Development Of Science Learning Tools Using Iinquiry Learning Model To Student Learning Outcomes

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ABSTRACT

This research refers to the procedure for conducting research and development following the stages of implementation according to Borg and Gall. The test subjects consisted of theoretical trials and empirical trials. Theoretical trials consist of learning device experts and learning material experts in the field of science. The empirical trial consisted of 10 people in the small group and 27 in the large group. The instruments used were interviews, observation sheets, questionnaires, and learning outcomes tests. The data obtained were analyzed descriptively and using comparative test analysis (Analyze Compare Means) with = 0.05. The results of the product validation of learning device experts are included in the very strong category with a value of 92% and the results of the validation of learning materials are included in the very strong category with a value of 90%. The results of the field test analysis show that the learning products are good for use in the implementation of classroom learning which can be seen through an increase in the average student learning outcomes before and after the implementation of learning. observation sheets, questionnaires, and learning outcomes tests. The data obtained were analyzed descriptively and using comparative test analysis (Analyze Compare Means) with = 0.05. The results of the product validation of learning device experts are included in the very strong category with a value of 92% and the results of the validation of learning materials are included in the very strong category with a value of 90%. The results of the field test analysis show that the learning products are good for use in the implementation of classroom learning which can be seen through an increase in the average student learning outcomes before and after the implementation of learning. observation sheets, questionnaires, and learning outcomes tests. The data obtained were analyzed descriptively and using comparative test analysis (Analyze Compare Means) with = 0.05. The results of the product validation of learning device experts are included in the very strong category with a value of 92% and the results of the validation of learning materials are included in the very strong category with a value of 90%. The results of the field test analysis show that the learning products are good for use in the implementation

of classroom learning which can be seen through an increase in the average student learning outcomes before and after the implementation of learning. The results of the product validation of learning device experts are included in the very strong category with a value of 92% and the results of the validation of learning materials are included in the very strong category with a value of 90%. The results of the field test analysis show that the learning products are good for use in the implementation of classroom learning which can be seen through an increase in the average student learning outcomes before and after the implementation of learning. The results of the product validation of learning device experts are included in the very strong category with a value of 92% and the results of the validation of learning materials are included in the very strong category with a value of 90%. The results of the field test analysis show that the learning products are good for use in the implementation of classroom learning which can be seen through an increase in the average student learning outcomes before and after the implementation of learning.

INTRODUCTION

The development of national education in Indonesia in the future will still be faced with various kinds of problems, including equity and expansion of access; improvement of quality, relevance, and competitiveness. The low quality and relevance of education is influenced by a number of factors, including the quality of the learning process that has not been able to create a quality learning process, the professionalism of teachers who are still perceived as low, especially the performance of teachers who are only oriented to mastery of theory and memorization, thus causing students' abilities to fail. develop optimally and intact, the school curriculum is structured and full of burdens making the learning process less relevant to the conditions and problems that occur in the environment. As a result, the educational process becomes routine, uninteresting,

Education that is able to support development in the future is education that is able to develop the potential of students. Learning is one way how we are able to live and compete in this era that continues to develop and advance. Learning is the development of new knowledge, skills, or attitudes when an individual interacts with information and the environment. According to Yunanto (in Fajri 2011), learning is a learning approach that provides space for children to play an active role in learning activities. According to Trianto (2007), integrated learning is a learning system that allows students, both individually and in groups, to actively seek, explore, and discover scientific concepts and principles in a holistic, meaningful, and authentic way.

Encouraging the The results showed that the science teacher at Franciskus Xaverius Kema Junior High School, so far the implementation of learning is still dominated by a class condition that still focuses on the teacher as the main source of knowledge and learning still lacks emphasis on the potential and abilities of students. The results of the study are also supported by data on the students' mid- semester scores which are lacking. For this reason, it is necessary to choose a learning model that empowers students more and can improve student learning outcomes.

Appropriate learning models need to be applied so as to increase student potential and continuous student learning outcomes, one of which is a portfolio-based inquiry learning model. The inquiry learning model is a series of activities that emphasize the process of thinking critically and analytically to seek and find the answer to a problem in question (Sanjaya, 2006). In essence, the purpose of the inquiry learning model is to develop the ability to think systematically, logically, and critically, or to develop students' intellectual abilities, thus students are not only required to master the material, but how they can use their potential.

