

DEVELOPMENT OF MATHEMATICAL LEARNING DEVICES BASED ON CONTEXTUAL LEARNING ON THE MAIN MATERIAL OF THE SET

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Abstract. The research aimed to produce a mathematical learning device based on contextual learning. This research uses the ADDIE model, which consists of 4 stages: the Analysis stage, the Design stage, the Development stage, and the Evaluation stage. The researcher did not use the Implementation (trial) stage in the ADDIE model because school learning in the 2019/2020 school year was carried out online. The data collection technique used a non-test technique, namely by using a validation sheet as a data collection instrument which was given to 4 validators consisting of 2 FKIP UIR lecturers and two mathematics teachers at SMP Negeri 8 Pekanbaru. The data analysis technique used is the quantitative descriptive analysis technique of ratio data. The results showed that the feasibility of learning tools in lesson plans had an average of 88.48% for the four validators. For LKPD, the average of the four validators was 90.83%, with very valid criteria. Based on these results, it can be concluded that the development of learning tools based on contextual learning on the subject matter of the set is valid.

Keywords: *ADDIE, Contextual Learning, Learning Tools*

1. INTRODUCTION

Education has a major role in personal and social development that affects individual and social change, peace, freedom, and justice [1]. Education is expected to be able to create a quality generation so that it is capable and proactive in responding to the challenges of an ever-changing era [2]. Education is a conscious effort that has been planned and an evaluation is given to students by educators to achieve learning outcomes. Innovation in the education system is needed in order to realize a quality next generation of the nation, one of which is by changing the curriculum. The change in curriculum that occurs in Indonesia is something that is very understandable because it follows the dynamics of today's life which makes the curriculum adapt to the state of community development.

The implementation of the 2013 curriculum was developed based on core competencies and basic learning competencies according to the education unit. At the State Junior High School (SMPN) 8 Pekanbaru, problems were found based on the results of interviews and observations of researchers with one of the mathematics teachers at SMPN 8 Pekanbaru on January 20, 2020, the results showed that in teaching and learning activities (1) Teachers had tried to apply the 2013 curriculum but students many still struggle to understand it; (2) During teaching and learning activities only a few students pay attention to the teacher and students tend to be lazy to

pay attention; (3) students feel that the teaching materials used are not interesting, it can be seen from the LKPD which is used as a support for learning resources other than printed textbooks; (4) the learning model used by the teacher has not been able to attract the interest of all students to be active/participate in learning. Teachers should be able to adapt the appropriate model or strategy to be used during the learning process. The Learning Implementation Plan (RPP) used by the teacher is sourced from the internet, so the RPP that will be used during learning will not be in accordance with the conditions of the students in the classroom. RPP should be conducive and innovative so that students can learn well according to their abilities.

Permendiknas 2006 [3] states that mathematics subjects aim to make students have the following abilities:

- a. Understanding mathematical concepts, explaining the relationship between concepts and applying concepts or algorithms, flexibly, accurately, efficiently, and precisely in problem solving.
- b. Uses reasoning on patterns and traits, performs mathematical manipulations in making generalizations, constructing proofs, or explaining mathematical ideas and statements.
- c. Solving problems which include the ability to understand problems, design mathematical models, complete models and interpret the solutions obtained.
- d. Communicate ideas with symbols, tables, diagrams, or other media to describe a situation or problem.
- e. Have an attitude of mutual respect for the usefulness of mathematics in life, namely having curiosity, attention, and interest in learning mathematics, as well as a tenacious and confident attitude in problem solving.

Based on this, the teacher as a facilitator must be good at directing students to solve a problem in the subject of the set. The solution is that the teacher can guide students in working on the problems in the LKPD with contextual learning that can bridge students in learning mathematics by using contextual learning. Contextual learning is learning that connects the subject matter obtained in school with the real life of students. With contextual learning can train students' ability to think actively, creatively and can solve problems related to everyday life. There are seven main components of contextual learning that underlie the application of learning, namely (1) Constructivism; (2) Find; (3) Asking; (4) Learning Society; (5) Modeling; (6) Reflection; and (7) Actual Assessment [1]. The application of the seven main components in contextual learning can improve students' ability to acquire knowledge and skills from a limited context, then construct their own which is useful for solving problems encountered in everyday society [1]. With contextual learning, it is hoped that it will create a classroom in which students will be active participants, not just passive observers, and are responsible for their learning [4].

