DEVELOPMENT OF MATHEMATICAL LEARNING DEVICES ON TRIGONOMETRY MATERIAL WITH THE PEER TUTORING METHOD

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Abstract. This study aims to produce mathematics learning tools in the form of syllabi, learning implementation plans (RPP), and student worksheets (LKPD) using the peer tutoring method in senior high schools that are tested for validity. The development of learning tools in this study uses the ADDIE development model which consists of 5 stages, namely Analysis, Design, Development, and Evaluation. However, due to Covid-19 constraints, researchers can only develop the ADDIE model up to the Analysis, Design, and Development stages. The data collection instrument in this study used syllabus validation sheets, lesson plans validation sheets, and worksheet validation sheets. The data collection technique used was validation data from 2 Lecturers of FKIP Mathematics at Riau Islamic University and 2 Mathematics Subject Teachers at SMA PGRI Pekanbaru. The data analysis technique used is a descriptive statistical analysis which describes the data that has been collected and will be tested for its validity. From the results of the validity test, it was obtained that the syllabus validation results were 93.02% with very valid information, the RPP validation results were 96.36% with very valid information, and the LKPD validation results were 95.80% with very valid.
Keywords: *learning devices, peer tutoring, mathematics learning*

1. INTRODUCTION

Education is an essential need for everyone, because through education humans can know what they do not know. With education, humans can gain knowledge that is very influential in their lives. In the Al-Qur'an [1] it has been explained that humans were created in the most perfect form to seek knowledge contained in the Al-Qur'an surah An-Nahl: 78:

وَٱللَّهُ أَخۡرَجَكُم مِّنۢ بُطُونِ أُمَّهَٰتِكُمۡ لَا تَعۡلَمُونَ شَيۡـٔٗا وَجَعَلَ
لَكُمُ ٱلسَّمۡعَ وَٱلۡأَبۡصَٰرَ وَٱلۡأَفۡـِٔدَةَ ۙ لَعَلَّكُمۡ تَشۡكُرُونَ ٧٨

Meaning: "*And Allah brought you out of your mother's belly in a state of not knowing anything, and He gave you hearing, sight and heart, so that you are grateful*".

Equipped with several senses such as hearing, sight, and mind which are important tools in seeking knowledge so that we become knowledgeable human beings. This is because knowledge is the foundation of every deed one does because a deed that is done without a foundation of knowledge will plunge a person into

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mistakes in doing good deeds. We can get knowledge through formal or informal education which aims to increase human potential.

Education plays a very important role in realizing a complete and independent human being as well as being a human being who is beneficial to the environment. Quality education is inseparable from the role of educators. The role of educators is indispensable in improving and perfecting the education system. For this reason, Educators are very responsible for the success of student learning. Educators must be able to concoct the learning system and the method of delivering material so that it becomes interesting, effective and innovative so as to be able to encourage student creativity and foster student motivation to learn.

One of the education that we can get in school is mathematics. The desired mathematics lesson is learning that directs students to activities on how students learn and how to encourage them to become quality, critical, logical, and constructive students. Through mathematics a person is able to solve everyday life problems, create and use sophisticated tools. So students from the elementary and secondary education levels are required to master mathematics well and be able to apply mathematics in their lives.

Recognizing the importance of mathematics at the educational level, serious attention is needed to improve mathematics learning outcomes. According to [2] the success of students learning mathematics is inseparable from the quality of teaching carried out by the teacher. The efforts to improve the quality of education that can be done are implementing an education system that has been made by the government and developing teacher learning tools.

Learning devices are tools that must be prepared before learning activities take place in order to carry out the learning process in accordance with the learning objectives. In [3] states that the learning tools needed in managing the learning process are in the form of Syllabus, Learning Implementation Plans (RPP), and Student Worksheets (LKPD), Lesson textbooks, and learning media. Therefore teachers can develop Learning Tools in order to build and develop students' knowledge and thinking.

As for the results of the researcher's interview on June 17 2020 with the math teacher for class X SMA PGRI Pekanbaru and obtained information that: (1) the learning tools used by the teacher already refer to the 2013 curriculum, (2) in learning it is still focused on teachers not students, (3) there are still some students who do not have their own handbooks because there are no books from the school. (4) the teacher has never used the peer tutoring method.