Portfolio is a collection or evidence of the progress of a student or group of students, evidence of student achievement, skills, and attitudes. Portfolios display student work or student work that is most meaningful as a result of their activities (Trianto, 2010). Portfolio is also a collection of information that teachers need to know as consideration in determining steps to

A learning model that does not require students to memorize facts, but can encourage students to construct the facts of knowledge that they have acquired based on concepts or principles through a thought process that can encourage students to find answers toproblems in learning.

improve learning or increase student learning.

RESEARCH METHODS

This research uses research and development methods or "Research and Development" (R & D) by following the stages of development research according to Borg and Gall (in Palilingan, 2014)

Development Research Procedure

3.2.1. Planning
The main activities in the planning steps include:
1) Formulation of objectives to be achieved by developing and producing appropriate science learning tools and good science learning tools that can improve student learning outcomes.
2) Determination of success criteria and the type of instrument used. Research hypotheses were tested to prove that the war equipment used could have a positive influence on student learning outcomes. Data were collected using learning outcomes tests, as well as questionnaires.

Designing initial product development activities and conducting field tests include:
1) Have a discussion with the supervisor. All inputs and suggestions from supervisors are recorded and then used as evaluation material in an effort to improve research products.
2) Determination of research subjects and facilities needed by carrying out field observations to determine product trial subjects by considering also the facilities needed in conducting research.
3) Prepare evaluation instruments. The instruments used in the product evaluation stage after field trials were carried out were student learning outcomes tests and student response

questionnaires to the research that had been carried out.

3.2.2. Exploration Studies
In this stage, identification and observation are carried out. The activities carried out are:

1) looking for various information needed related to product development in the form of learning tools that will be produced in accordance with the applicable curriculum.

2) Conduct field observations and surveys to observe directly in order to obtain various information on the state of the school which is the focus of product development.

Design validation is an activity process to assess the product design, in this case the new learning model will actually have a good influence. Product validation is done through:

In this stage, product repairs are carried out by experts. Various inputs from experts in the framework of the product will be better which can be used in research.

After being analyzed based on the data obtained, then the percentage is calculated. The percentage value

indicates the location of the category on a continuous line. The percentage is calculated by dividing the total number of scores achieved by the total number of maximum scores multiplied by 100%.

According to Arikunto (in Polakitan, 2015), the interpretation of the score and its calculation is as follows:

Number 0% - 20%   =Very weak
Figures 21% - 40%   =Weak
Figures 41% - 60%   =Enough
Figures 61% - 80%   =Strong
Figure 81% - 100%   =Very strong

$$\frac{\text{Jumlah skor yang dicapai}}{\text{Jumlah skor maksimum}} \times 100\%$$
$$= \frac{60}{65} \times 100\% = 92\%$$

The material expert's assessment indicated by the continuum line is very strong, which is at 92%, meaning that the learning equipment gets a good assessment and in general the components of the learning device are very good.

After taking data from the reviewer, the researcher also received input from the reviewer directly. The following is an overall summary after several meetings with reviewers in Table 4.2.

Table 1. Summary of Discussions with Learning Device Design Experts

No	Indicator	Change
1	Reviewer comments for product parts that need revision	In the syntax of the learning process, it must contain the learning steps of the model used On student worksheet 1, an observation table must be added to make it easier for students to collect data from practicum results
2	Recommendation	This learning tool is appropriate and can be implemented for students. Before the implementation of the input/evaluation class, it must be corrected first.

This learning material expert assesses the suitability of the material with competency standards, basic competencies, learning objectives, as well as writing the content of the material. He is a doctor in the field of Biology Education so it is very appropriate to assess basic Biology material, especially material on the digestive system.

Table 2. Questionnaire of learning material experts

No	Statement	Scoring scale				
		SB	B	CB	KB	TB
1	The suitability of the SK and KD syllabus to be achieved	✓				
2	Conformity with indicators to be achieved		✓			
3	Clarity of the language used	✓				
4	Clarity of language in the picture.		✓			
No	Statement	Scoring scale				
		SB	B	CB	KB	TB
	Used					
5	The material can guide students in solving problems on the LKS		✓			
6	Systematic content of the material		✓			
7	Clarity of content		✓			
8	Image color is appropriate	✓				
9	Material taken from several Biology books is appropriate	✓				
10	The concepts in the material are easy to understand	✓				

From listThe prepared statement can be seen from the expert's answers on each value as follows:

