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DEVELOPMENT OF MATHEMATICS LEARNING PACKAGE WITH GEOGEBRA-ASSISTED SCIENTIFIC APPROACH FOR THE EIGHT GRADERS

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Abstract
This is a research and developmentstudy with limited trials which aims to develop the Mathematics Learning Package by using a geogebra-assisted scientific approach in the eight grade of MTs Al-Junaidiyah Biru, Bone Regency. Such learning package includes student books, student activity sheets, learning implementation plans and learning outcomes test. The subjects of this study were twenty two students of class VIIIC MTs Al-Junaidiyah Biru Bone Regency. The development procedure used in this study is the Thiagarajan model or 4D model (Define, Design, Develop, and Disseminate) which includes four phases, namely the limitation, the design, the development, and the small scale distribution phase. Learning packagewith geogebra-assisted scientific approach that had been developed have been validated by experts and have been revised so that results are feasible to use. The results of limited trials show that the learning package produced has been practical and effective. (4) skor rata-rata yang diperoleh siswa pada tes hasil belajar adalah 78,40 dari skor ideal 100 dengan standar deviasi 11,89. Dimana 19 dari 22 siswa atau 86,36% memenuhi ketuntasan individu yang menunjukkan bahwa ketuntasan klasikal tercapai.The results of data analysis are as follows: (1) teacher activities can guide groups to work and learneffectively; (2) students generally give the positive responses to the developed learning package; (3) mathematics learning package with geogebra-assisted scientific approach make students more active in the learning process; (4) the average score obtained by students on the learning outcomes test is 78.40 from the ideal score of 100 with a standard deviation of 11.89. Then, 19 of 22 students or 86.36% fulfilled individual completeness which shows that classical completeness was achieved.

Keywords: Learning package development, mathematics learning, scientific approach, geogebra

INTRODUCTION

It has been widely believed that education is a most common way to improve the quality of human resources. Indonesian Constitution also guarantees the right of every Indonesian people to obtain education. It indicates that the founding fathers highly believe that through education Indonesian people will be able to become intelligent nations which is able to compete with other nations.

Law No. 20 of 2003 concerning the National Education System states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the necessary skills himself, society, nation and country.

In this regard, the government hopes that the changes from curriculum 2006 to the curriculum 2013 can produce the reliable and quality graduates who are able to compete well. This refers to the government's goal to improve the quality of existing human resources so that they have the skills to follow developments and competition in the globalization era. The learning process in curriculum 2013 is carried out with a scientific approach. Kemendikbud (2012) then stated that changes in the 2013 curriculum include competency standards of graduates, content standards, process standards, and assessment standards. Furthermore, the implementation of the curriculum2013 includes: 1) SKL-oriented, improvement and balance of soft skills and hard skills; 2) the use ofscientific approach in the learning process; 3) the use of natural, social, artistic and cultural phenomena; and 4) the use of information and communication technology (ICT) as learning tools. Kemendikbud (2013) also stated that through the implementation of the curriculum2013, it is hoped that Indonesian people can be productive, creative, innovative, and affective through strengthening attitudes (know why), skills (know how), and knowledge (know what). Implementation of the curriculum 2013 also brings a newparadigm in mathematics classroom by integrating ICT in learning process. The use of ICT media aims to reduce learning difficulties caused by the abstract object in mathematics subject. One of softwaresthat can be used as a mathematics learning media mathematics is Geogebra.

According to Hohenwarter (Putrawan, 2014), Geogebra is one of the computer programs to teach students the concepts of geometry and algebra. Geogebra is multi-representation, namely: 1) the appearance of geometry and algebra; 2) graphical display; and 3) a numerical display. These three views are dynamically connected. Geogebra can support students to learn abstract object of geometric and algebraic. Besides, Geogebra is free and easy to use. For the sort of these advantages, the use of Geogebra is expected to reduce learning difficulties experienced by students.

However, based on the observations and interviews resultsat MTs Al-Junaidiyah Biru, it is revealed that in the mathematics learning process teachers tend to transfer their knowledge conventionally with lecture method. Teacher give the material and questions on the board, then the students will solve the given tasks and problems. This caused a number of students at MTs Al-Junaidiyah Biru to have difficulty in understanding mathematics, resulting in low mathematics learning outcomes. Therefore, an approach and model is needed in mathematics learning so that students enjoy learning mathematics.

One solutive way to overcome the weaknesses of mathematics learning is the selection of appropriate learning models and approaches, so that the students are able to actively involve physically, emotionally and socially. The lack of use of devices and learning resources used by students also contributes to the low students' mathematical outcome.

