

DEVELOPING MEDIA OF MATHEMATICS LEARNING BASED PROBLEM BASED LEARNING TO LEARN LINE AND ANGLE FOR 7TH JUNIOR HIGH SCHOOL

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Abstract

This research was about development research that had purpose to make product and describe the quality of product that must fulfill aspect of validity, practicality, and effectiveness. The product consisted of student worksheet and visual aid (frame of line and angle) based on Problem Based Learning approach to learn mathematics material about line and angle especially in basic competence 3.13 and 4.13 for 7th grade of junior high school.

This development research used Plomp methods with 5 phases such as phase of preliminary investigation, phase of design, phase of realization or construction, phase of test, evaluation, and revision, and phase of implementation. Subject of this research was 32 students of 7th grade of junior high school 1 Mlati with 90,62% of students passed school grade value, it meant learning objectives were achieved.

The result of this development research were: (1) product was valid to help students learn about line and angle, basic competence 3.13 and 4.13; (2) product was practise to help teacher and students in learning process; (3) product was effective with achieved of learning objectives. This product was valid, practice, and effective so it could be implemented in learning process.

Key words: line and angle, worksheet and visual aid (frame of line and angle), Problem Based Learning, Plomp methods.

INTRODUCTION

Education is a conscious and well-planned effort to create an atmosphere of learning and learning process so that students are actively developing their potential to have spiritual spiritual power, self-control, personality, intelligence, noble character, and skills needed by them, society, nation and state (UU No. 20 in year 2003 about National Education System). To create an education that can develop self-potential of every student in school, it is necessary to hold a fun learning activity, innovative, and can improve student learning activities. Successful education can be demonstrated by several indicators, one of which is the

achievement of students's understanding of the material taught in the school. Based on the curriculum of 2013, there are some materials that must be understood by the students according to the level of education, for the VII grade junior high school (SMP) even semester, there is the material about line and angle which is one of the basic competences of geometry that must be mastered by students. The material is also a prerequisite for understanding the next basic geometric competence material, such as: identifying triangular properties based on the sides and angles, identifying rectangular properties, determining the angle of planeg anometry and solid geometry,

determining the same angles of the concept of congruence, and determining same the angles of the concept of similarity. Thus, if students do not understand the material about line and angle well, students will have difficulty when studying the basic concept of the next material of geometry.

The role of teachers in the learning process is very important, teachers are expected to create a conducive atmosphere of learning, innovative and fun for students. Students are expected to understand the material given so as to apply it in various mathematical problems. Learning materials can be understood by students, if the learning materials are taught and presented well using media of learning that can help students to understand it. But in practice, not all learning in the school goes as expected, there are many things that cause the learning does not run properly, one of which is teachers use media of learning in the learning process rarely. This is in accordance with the statement from Sudjana (2002: 2) that the appropriate media of learning can attract student's attention so it will improve their motivation to learn.

Based on the results of researcher's observation when practice of teaching (PPL) in SMPN 1 Mlati, mathematics teachers still rarely use

instructional media such as student worksheet with assisted props in teaching the subject matter to the students. student worksheet used are student worksheet taken from books that have been provided from the government, although student worksheet taken from book have been adjusted with curriculum 2013, not all students are able to understand what is presented in student worksheet. The material written in the book, explained directly followed by examples of problems and alternative solutions. Students are asked to read and understand the explanation of the material first independently, followed by analyzing the existing problems in the book along with alternative solutions already listed in it, then the students are directed to work on the problem of existing exercises . Nevertheless, students have not been able to capture what is described in the book, students need steps where they can explore and analyze the taught material by conducting real experiments that improve their understanding of the material being studied. This concrete experiment can be done using various visual aids in classroom, one of which is props which will be developed in this research to understand the material about angular relationship formed from two parallel lines cut by transversal line.