Answering SB score 5 as many as 5 statements 5 x 5 = 25
Answering B a score of 4 as many as 5 statements 4 x 5 = 20
Answering C score 3 as much as 0 statements 3 x 0 = 0
Answering KB score 2 as much as 0 statements 2 x 0 = 0
Answering TB score 1 is 0 statements 1 x 0 = 0 +

Amount45

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Figure 81% - 100%   =Very strong

$$\frac{\text{Jumlah skor yang dicapai}}{\text{Jumlah skor maksimum}} \times 100\%$$
$$= \frac{45}{50} \times 100\% = 90\%$$

On the continuum line, the assessment of material experts is in the very strong category with a figure of 90%, meaning that the material that has been developed gets a good assessment so that it can be used in field research.

After taking data from the reviewer, the researcher also received input from the reviewer directly. The following is an overall summary after several meetings with reviewers.

Table 3. Summary of Discussions with Learning Material Experts

No	Indicator	Change
1	Reviewer comments for product parts that need revision	Change the use of vocabulary and writing in the content of the material. The pretest and posttest questions should use clear assessments and measurements. Answer must be listed Develop an assessment tool in the form of a rubric.
2	Recommendation	This learning tool is appropriate and can be implemented for students. Before the implementation of the input/evaluation class, it must be corrected first.

TestThis small group trial was carried out at SMP Kr. Jubilee Kema. The subject of the experiment was grade 8 with material on the human digestive system with 10 students. The data collection instrument used was a student response questionnaire. This small group trial is very important to determine the quality in terms of product appearance, material content, and product writing method.

Learning products are distributed to each student, then the researcher guides students in learning procedures using inquiry learning products and models. After completing the learning, students are given a response questionnaire to assess the learning product and provide comments for the improvement of the learning product.

Table 4. Small Group Student Response Questionnaire

No	STATEMENT	SCORING SCALE					Total students
		SB	B	C	K	SK	
1	How does the cover of teaching materials look like?	4 40%	4 40%	2 20%	0	0	10
2	What is the physical appearance of the entire teaching material?	10 100%	0	0	0	0	10
3	Is the first part of the product able to attract attention?	5 50%	2 20%	2 20%	0	1	10
4	Is the explanation of the material easy to understand?	5 50%	5 50%	0	0	0	10
5	Is the caption on the picture easy to read?	10 100%	0	0	0	0	10

6	Are the letters used legible?	10 100%	0	0	0	0	10
7	Can the letters be seen clearly?	8 80%	2 20%	0	0	0	10
8	Does the use of color in the letters not interfere with reading?	7 70%	3 30%	0	0	0	10
9	Is the learning tool in the form of a book interesting to study?	7 70%	3 30%	0	0	0	10
10	Are the pictures in the book clearly visible?	6 60%	4 40%	0	0	0	10
11	Are the colors in the pictures attractive?	7 70%	2 20%	0	0	1 10%	10
12	Are the learning tools in accordance with the learning objectives?	6 60%	3 30%	0	0	1 10%	10
13	Is it easy to remember the material after using the learning device?	6 60%	3 30%	1 10%	0	0	10
14	Can the existing materials help in completing the LKS?	4 40%	5 50%	1 10%	0	0	10
15	Is the learning model used able to increase the enthusiasm for learning in Biology subjects?	7 70%	3 30%	0	0	0	10
16	Is this new innovation in learning able to improve learning outcomes?	4 40%	4 40%	2 20%	0	0	10
	Percentage	**66%**	**27%**	**5%**	**0**	**2%**	**100%**

From the data above, it shows that in general, out of 10 students who were the subject of the research, they gave varied responses to the statements put forward in the student response questionnaires. Calculation of the percentage of students who gave an assessment is as follows:

a. Very Good Category (SB) : 66 %
b. Good Category (B) : 27%
c. Category Fairly Good (C): 5 %
d. Poor Category (K): 0
e. Bad Category (SK): 2%

Based on the student response data above, it can be concluded that the students gave a positive response to the learning product.

Testtry large groups to find out the effectiveness of the products developed to achieve the expected quality of learning. This research was conducted at SMP Kt. Xaverius Kema with 27 students on the digestive system material and held 4 meetings.

OnAt the beginning of learning the teacher explains the inquiry and portfolio learning model to students and informs that the results of the assignments, as well as the results of student learning outcomes will be included in the portfolio document. At each meeting students work on assignments in groups which are divided into 2 groups.