To overcome this, it is deemed necessary to prepare learning package that can be used by students and teachers in mathematics classroom. Such learning packageincludes student books and lesson plan to guide teacher in carrying out the learning process. The mathematics learning package with scientific approach presents objects of natural, social, artistic and cultural phenomena and integrating Geogebra's learning media in the learning process. Geogebra's use in mathematics learning is expected to be able to provide visualization and assistance to students in understanding and determining solutions to problems related to building space.

Based on the background above, researcherthen were encouraged to conduct a research on the development of mathematical learning packagge with geogebra-assistedscientific approach in the eight grade of MTs Al-Junaidiyah Biru Bone Regency.

METHOD

This is Reseach and Development study which includes the development of learning packageconsisting of Student Books, Lesson Plan, Student Worksheets, and Learning Outcomes Test. This research was conducted at MTs Al-Junaidiyah Biru Bone regency, and the research subjects were 22 students in class VIIIC of MTs Al-Junaidiyah Biru. The development of the mathematics learning package in this study refers to the 4-D model (Thiagarajan Model). This model consists of four development phases, namely Define, Design, Develope, and Desseminates, or adapted into a 4P Model, namely Defining, Designing, Developing and Spreading. The research instruments used in this study are learning device validation sheets, observation sheets (teacher and student activities), student learning outcomes tests and student response questionnaires. The data in this study were collected in the following ways: 1) data from expert validation; 2) learning management data; 3) data on the implementation of learning. The data that has been collected using instruments is then analyzed quantitatively and directed to explain the validity, effectiveness and practicality of the developed mathematics learning package with the geogebra-assisted scientific approach. Data obtained from the results of validation by experts were analyzed to explain the validity and feasibility of such the developed mathematics learning package.

The results of the trial class dataareused to explain the effectiveness and practicality of of the developed mathematics learning package with the geogebra-assisted scientific approach.Then, the data from the learning management observation sheet are used to explain the practicality of of the developed mathematics learning package with the geogebra-assisted scientific approach (Darwis, 2007).

The following is the description about validity, effectiveness and practicality data analysis.

1. Data analysis of learning package validity

The validator examines all learning package that have been produced (Draft I). The results of the validation from the experts are used as a basis for revising learning pacage developed with geogebra-assisted scientific aproach. These results are also used for the validity of the use of mathematical learning package developed.

Interval of validity category are as follows:

$4{,}5 \le \overline{V}$: Strongly valid

$3{,}5 \le \overline{V} < 4{,}5$: valid

$2{,}5 \le \overline{V} < 3{,}5$: valid enough

$1{,}5 \le \overline{V} < 2{,}5$: poorly valid

$\overline{V} < 1{,}5$: unvalid (Darwis, 2007)

Note: $\overline{V}$ is validity of mathematics learning package

2. Data Analysis of the Effectiveness of Learning The Geogebra-assisted Scientific Approach

The activity of analyzing data on these four components is as follows:

a. Data Analysis of Students' Learning Outcomes

Analysis is carried out on students' learning outcomes score based on the test given after all the material was thoroughly discussed. The criteria used to determine the score are scale five based on standard categorization techniques established by the Ministry of National Education (Khadijah, 2010), as follows:

Table 1. Standard categorization techniques established by the Indonesian Ministry of National Education

Score	Category
0 – 34	Very Low
35 – 54	Low
55 – 64	Moderate
65 – 84	High
85 – 100	Very High

b. Data Analysis of Sudents' Activity

Data ofstudents' activities observation during the collaboration in the groups carried out were analyzed and described.

Table 2. The Criteria for Achieving Ideal Time Students' Activities

No.	Students' Activities	Ideal Time (IT)	PWI Tolerance Interval (%)	Criteria
1.	Paying attention to information and record as necessary (observing)	22,2% of IT	17,2-27,2	4 of 9 categories were fulfilled and (2), (3), (4), (6) should be fulfilled
2.	Reading LKS, learning material or student books (asking questions and gathering information)	11,1 % of IT	6,1 – 11,1	
3.	Actively involved in the task (reasoning)	15,6 % of IT	10,6-20,6	
4.	Actively discuss with friends (reasoning)	11,1 % of IT	6,1 – 11,1	
5.	Writing down what your friend is saying (gathering information)	8,9 % of IT	3,9-13,9	
6.	Asking questions to friends /teachers (asking questions)	13,3 % of IT	8,3-18,3	
7.	Answering/responding to friend or teacher questions (conclude)	11,1 % of IT	6,1 – 11,1	
8.	Writing down and explaining what is found in seeking information (communicating)	6,7 % of IT	1,7-11,7	
9.	Off-duty activities	0 % of IT	0 – 5	

Note: PWI is the percentage of indicator time
IT is the time available at each meeting

c. Analysis of Students' Response

The criteria to state that students have a positive response towarda learning package with geogebra-assisted scientific approach arewhen 50% of them respond positively to a minimum of 75% of the number of aspects asked (Darwis, 2007).

d. Data Analysis of Teacher Activity

Data from the observation of teacher activities during the collaboration in the groups carried out were analyzed and described.

