	**48**	**149**	**180**	**167%**
Average Percentage				**83%**		
Intepretation Criteria				**Very Worthy**		

Based on the results of the validation recapitulation by media experts, the total score was 149 with an average percentage of 83% with the "Very Worth" interpretation criteria. The attention aspect reached a percentage of 84.4% with the interpretation criteria "Very Worthy", while the feasibility aspect of the presentation reached 82.2% with the "Very Worth" interpretation criteria.

Table 4. Recapitulation of Results of Language Expert Validation

Important Aspects	Assessment by Validator			Scores for each aspect	Ideal score each aspect
	X1	X2	X3		
Aspect of language feasibility	20	19	22	80	100
Average Percentage				**80%**	
Intepretation Criteria				**Worthy**	

Based on the results of the validation recapitulation by linguists, there were 80 scores per aspect with an ideal score of 100 and an average percentage of 80% with the "Worthy" interpretation criteria.

Table 5. Results of Readability Questionnaire Analysis

No	Student's Name	Score aspects assessed										Total
		1	2	3	4	5	6	7	8	9	10	
1	Siswa 1	4	3	4	4	4	5	4	4	4	3	39
2	Siswa 2	4	3	4	4	4	5	4	4	3	4	39
3	Siswa 3	4	3	4	5	4	5	4	4	3	4	40
4	Siswa 4	3	3	4	4	4	4	3	4	3	4	36
5	Siswa 5	4	3	4	3	4	5	4	5	4	4	40
6	Siswa 6	3	3	4	4	5	4	3	4	4	4	38
7	Siswa 7	3	4	4	5	4	4	3	4	3	3	37
8	Siswa 8	3	3	3	4	5	4	4	3	4	4	37
9	Siswa 9	3	3	4	4	4	4	4	4	4	4	38
10	Siswa 10	3	3	4	3	5	5	4	3	4	4	38
11	Siswa 11	4	3	4	4	4	4	4	4	4	4	39
12	Siswa 12	3	3	4	4	4	4	4	4	4	4	38
13	Siswa 13	3	3	4	4	4	4	4	4	4	4	38
14	Siswa 14	4	3	4	4	4	4	4	4	4	4	39
15	Siswa 15	3	4	4	4	4	4	4	4	4	4	39
Total Score												575
Percentage												77%

Based on Table 4.7, it can be seen that the number of scores obtained is 575 from a maximum score of 750. The percentage gain in the scale test is limited to 77%. This value is included in the range of 61% - 80% with the Agree category which means that the encyclopedia has proper readability for students. Encyclopedia of biology lab tools and materials can be read by students clearly, and equipped with pictures. Even though the encyclopedia has proper readability for students, the module still undergoes improvements based on the suggestions of the students at a limited scale test. Some of these inputs need to be added to the picture in the title sub-chapter to make it more interesting. These suggestions will be considered for phase III revisions.

Data from the Biology teacher questionnaire analysis were used to determine the response of Biology teachers to the encyclopedia of biology lab tools and materials developed. The results of the statement of questionnaire analysis are shown in Table 6 as follows.

Table 6. Results of Biological Teacher Responses

No	Item to	Score
1	1	5
2	2	5
3	3	5
4	4	3
5	5	4
6	6	4
7	7	4
8	8	4
9	9	4
10	10	4
Total Score		**42**
Percentage		**84%**

Based on Table 4.5, it can be seen that the total score obtained is 42 from a maximum score of 50. The percentage of Biology teacher response questionnaires is 84%. This value is included in the range of 80% -100% in the scoring criteria and is included in the category of Strongly Agree.

Data from the results of student response analysis are used to determine students' responses to the encyclopedia of biology lab tools and materials developed. The results of the student response analysis are presented in Table 7.

Table 7. Results of Student Response Questionnaire

No	Item to	Skcore
1	1	40
2	2	40
3	3	41
4	4	40
5	5	41
6	6	42
7	7	41
8	8	43
9	9	43
10	10	41
11	11	40
12	12	43
13	13	43
14	14	41

15	15	42
16	16	42
17	17	43
18	18	40
19	19	41
20	20	43
21	21	39
22	22	40
23	23	41
24	24	41
25	25	41
26	26	39
27	27	41
28	28	42
29	29	39
30	30	40
31	31	41
32	32	40
33	33	41
34	34	40
35	35	41
36	36	41
Total Score		**1477**
Percentage		**82,06 %**

The number of scores obtained was 1477 from the maximum score of 1800. The percentage of student response questionnaires was 82.06%. This value is included in the range of 80% -100% in the scoring criteria, and is included in the category of Strongly Agree which means that students respond very positively to the use of encyclopedia of biology lab tools and materials.

4. CONCLUSIONS AND SUGGESTIONS

Based on the results and discussion above, it can be concluded that the average value of the experts is 81.3% with the criteria of Very Worthy. This shows that the quality of the encyclopedia of biology lab tools and materials developed based on the assessment of material experts, media experts and linguists is appropriate to use. Therefore, researchers suggest

further development can be applied to the android so that students are more interested and easier to access.

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