The first meeting used students' products to carry out tasks in the LKS which were carried out in practicum with the aim of identifying the vitamin C content in fruits and drinks containing vitamin C. The results of the practicum report were included in a portfolio document. In the second meeting, students worked on worksheets which were done individually with the aim of distinguishing between mechanical digestion and chemical digestion, distinguishing the digestive tract from digestive glands, and at the end of the study students in the form of groups were given the task of drawing the organs that play a role in the human digestive system. The third meeting of students in the form of groups working on worksheets with the aim of explaining the process of digestion of food in humans.

Another document that is also very important is data on student learning outcomes taken at the beginning of learning and after learning using learning products using an inquiry learning model combined with a portfolio.

The results of this study are needed to test the hypotheses of the research, but before that, the data of learning outcomes are tested for the normality of the data. Following are the results of data normality analysis (Appendix 18) using SPSS version 22 analysis software.

Table.5. Data Normality Test Results

Tests of Normality

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
P1T1	.180	27	.025	.919	27	.038
P1T2	.150	27	.120	.938	27	.108
P2T1	.190	27	.014	.940	27	.125
P2T2	.175	27	.033	.963	27	.440
P3T1	.256	27	.000	.911	27	.024
P3T2	.225	27	.001	.913	27	.027
P4T1	.123	27	.200*	.955	27	.277
P4T2	.179	27	.026	.953	27	.260

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

If the significance obtained > 0.05, then the sample comes from a population that is normally distributed. If the significance obtained is < , then the sample comes from a population that is not normally distributed. From the table of normality test results, most of the learning outcomes data are at a significance level of more than 0.05, so it can be concluded that the data are normally distributed (P1T2, P2T1, P2T2, P4T1, and P4T2). Other results also showed that some test results were below the 0.05 significance (P1T1, P3T1, and P3T2), but the significance obtained was not far from 0.05 so that the data could be considered close to normal.

After testing the normality of the data, the next step is to test the average comparison of learning outcomes to test the research hypothesis. Following are the results of the analysis of hypothesis testing using SPSS version 22 using comparative analysis (Analyze Compare Means) (Appendix 19).

Table. 6. Results of Hypothesis Testing Analysis

		mean	Std. Deviation	T	df	Sig. (2-tailed)
Pair 1	P1T1 - P1T2	-1,963	7,949	-1.283	26	.211
Pair 2	P2T1 - P2T2	-17.778	10,184	-9.071	26	.000
Pair 3	P3T1 - P3T2	-24.185	14,296	-8,790	26	.000
Pair 4	P4T1 - P4T2	-19.296	11,684	-8,581	26	.000
Pair 5	P1T2 - P2T2	-18,815	13,692	-7.140	26	.000
Pairs 6	P1T2 - P3T2	-24.481	13,940	-9.125	26	.000
Pair 7	P1T2 - P4T2	-25.222	10,500	-12,481	26	.000
Pairs 8	P2T2 - P3T2	-5.667	17,045	-1,727	26	.096
Pair 9	P2T2 - P4T2	-6,407	15,714	-2.119	26	.044
Pairs 10	P3T2 - P4T2	-.741	14,935	-.258	26	.799

Information :P = Meeting and T = Test

Based on the learning outcomes data obtained from the research, it can be seen the comparison of the average learning outcomes on each test given at each meeting. Criteria for acceptance of the hypothesis if Sig. (2-tailed) is less than 0.05 then Ho is rejected and H1 is accepted. If Sig. (2-tailed) is greater than 0.05 then Ho is accepted and H1 is rejected.

The comparison of the significance value obtained in the first pair of the first meeting that did not use the learning product was 0.211 > 0.05 so that H0 was accepted and H1 rejected. At the first meeting, using learning without a product had no effect because the significance value was far above the specified significance value.

In general, at meetings 2, 3, and 4 the significance value is far below 0.05, so H0 is rejected and H1 is accepted. Shows the learning products used can have a significant influence in improving student learning outcomes. The results of the comparison between meetings after learning (Posttest results) using products and not using products in pairs 5, 6, and 7 obtained a significance value below 0.05. There is a difference in the average learning outcomes of those who use the product higher while those who do not use the product are lower because the significance value shows a significance value of less than 0.05. While the comparison of learning outcomes after learning using products in pairs 8, 9, and 10 does not show any significant effect because the value obtained is above 0.05.