Tabel 3. The Criteria for Achieving Ideal Time Teacher' Activities

No.	Teacher' Activities	Ideal Time (IT)	PWI Tolerance Interval (%)	Criteria
1.	Informing the problem that must be done together	11.11% of IT	6,11-16,11	Categories (2), (4), (5), (6) and (7) should be fulfilled
2.	Asking students to work on group LKS assignments with collaboration in groups	17.78 % of IT	12,78-22,78	
3.	Giving direction so students are always on group assignments	11.11 % of IT	6,11-16,11	
4.	Controling the group work	15.56 % of IT	10,56-20,56	
5.	Guiding/giving assistance to students in group activities	17.78 % of IT	12,78-22,78	
6.	Asking questions that stimulate students' thinking (insightful questions)	13.33 % of IT	8,33-18,33	
7.	Giving feedback	13.33 % of IT	8,33-18,33	
8.	Off-duty activities	0 % of IT	0 – 5	

Note: PWI is the percentage of indicator time
IT is the time available at each meeting

The development design of learning package

The development design of learning package with limited trials is illustrated on the following flowcharts;

FINDINGS AND DISCUSSIONS

Data of validity was obtained after the learning packagewas being validated by validators and revised by the researcher.

The concluded that the average score or validation results from experts on the learning package developed includingstudent book, student worksheet, lesson plan, and learning outcome test are in the "Valid" category (2.50 <V <3.50) Furthermore, some suggestions from the validator have been received as revised material. This means that the learning package is feasible to be tested.

The results of student activities observationon show that all categories of observed student activities meet the PWI Tolerance Interval (%). It indicates that the criteria for achieving the ideal time of student activities discussed in Chapter III were achieved, namely 9 categories fulfilled and automatically the main conditions namely categories (3), (4), (5), and (8) were fulfilled.

The results of observations of teacher activities shows that all categories of teacher activities observed meet the PWI Tolerance Interval (%) specified. It indicates that the criteria for achieving the ideal time of teacher activity discussed in Chapter III were achieved, namely categories 'Giving direction so students are always in group assignments', 'Controlling/going around paying attention to group work', 'Guiding/giving assistance to students in group activities', 'Asking questions that stimulate thinking students (insightful questions) and feedback'were fulfilled.

The mathematics learning packages that have been revised based on the results of these trials are called Final Drafts. Based on the revised results of the Final Draft, it was found that the validator's assessment was on a good scale and could be used without revision.

Students' responses to mathematics are different. Some of them feel that mathematics is fun and easy, but some other regard mathematics as a challenging or difficult subjct to understand. 19 of 22 students (86.36%) said that mathematics was easy. From the results of the questionnaire it was also obtained 3 out of 22 (13.64%) students who said mathematics was difficult. They will be happier to learn mathematics if they succeed in understanding the material presented and answering the questions given by the teacher.

DISCUSSION

In this study a geogebra-assisted scientific approach was used. This approach is designed so students can actively construct the concepts and principles through the stages of observing (to identify or find problems), formulating problems, collecting data with various techniques, analyzing data, and communicating concepts. The scientific approach is designed to provide understanding to students in grade VIIIc in recognizing, understanding various materials using a scientific approach. Since the information even can come from anywhere, anytime, does not only from the teacher.

Learning with the scientific approach is a constructivist approach to learning, where the teacher acts as a problem presenter, and students are required to be more active in solving the problem. The problems prepared were adjusted to the curriculum used by students in class VIIIC of MTs Al-Junaidiyah Biru, and were validated by experts (validators). Teachers also act as questioners and hold dialogues. Then, teacher will provide direction if needed. The main principle of constructivists is that knowledge is not passively accepted, but is actively built by individuals. Therefore in this study it was built through group cooperation which was deliberately divided into several groups.

The scientific learning approach consists of six main steps; observing, asking, gathering information, associating / processing information / reasoning, drawing conclusions, and communicating. This is because the time is relatively short for each step in the scientific learning approach so that to analyze the results of student work in groups cannot be done as a whole in the classroom.

According to Hohenwarter and Fuchs (2004), geogebra is very useful as a mathematics learning media with a variety of activities, namely as a demonstration and visualization media, as a knowledge construction aid, and as a tool for the discovery process. In addition, geogebra can be an option to understand or solve mathematical problems. As concluded by Proklamanto (2013) that learning using geogebra programs is effective in helping students' mathematics understanding.