Based on the information obtained, the researcher concludes that the above weaknesses indicate that the quality of the teaching materials used is still not good enough, it is necessary to change the implementation of a learning system that involves the active role of students in learning activities so that there is interaction between the teacher and the participants. students and between students and students. The way to overcome these problems at school is by developing mathematics learning

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tools, namely syllabus, learning implementation plans (RPP) and student activity sheets (LKPD) using the peer tutoring method. The Peer Tutoring Method (peer tutor) means that students teach other students or those who act as tutors (tutors) are students.

As for the research conducted by [4] (2013: 188), where in his research it was said that it was necessary to have a teaching material that was adapted to the needs of students to solve students' problems in applying interrelated concepts of learning mathematics. Because teaching materials are all forms of materials in the form of a set of materials arranged systematically that are used to assist teachers/instructors in carrying out learning activities. The teaching materials designed are student books which also contain student worksheets while the learning tools designed are syllabus, lesson plans and TKPM (Mathematical Reasoning Ability Test) and implemented using the peer tutor method on distance material in three-dimensional space.

In line with that, [5] said that to improve students' understanding of learning, a teacher must be able to provide study guides that can be used by students to make it easier for students to understand the lessons conveyed by the teacher. In addition to this, the relationships that are strung between students and students and also teachers and students also influence learning activities.

Based on the description above, it can be concluded that the learning process is still focused on the teacher and not on students, so it is necessary to improve learning tools that can activate participants in learning so that relationships are established between teachers and students and students with students.

In this connection, the researcher is interested in taking up research with the title "Development of Mathematical Learning Devices with the Peer Tutoring Method in Trigonometry Material for Class X SMA PGRI Pekanbaru".

2. RESEARCH METHOD

The form of research in this research is development research, namely developing learning tools in the form of syllabus, learning implementation plans (RPP) and student worksheets (LKPD). Where the device uses the peer tutoring method on trigonometry material in class X SMA PGRI Pekanbaru. The development of this learning tool uses the ADDIE development model which consists of 5 stages, namely Analysis, Design, Development, Implementation, and Evaluation. However, due to the Covid-19 constraints, researchers can only develop the ADDIE model up to the Analysis stage, the Design stage, and the Development stage.

The data collection instruments in this study were syllabus validation sheets, lesson plans validation sheets, and LKPD validation sheets. The validation sheet created by the researcher uses indicators that have been made by experts in previous studies. Those who acted as validators were 2 lecturers from Mathematics FKIP Riau Islamic University and 2 Mathematics Subject Teachers at SMA PGRI Pekanbaru. Data analysis techniques can be calculated using the formula:

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$$V_a = \frac{TSe}{Tsh} \times 100\%$$

The results of the validation and the results of the combined validation analysis after knowing the level of presentation can be matched or confirmed with the following validation criteria:

Table 1. Validation Criteria

Validity Criteria	Validity Level
85,01 % - 100,00 %	Very valid, or usable without revision.
70,01 % - 85,00 %	Moderality Valid, or can be used but needs minor revision.
50,01 % - 70,00 %	Less valid, it is recommended not to use it because it needs major revisions.
01,00 % - 50,00 %	Invalid, or may not be used

Source: [6]

3. RESULTS AND DISCUSSION

Results Preliminary Research

Analysis Phase

In this study, researchers used the analysis stage as a first step to obtain information through interviews about the learning tools used by the PGRI Pekanbaru high school mathematics teacher on June 17 2020.

Design Stage

Researchers designed learning tools that were developed namely Syllabus, Learning Implementation Plans (RPP) and Student Worksheets (LKPD).

Development Stage

The development stage is the stage of realizing the design that has been designed to become a reality. In this study, researchers developed learning device products in the form of syllabus, lesson plans and worksheets. The learning device was tested by the validator before being implemented by validating it. The product validation results obtained are described in the following table:

Table 2. Average Syllabus Validation Results for Each Validator

Syllabus	**Percentage Validity (%)**				**Average (%)**	**Description**
	v_1	v_2	v_3	v_4		
	96,88	96,88	96,35	84,38	**93,62**	**Very Valid**

Based on Table 2, it is obtained that the total average percentage of syllabus validation for each validator is 93.62%, in which the syllabus made can be used without revision.