In addition, to help students understand the material, it is also necessary use the learning approach adjusted to the needs of the students. Now curriculum 2013 is implemented in schools focuses in student-centered learning which the activity of students in the class is very preferred. Although the teacher only acts as a facilitator in learning, the teacher still guides and accompanies the students of each activity in the classroom. Many teaching approaches can be used by teachers in each lesson to facilitate students to actively participate in the classroom . One of them using problem-based learning approach, where problem-based learning is abbreviated as PBL is a learning approach that begins with the presentation of problems that are designed relevant to the material being studied. This PBL approach directs students to active in learning based on the problems presented. However, in realization the PBL approach is still rarely applied in school that now has implemented the curriculum 2013.

SMPN 1 Mlati is one of schools that has been using the curriculum 2013 based on scientific approach and began to be applied in class VII of the academic year 2016/2017. The scientific approach is the characteristic of the curriculum 2013 can be applied in the learning process by collaborating scientific approach with

student-centered approach by using problem-based learning approach (PBL) . But in practice, teachers in SMPN 1 Mlati rarely use other learning approaches because the teacher still uses a purely scientific approach with the steps already stated in the book to teach the material to students in the class so that the teachers do not try yet to collaborate the scientific approach with various learning approach such as problem based learning (PBL). As mentioned earlier , the curriculum 2013 does not restrict teachers from choosing learning approach, the most important is that the applied learning approach can improve student's understanding and activeness. Therefore, the use of problem based learning (PBL) in learning needs to be improved to facilitate students in order to learn more independently and actively in the classroom.

Based on the information of mathematics's teachers in SMPN1 Mlati, the material about line and angle is one of the difficult materials to be understood by students. Many students have difficulties to understand the concepts of line and angle, such as: determining the relationships between angles formed from two parallel lines cut by transverse lines, determining the angular alignment, differentiating angle types, and solving the mathematical problems associated with concepts of line and angle. The difficulties

of the students in understanding the material of line and angle are also shown on the percentage of mastering mathematics exam subjects of junior high school academic year 2014/2015 about solving problems related to the relationship of two lines: large angle with the following results; At the school level of SMPN 1 Mlati 49,21% students can solve the problem of line and angle, at the level of Sleman city as much as 43,46% students can solve the problem of line and angle, at provincial level of Yogyakarta counted 41,88% can solve the problem of lines and angles, and at the national level as much as 44.55% students can solve the problem of lines and angles. From the result of the percentage of the number of students who are able to solve the problems of the lines and angles on the national exam of 2014/2015 in all four levels, the average is 44.77%.

This indicates that more than 50% of students in SMP Negeri 1 Mlati, at district level of Sleman, province of Yogyakarta, and nationally have not mastered the line and angle materials especially in the matter of determining the size of the angle or the straightener formed from two intersecting lines. The concept of determining the angular alignment of the two intersecting lines is a part of the line and angle material studied in basic competence 3.13 and 4.13 about

the angular relationship as a result of two parallel lines cut by the transverse line.

Based on the text above, to improve the expected learning process and improve students' understanding of the material lines and angles, it is necessary to develop an interesting learning media and facilitate students in learning. Therefore, researchers intend to create a product that can serve as a learning medium for students in learning the material lines and angles. This study is limited to conceptual and problem-solving materials related to angular relationships as a result of two parallel lines cut by transverse lines. So the basic competencies used are 3.13 and 4.13. Products developed in the form of student worksheets equipped with props to support the learning process. Student worksheet is expected to help the students to move in order to understand the concept, by manipulating the props given.

Given the need to develop mathematics learning media on line and corner materials, researchers will develop learning media in the form of student worksheet and props using problem based learning (PBL) approach. Learning media developed will be tested in SMPN 1 Mlati to find out whether the learning media can be applied in school or not. After the test results are done, revision of instructional media will be made in accordance with the results of the trial evaluation

conducted at SMPN 1 Mlati. Learning media developed, applicable in schools if they meet valid, practical, and effective criteria, this is in accordance with the statement Nieveen (1999: 24).

The purpose of this research development is to produce learning media of mathematics in the form of student worksheet and props based on problem based learning (PBL) approach and to know the level of feasibility of media of mathematics learning that developed.