Learning package consistsof learning implementation plan (RPP), student books, student worksheets, and learning outcomes tests (Sri Wahyuni: 2009). This learning packagewas prepared based on the curriculum implemented in the class VIIIC of MTs Al-JunaidiyahBiru in accordance with competency standards, basic competencies, and indicators. The learning package was developed for three meetings of the teaching and learning process

and one meeting for the provision of test results. The device is compiled and made as attractive as possible from the learning resources used, the problems given, the material presented, then analyzed from various aspects, contents, giving problems, and writing so that it is worthy of being used in this research. After going through a revision of the validators, the learning package can be used by the students.

The development model used in this study is a 4-D model because it is more systematic and detailed. The stages in the Thiagarajan 4D model are in accordance with the steps in the Research and Development.

There are four stages whih were carried out in this study (Sudjana in Trianto: 2007). The first stage is *define*. In this stage, the researchercarried out curriculum analysis which aims to determine the basic competencies, competency standards, achievement indicators used by thestudents in class VIIIC of MTs Al-Junaidiyah Biru. Student analysis aimed to examine the background knowledge of students, while concept analysis aimed to outline the material used by the ofstudents in class VIIIC of MTs Al-Junaidiyah Biru. Task analysis aimed to answer tasks so that learning objectives could be achieved. Specification of learning objectives aimed at to determine the achievement and learning objectives of students in class VIIIC of MTs Al-Junaidiyah Biru.

The second stageis *design*.In this phase is the preparation of tests, namely the preparation of instruments on student ability tests. The selection of media;in this case, media is the used learning package and media in the form of a geogebra program. Format selection results in the design of learning package and learning outcomes tests which will be given to student as research subject in this study.

The third stage is *develope*.In this phase, researcher obtain a learning package that has been revised by experts and has been tested to students in class VIIIC MTs Al-Junaidiyah Biru. So that the implementation plan of learning, student books, student worksheets, and tests of acquired learning outcomes have been analyzed and are feasible to use.

The fourth stage is*deployment (dessiminate)*. This phaseincludes the spread of mathematics learning package in schools, but in this study it was not carried out due to time constraints, the spread of this study was limited to the schools where this research was conducted.

Based on the data on the average percentage of student activity from the three meetings, it was obtained that students were more active in carrying out activities in the first, second and third categories, namely paying attention to information and taking notes as needed, reading LKS and being involved in the task. This was because students were interested in doing assignments on the subject of fractions that were related to problems in everyday life.

In addition, the format of the student book and student activity sheets were completed with questions and drawings to make students interested and motivated to learn. In addition, information obtained from all categories is fulfilled, while the condition that student activities were achieved 4 out of 9 tolerance interval categories must be fulfilled, namely categories (2), (3), (4), and (6). It indicated that the criteria for achieving the ideal time of student activity was achieved. Whereas for teacher activity data, information obtained from all categories was fulfilled. While the condition was that teacher activity is achieved in 5 out of 8 categories at the tolerance interval must be fulfilled, namely categories (2), (4), (5), (6) and (7). It indicated that the criteria for achieving the ideal time of student activity was achieved.

Students' responses to mathematics are different. Some of them feel that mathematics is fun and easy, but some other regard mathematics as a challenging or difficult subjct to

understand. 19 of 22 students (86.36%) said that mathematics was easy. From the results of the questionnaire it was also obtained 3 out of 22 (13.64%) students who said mathematics was difficult. They will be happier to learn mathematics if they succeed in understanding the material presented and answering the questions given by the teacher.

CONCLUSION

Based on the discussion above, it can be concluded that:

1. The mathematics learning package was developed with a geogebra-assisted scientific approach on the subject of Cubes and Beams. In this study, the learning package included Student Books, Student Worksheets, lesson plan, and learning outcome test using the Thiagarajan model or 4-D model which includes four stages, namely the define stage, the design stage, the development (develop) stage, and the dissemination (disseminate) stage. After doing validation and revision for three times, the learning package which include Student Books, Student Worksheets, lesson plans, and learning outcome testwerecategorized to be valid, practical, and effective to use.
2. Mathematics learning package withgeogebra-assisted scientific approach developed is categorized to beeffective because they meet the effectiveness criteria, with the following results:
   a. Minimum learning outcomes are in the high category. The average score obtained by students on the learning outcomes test is 78.40 from the ideal score of 100 with a standard deviation of 11.89 with students completing learning 19 people from 22 people or 86.36% from the classical completeness of 75%.
   b. Students become more active in the learning process. It is seen that all categories of student activities are fulfilled.
   c. All categories of teacher activities are met.
   d. In general students give a positive response to the learning device used.
3. Mathematics learning package with geogebra-assisted scientific approach developed is categorized to be practical;Learning packagemeetsthe validity for all indicators Based on data from observers, it appears that the teacher is able to manage learning with geogebra-assisted scientific approach.

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