Development Of Science Learning Tools Using Inquiry 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 ofclassroom 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 of classroom learning which can be seen through an increase in the average student learningoutcomes 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 strongcategory 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 expertsare included in the very strong category with a value of 92% and the results of the validationof 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 averagestudent learning outcomes before and after the implementation of learning.

Keywords: learning tools, inquiry learning model, portfolio, learning outcomes.

INTRODUCTION

The development of national education inIndonesia 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 anumber 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 onlyoriented to mastery of theory and memorization, thus causing students' abilities to fail. develop optimally and intact, the school curriculum is structuredand full of burdens making the learning process less relevant to the conditions and problems that occur in the environment. As a result, the educationalprocess 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 areable 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 individuallyand in groups, to actively seek, explore, and discover scientific concepts and principles in a holistic, meaningful, and authentic way.

Encouraging the The resultsshowed that the science teacher at Franciskus Xaverius Kema Junior HighSchool, 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 scoreswhich are lacking. For this reason, it is necessary to choose a learning model that empowers students more and can improvestudent learning outcomes. Appropriate learning modelsneed 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, thepurpose 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 onlyrequired 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 asconsideration 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 haveacquired 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 thestages of development researchaccording 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 sciencelearning 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 productdevelopment 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 werecarried out were student learning outcomes tests and student response questionnaires to the research that hadbeen carried out.

3.2.2. Exploration Studies

In this stage, identification andobservation are carried out. The activitiescarried out are:

1) looking for various information needed related to productdevelopment in the form of learning tools that will be produced in accordance with theapplicable 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 willactually have a good influence. Product validation is done through:

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

After being analyzed based onthe 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 ofscores achieved by the total number of maximum scores multiplied by 100%.

According to Arikunto (inPolakitan, 2015), the interpretation of thescore 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

The material expert's assessmentindicated by the continuum line is very strong, which is at 92%, meaning that thelearning 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 afterseveral meetings with reviewers in Table 1.

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 usedOn student worksheet 1, an observation tablemust be added to make it easier for students tocollect 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 5statements 5 x 5 = 25
Answering B a score of 4 as many as 5statements 4 x 5 = 20
Answering C score 3 as much as 0statements 3 x 0 = 0
Answering KB score 2 as much as 0statements 2 x 0 = 0
Answering TB score 1 is 0 statements 1 x
0 = 0 +

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 (inPolakitan, 2015), the interpretation of thescore 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

Jumlah skor yang dicapai Amount 45

Jumlah skor maksimum 45.   x 100%

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.

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 thecontent of the material. The pretest and posttest questions should use clear assessments and measurements. Answermust 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, itmust be corrected first.

Test This small group trial was carried outat SMP Kr. Jubilee Kema. The subject ofthe experiment was grade 8 with materialon 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 interms of product appearance, material content, and product writing method.
Learning products are distributedto each student, then the researcher guides students in learning proceduresusing 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 appearanceof the entire teaching material?	10 100%	0	0	0	0	10
3	Is the first part of the product ableto attract attention?	5 50%	2 20%	2 20%	0	1	10
4	Is the explanation of the materialeasy to understand?	5 50%	5 50%	0	0	0	10
5	Is the caption on the picture easyto read?	10 100%	0	0	0	0	10

From the data above, it shows that in general, out of 10 students who were thesubject 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 thelearning product.

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

On at 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 onassignments in groups which are dividedinto 2 groups.

The first meeting used students' products to carry out tasks in the LKS which were carried out in practicum withthe 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 weregiven the task of drawing the organs thatplay a role in the human digestive system.The third meeting of students in the formof groups working on worksheets with the aim of explaining the process ofdigestion of food in humans.

Another document that is also very important is data on student learningoutcomes taken at the beginning of learning and after learning using learningproducts using an inquiry learning modelcombined with a portfolio. The results of this study areneeded 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 ResultsTests 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. Ifthe 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 itcan 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 wasnot far from 0.05 so that the data could beconsidered close to normal.

After testing the normality of thedata, the next step is to test the average comparison of learning outcomes to test the research hypothesis. Following arethe 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 beseen 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 sothat 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 canhave a significant influence in improvingstudent learning outcomes. The results ofthe comparison between meetings after learning (Posttest results) using productsand not using products in pairs 5, 6, and 7 obtained a significance value below 0.05. There is a difference in the averagelearning outcomes of those who use the product higher while those who do not use the product are lower because the significance value shows a significancevalue of less than 0.05. While the comparison of learning outcomes afterlearning using products in pairs 8, 9, and 10 does not show any significant effectbecause the value obtained is above 0.05.The results of the observation of affective aspects at the last meeting showed that student involvement in thelearning process was good and studentsreally 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 thecontent 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 carryingout the practicum and is also supported by the results presented. orally or in writing.

Observationaldata both for as revisions from students and experts who completely follow the steps of affective and psychomotor aspects arepart of the learning assessment using a portfolio and are used as supporting datain 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 putforward 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 toolswith 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 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 researchers which 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

After through 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

finaldevelopment 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 deviceis deepened and the pictures in the material are more clarified sothat students will betterunderstand the human digestive system, both food substances anddigestive 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 actuallyimprove the learning outcomes of class VIII students of SMP Kt. Francis XavierKema.

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