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Table 3. Average RPP Validation Results for Each Validator

RPP	Validity Percentage (%)				Average (%)	Description
	v_1	v_2	v_3	v_4		
RPP-1	95,91	93,99	100	84,13	93,51	Very Valid
RPP-2	98,08	96,15	100	100	94,23	Very Valid
RPP-3	100	100	100	100	98,56	Very Valid
RPP-4	100	82,69	94,23	96,63	99,16	Very Valid
Total average result of RPP validation for each validator					**96,36**	**Very Valid**

Based on Table 3, it is obtained that the total average percentage of RPP validation for each validator is 96.36%, in which the RPP made can be used with minor revisions.

Table 4. Average LKPD Validation Results for Each Validator

LKPD	Validity Percentage LKPD (%)				Average (%)	Description
	v_1	v_2	v_3	v_4		
LKPD -1	98,44	95,31	95,31	84,38	93,36	Very Valid
LKPD -2	98,44	96,88	100	92,19	96,88	Very Valid
LKPD -3	96,88	95,31	100	96,88	97,27	Very Valid
LKPD -4	96,88	95,31	100	90,63	95,71	Very Valid
Total average result of LKPD validation for each validator					**95,80**	**Very Valid**

Based on Table 4, it is obtained that the total average percentage of LKPD validation for each validator is 95.80%, where the LKPD made can be used with minor revisions.

Discussion

The products resulting from this research are mathematics learning tools which consist of syllabus, learning implementation plans (RPP) and student worksheets (LKPD). The learning device was developed based on the 2013 curriculum using a scientific approach and using the peer tutoring method on trigonometry material for class X at the high school level. The model for developing the mathematics learning tools used is the ADDIE model which consists of 5 stages, namely: 1) Analysis Stage, 2) Design Stage, 3) Development Stage, (4) Implementation Stage, and (5) Evaluation Stage. However, due to the Covid-19 constraints, researchers can only develop the ADDIE model up to the Analysis stage, the Design stage, and the Development stage.

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At the Analysis (analysis) stage, the researcher conducted interviews with the mathematics teacher for class X SMA PGRI Pekanbaru on June 17 2020 and obtained some information that the teacher had used learning tools that referred to the 2013 curriculum, but the learning process activities were still focused on the teacher is not the student and the teacher at the school has never used the peer tutoring method before.

After carrying out the Analysis (analysis) stage, the researcher then carried out the Design (design) stage, namely making a learning device design, namely in the form of a Syllabus, Learning Implementation Plan (RPP) and Student Worksheets (LKPD). At the design stage, the researcher also made instruments in the form of syllabus validation sheets, lesson plans validation sheets, and LKPD validation sheets. The validation sheet created by the researcher uses indicators that have been made by experts in previous studies.

After designing the learning device, the researcher then proceeded to the Development stage, namely making the design a reality. The important step in the Development stage is testing before implementation. Where at this stage the learning tools made will be validated by 2 lecturers of Mathematics at FKIP UIR, namely Dr. Dedek Andrian, S.Pd, M.Pd and Dr. Lilis Marina Anggraini, S.Pd, M.Pd and 2 math teachers at PGRI Pekanbaru High School, namely Suprihatiningsih, S.Si and Rafiqah Sari, S.Pd using the prepared validation sheet. After the learning device was validated by the validator, the researcher then revised it according to the validator's suggestion. Then after making revisions, the validator is asked to fill out a questionnaire for the Syllabus validation sheet, RPP validation sheet, and LKPD validation sheet. After getting the results from the validation sheet that has been filled in by the validator, the researcher then processed the data and obtained a total average syllabus of 93.62% with Very Valid information, an average total result of lesson plans of 96.36% with Very Valid information, and the total average result of LKPD is 95.80% with Very Valid information.

Based on the validation results obtained, the development of mathematics learning tools using the peer tutoring method on trigonometry material is feasible to use. With this learning tool, it is hoped that it will be able to make students active in the learning process and able to understand learning concepts easily with guidance from tutors.

4. CONCLUSION

Based on the results of the research and data analysis that has been carried out, it can be concluded that the mathematics learning tools developed by researchers using the peer tutoring method have very valid results so that the learning tools are feasible to use.

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