RESEARCH METHOD

Type of Research

Type of research used is research development. Based on Van den Akker (1999: 3-5) the purpose of development research can be seen from various perspectives that can not be separated. If viewed from the perspective of media and technology, the purpose of this research is to increase the variation in the learning process so that learning becomes more dynamic and learning objectives more easily achieved. The products are developed by the researcher as the media of mathematics learning based on the problem based learning approach such as student worksheet with the props shaped frame of line and angle to learn the materials in basic competence 3.13 and 4.13 for the seventh grade students of junior high school.

Subject of Research

The subjects of this research were 32 students of class VII at SMPN 1 Mlati, Sleman, Yogyakarta. The research was conducted in 2nd semester of academic year 2016/2017 in March-April 2017.

Procedure of Research

The development procedure used in this research is development procedures developed by Plomp (1997 : 5) consisting of preliminary investigation phase, design phase, realization or construction phase, test, evaluation, and revision (test , evaluation , and revision)phase, and implementation phase.

In the preliminary investigation phase conducted at the beginning of the research, the researcher analyzed and searched for information related to school activities to identify problems that will be found solution to solve the problem. The results of analysis in this phase are intended to analyze the gap between the desired competence and the competencies held now. Analysis of the initial investigation is obtained from observations, literature studies, and teacher interviews.

In the design phase, the researcher determines the problem solving or finds a solution to solve the problems that have been raised in the preliminary

investigation phase. The problem solving that is chosen by the researcher is to create mathematics learning media in the form of student worksheet and props of frame of line and angle that can support the learning process. At this stage, researcher designs the content and layout of student worksheet and the props first that based on the learning objectives to be achieved. The purpose of this learning in accordance with indicators of achievement of competencies that have been designed by researcher.

In the realization or construction phase, the researcher creates a pre-designed learning media. Developing props of designed materials and materials, creating student worksheet with pre-designed designs, starting from cover, layout, and contents. In addition, the researcher also made an instrument evaluation that used to determine the quality of developed media of learning. Instrument evaluation used in this research are media assessment sheets, learning result tests, teacher assessment sheets, and observation sheets. Student worksheet, props structures, and instrument evaluation are described in the next section in the instrument of research.

In test phase, evaluation, and revision (test , evaluation , and revision) phases, the researcher performs theoretical

testing or validation of the product to know the quality of media of learning from validity aspect. The validation of the product is done after the student worksheet and the props are prepared, have been discussed_together with the supervisor. Validation of this product is done by requesting assessment, suggestion, or opinion from expert lecturers and teachers on developed media of learning. Then, validation results are evaluated and revised in accordance with ratings, suggestions, or opinions of expert lecturers and teachers before being applied in the class.

In the implementation phase is done by conducting trial media of learning involving_32 students of class VII B, SMPN 1 Mlati. The purpose of this trial is to know the results of student learning using media of learning. After the learning is done, empirical testing is done to know the quality of the media from the aspect of effectiveness and practicality. Therefore, given the test at the end of the learning to determine the achievement of learning objectives (knowing the quality of learning media from the aspect of effectiveness). In addition , teachers also provide an assessment of the use of media of learning by filling out the teacher's assessment sheet to determine the quality of media of learning from the aspect of

practicality. The practicality of media of learning is also supported by the results of teacher and student interviews on media of learning that had been applied in the class.

Types of Data

There are 3 types of data from this research, namely: (1) product effectiveness data, this data in terms of the feasibility of content and conformity with the problem based learning approach obtained from the assessment sheet filled by expert lecturers and class teachers; (2) product practicality data, this data is obtained from the teacher's assessment sheet and supported by the result of student and teacher interview about the product in the form of instructional media that have been use . Product is considered practical if the product can help and facilitate teachers and students in the learning process; (3) product effectiveness data, this data is obtained by analyzing student learning result obtained from written test result conducted at the end of research. The product is considered effective if the percentage of of learning achievement obtained at least 70%.