Based on the above background, researchers are interested in conducting research to develop learning tools with the title "*Development of Contextual Learning-Based Mathematics Learning Devices on the Main Materials of the Association*" to facilitate and assist teachers in implementing or implementing the 2013 curriculum in the future.

2. RESEARCH METHOD

The type of research conducted in this research is research and development in the form of lesson plans and LKPD learning tools. This study uses the ADDIE development model (analysis, design, development, implementation, and evaluate) while the field trial/implementation stage cannot be carried out on students due to the implementation of PSBB during the Covid-19 pandemic which closed schools as stated in Article 4 paragraph (1) Government Regulation Number 21 of 2020 [5].

The data analysis technique used in this study is descriptive analysis which describes the validity of valid learning tools that have been developed by calculating scores for each indicator of the data collection tool/instrument filled in by the validator. The data collection instrument uses the RPP validation sheet and the LKPD validation sheet with the provisions of giving a score given to the validator which can be seen in the following table:

Table 1. Validation Sheet Assessment Category

Skor Penilaian	Kriteria
4	Very Agree
3	Agree
2	Poor Agree
1	Not Agree

Source: Modification [6]

3. RESULTS AND DISCUSSION

Research Results

The results of the validation of the learning tools in the form of RPP and LKPD on the subject matter of the set in class VII SMP based on the grid from each of the RPP and LKPD learning tools. RPP validation is designed based on high-value RPP components according to modifications [7] and [8] with several aspects, namely the formulation of learning objectives, teaching materials, learning activities, learning resources, as well as assessment instruments and a few modifications by researchers by adding language. The RPP validation sheet is made based on the development of the validation sheet in more detail, the validation sheet grid is in the table below:

Table 2. Grid of RPP Validation Sheets

Rated aspect	Achievement Indicator	Statement Number	Number of Items
Formulation of Learning Objectives	Conformity of learning objectives with KI, KD and Indicators	1&2	2
	The suitability of learning objectives with the level of student development	3	1
	The suitability of the learning objectives to be achieved in accordance with the time provided	4	1
Learning materials	The suitability of the material with the learning objectives and KD	5&6	2

Rated aspect	Achievement Indicator	Statement Number	Number of Items
Learning Activities	The suitability of the sequence of learning activities with Contextual Learning	7	1
	Loading learning activities by linking with those in everyday life	8	1
	Clarity of learning stages	9	1
	Activities involving students	10	1
	Time allocation accuracy	11	1
Learning Resources	The suitability of learning resources with teaching materials and student needs	12&13	2
Assessment instrument	Appropriateness of assessment with learning objectives	14	1
Language	Use of language according to EYD	15	1
	Ease of language used	16	1
Number of Items			16

While the LKPD validation sheet is made based on good LKPD criteria according to [8] and [9] with aspects; namely content, didactic, construct, technical and time. The grid for the LKPD validation sheet is as follows.

Table 3. Grid of LKPD Validation Sheets

Rated aspect	Achievement Indicator	Statement Number	Number of Items
Quality of LKPD material content	The suitability of the material with KI and KD	1	1
	Material presentation	2,3,4,5	4
LKPD conformity with didactic requirements	Activities that stimulate students	6,7	2
	Suitability with students' abilities	8,9	2
LKPD conformity with construct requirements	Accuracy in the use of language and sentences	10,11,12,13	4
	There is enough space	14	1
LKPD conformity with technical requirements	Appearance	15,16	2
	Writing	17	1
	Layout	18	1
	Picture	19	1
LKPD conformity with time	Time compatibility	20	1
Number of Statement Items			20

Based on Table 4, the results of the validation assessment of the Learning Implementation Plan (RPP) for the first meeting up to the sixth meeting have a very valid level of validity and have gone through the following validation process.

Table 4. Calculation Results of RPP Validation

RPP	Validity Percentage (%)				Average (%)	Validity Level
	V1	V2	V3	V4		
RPP-1	98,44%	78,13%	85,94%	95,31%	89,45%	Very Valid
RPP-2	87,50%	84,38%	90,63%	95,31%	89,45%	Very Valid
RPP-3	84,38%	82,81%	89,06%	96,88%	88,28%	Very Valid
RPP-4	82,81%	85,94%	89,06%	95,31%	88,28%	Very Valid
RPP-5	87,50%	79,69%	89,06%	98,44%	88,67%	Very Valid
RPP-6	81,25%	79,69%	87,50%	98,44%	86,72%	Very Valid
Average Total					88,48%	Very Valid

The results of the RPP validation obtained an average total of 88.48% so from these results that the RPP developed by the researcher is included in the Very Valid category or can be used in the learning process. While the results of the Student Worksheet (LKPD) validation assessment for the first meeting up to the sixth meeting have a very valid level of validity and have gone through the following validation process.