The results of the observation of affective aspects at the last meeting showed that student involvement in the learning process was good and students really enjoyed the learning process, namely 15% or 4 students were very active, 66% or 18 students were active, and 19% or 5 students were quite active (Appendix 20). In collecting data on affective aspects, students use observation sheets for affective aspects, assisted by teacher friends to facilitate the process of observing students.

Psychomotor result data seen through observationwhen the learning process is carried out in the form of a practicum that aims to identify the content of vitamin C in Fruits and Beverages. The results obtained indicate that the understanding of the work skills of the students is good, as many as 22% or 6 students are very good, 70% or 19 students are good and 8% or 2 students are quite good (Appendix 21) in carrying out the practicum and is also supported by the results presented. orally or in

writing.

Observational data both for affective and psychomotor aspects are part of the learning assessment using a portfolio and are used as supporting data in the implementation of the learning process using learning device products using an inquiry learning model combined with a portfolio.

The data above shows that in general, 27 students who were the research subjects in large groups gave varied responses to the statements put forward in the student response questionnaires.

The results of the calculation of the percentage of students who give an assessment are as follows:

Very Good Category (SB) : 63 %
Good Category (B) : 29 %
Category Fairly Good (C): 5 %
Poor Category (K): 2%
Bad Category (SK): 1%

Based on the student response data above, it can be concluded that the students gave a positive response to the learning product.

The development of learning tools with a portfolio-based learning model on the human digestive system material is made and implemented to improve student learning outcomes for grade 8. The development of learning tools is very necessary to be made and developed considering the importance of full student involvement in the teaching and learning process in the classroom. This research was conducted for 4 meetings at SMP Kt. Franciscus Xaverius Kema in grade 8 with 27 students.

This learning device product has gone through a long stage by following the "research and development" development research procedure as well

as revisions from students and experts who completely follow the steps of development research according to Brog and Gall which have 7 stages of development, namely planning, exploration, initial product development, instrument and data analysis, validation, field testing, revision based on validation results, and product dissemination.

The results obtained through student learning outcomes indicate that there is a difference in the average learning outcomes using learning products and those not using learning products. Learning to use products provides its own privileges for students in increasing the potential of each student so that it has an impact on learning outcomes. The data obtained have been tested for normality of the data and the results show that the data distribution is generally normally distributed. After the data is normally distributed, then test the hypothesis using SPSS version 22 with test analysis using comparative analysis (Analyze Compare Means) and the results show that there is an influence given through the learning products used in the meetings held,

At the meeting that used the product, each meeting obtained pretest and posttest scores, the second meeting with an average of 38.7 pretest and 54.8 posttest, the third meeting, the average of 37.9 for the pretest and 62.1 for the posttest, and the fourth meeting with an average of pretest 43.5 and postset 62.8. The increase obtained occurs at every meeting that is held, although the increase in learning outcomes experienced is not too large, but with these results it shows that there is an influence given through the learning products used. Different results occurred in the first meeting that did not use learning products with an average pretest result of 35.7 and a posttest score of 37.6. This indicates that there is no significant effect on student learning outcomes.

The application of learning using the inquiry learning model combined with a portfolio can help students to explore and find their own concepts related to the subject matter. Finding it yourself will make the student's learning process more meaningful, meaningfulness will deepen memory and understanding of the material being studied so that it will have a positive impact on student learning outcomes.

The results of this study are relevant to research conducted by previous researcherswhich uses inquiry and portfolio learning models. The research they conducted showed an increase in learning outcomes using both the inquiry and portfolio learning models. In line with these studies, in an effort to improve student learning outcomes, this research combines the development of learning tools with inquiry and portfolio learning models. The results of this study produce products that can direct and guide students in the teaching and learning process so as to improve student learning outcomes.

Revision Based on Validation Results

Afterthrough the stages of development and testing in small groups and large groups this learning product has been revised or improved. This final product improvement is needed to improve the device based on input from reviewers and students. The following is the final development product:

1. Learning tools are more focused on each learning step in the inquiry model combined with a portfolio and more emphasis on the objectives of the material used.
2. The material in the learning device is deepened and the pictures in the material are more clarified so that students will better understand the human digestive system, both food substances and digestive organs.

CONCLUSION

The development of science learning tools using an inquiry learning model combined with a portfolio is good and feasible to use in the implementation of learning. The development of science learning tools using an inquiry learning model combined with a portfolio with a product in the form of a book can actually improve the learning outcomes of class VIII students of SMP Kt. Francis Xavier Kema.

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