Instruments of Research

The instruments of research used are student worksheet, frame of line and angle as props, assessment sheets of

media of learning by expert lecturers and class teachers, observation sheets of instructional implementation, test of learning outcomes, teacher assessment sheets after learning media used, and interview guidelines for teacher and student.

Technic of Data Analysis

Data of research obtained, then analyzed to determine the quality or level of eligibility of learning media developed according to Nieveen (1999 : 24), where the media of learning can be used well in the class if it meets the valid, practical, and effective criteria. Media of learning declared valid, if the results of the assessment of expert lecturers and teachers stated that the media is worth a trial in school. Media of learning is considered practical, if it allows teachers and students to do easily in learning process. Media of learning declared effective, if the learning objectives are achieved that is indicated by the percentage mastery of learning achievement of at least 70%. Percentage of learning achievement (P) can be searched using the following formula:

$$P = \frac{\text{many completed students}}{\text{many students who take the test}} \times 100$$

Students are said to be completed when obtaining a score that already meets the applicable KKM at school that is 70.

RESULT AND DISCUSSION

The results of this research are :

(1) Student worksheet and the props as frame of line and angle based on problem based learning approach; (2) The result of learning media validation obtained from the assessment sheet of the learning media by the expert lecturer and the class teacher stated that the learning media is worthy to be tested in the class with some revisions. So it can be said that the learning media is valid, for the results of revision that has been done presented in the attachment F2; (3) Result of learning achievement test is 29 completed students from 32 students who take the test. Here are the results of learning achievement test:

Description	Result	
Mean	90,38	
Median	98	
Modus	100	
Deviation Standard	14,10	
Highest Score	100	KKM=70
Lowest Score	46	
Incompleted Students	3 students	
Completed Students	29 students	

Based on the table, it can be seen that from 32 students of class VII B, SMPN 1

Mlati, there are 29 completed students. So that the percentage of learning achievement (*P*) can be searched by the formula:

$$P = \frac{\text{many completed students}}{\text{many students who take the test}} \times 100$$

$$P = \frac{29}{32} \times 100\% = 90,62\%$$

Media of learning is effective if the percentage of learning achievement obtained at least 70%. From the calculation above to find the value of *P*, obtained percentage of learning achievement (*P*) to 90.62% . Thus, the media of mathematics learning is effective and can be applied in SMPN 1 Mlati; (4) The result of the teacher's assessment after the learning media is used is the teacher feel that it helps in teaching the material of line and angle, then after doing interview with teacher and student, reasearch get result that teacher and student can use use the media of learning easily, so the results of interview can be said that the learning media is practical because it helps teachers and students in learning.

Based on the results of validation, the results of application of media in schools, the results of learning achievement, the results of the assessment by teachers, and the results of interviews with teacher and students can be seen that

the media of learning has valid, practical, and effective criteria.

CONCLUSION AND SUGGESTION

Conclusion

Based on this research development which media of mathematics learning in the form as student worksheet and the props frame line and angle based on problem based learning approach to learn the materials in basic competence 3.13 and 4.13 for students of grade VII in SMPN 1 Mlati, obtained the following conclusion:

1. The media of mathematics learning is valid or feasible to be used as a learning tool for students of grade VII junior high school in studying the line and angle of basic competence 3.13 and 4.13.
 2. The media of mathematics learning is effective because students can follow the learning well and learning objectives can also be achieved.
 3. The media of mathematics learning is practical because teachers and students are interested and can use the media of mathematics learning easily.
- Fulfilling aspects of validity, effectiveness, and practicality according to Nieveen this makes the media of mathematics learning in the form as student worksheet and the props frame of line and angle can be used well in the class.

Suggestion

Based on research that has been done, suggestions that can be submitted to researchers and the other researchers who are interested in this research is that researchers should be more in-depth study of problem-based learning approach and its application in real learning. As researcher also do that for self-development. Due to the experiment of media in this research only done in one class at SMPN 1 Mlati. Researcher also suggested to researchers who will develop the media of learning can conduct trials in the field with a wider scale .

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