Table 5. LKPD Validation Calculation Results

LKPD	Validity Percentage (%)				Average (%)	Validity Level
	V1	V2	V3	V4		
LKPD-1	86,25%	81,25%	93,75%	97,50%	89,37%	Very Valid
LKPD-2	96,25%	82,50%	92,50%	95%	91,56%	Very Valid
LKPD-3	95%	81,25%	90%	98,75%	91,25%	Very Valid
LKPD-4	91,25%	80%	88,75%	98,75%	89,68%	Very Valid
LKPD-5	98,75%	81,25%	88,75%	98,75%	91,87%	Very Valid
LKPD-6	95%	86,25%	85%	98,75%	91,25%	Very Valid
Average Total					90,83%	Very Valid

The results of the LKPD validation obtained an average total of 90.83% so that from these results it was applied that the LKPD developed by the researcher was included in the **Very Valid** category according to the LKPD validity criteria.

Discussion

This development research aims to produce a product and this development research is aimed at the junior high school level. The development research in question is to develop mathematics learning tools in the form of Learning Implementation Plans (RPP) and Student Worksheets (LKPD) according to the 2013 curriculum and using Contextual Learning on the subject matter of the set. The process of developing mathematics learning tools based on contextual learning refers to the type of ADDIE development that has been modified into ADDE (*Analysis, Design, Development, and Evaluation*).

At the analysis stage, the researcher conducted interviews with teachers in the field of mathematics studies regarding the learning tools used and the difficulties encountered by the teachers in designing learning tools. And the difficulties faced by students in the learning process by using LKS books from publishers that are colorless and less attractive. Some students during learning tend to be silent and less active either asking or asking

questions. Next, the teacher shows the learning tools used for learning in the form of a hardcopy of the lesson plans. Researchers see the lesson plans used by the teacher are lesson plans purchased/similar from the internet.

The product design stage of research development researchers designed learning tools, namely RPP and LKPD by designing 6 meetings for each RPP and LKPD then to determine the level of validity the researchers designed a validation instrument in the form of a validation sheet. The validation sheet for the Learning Implementation Plan (RPP) contains 6 aspects that will be assessed, namely: 1) Formulation of Learning Objectives; 2) Learning Materials; 3) Learning Activities; 4) Learning Resources; and 5) Assessment Instruments; 6) Language. Then the validation sheet for the Student Worksheet (LKPD) contains five aspects that will be assessed, namely: 1) Content Aspects; 2) Didactic aspects; 3) Construct Aspects; 4) Technical; and 5) Time.

In the Development phase, researchers make learning tools, namely RPP and LKPD based on the 2013 curriculum, each of which consists of 6 RPP and 6 LKPD for six learning meetings. The researcher developed a learning tool in the form of a Learning Implementation Plan (RPP) using contextual learning accompanied by scientific learning on the subject matter of the set for the junior high school level. The contextual learning lesson plans consist of seven main components of contextual learning, namely (1) constructivism; (2) Find; (3) Asking; (4) Learning Society; (5) Modeling; (6) Reflection; and (7) Actual Assessment which is included in the core activity, while for the Student Worksheet (LKPD) there are questions related to contextual learning.

Furthermore, at the evaluation stage, validation was carried out by 4 validators consisting of 2 mathematics lecturers from FKIP UIR and 2 mathematics teachers at SMP Negeri 8 Pekanbaru. Validation was carried out starting from June 22, 2020 to July 02, 2020. The validation of the learning tools researchers carried out the revision stage by correcting errors contained in the RPP and LKPD according to the suggestions given by the validator. Revision of learning tools is only done once with corrections of errors and suggestions from the validator. At the stage of device validation, namely the RPP and LKPD, the researcher received advice from the validator about the RPP and LKPD that the researcher designed. As for the validator's suggestions, namely: 1) in the RPP, scientific learning activities have not been shown; 2) sentences on story questions on LKPD are difficult to understand; 3) the LKPD still lacks questions related to contextual learning; 4) time allocation on LKPD can be adjusted accordingly. The validation stage is carried out with the aim of knowing the level of validity of the RPP and LKPD, from the combined validation results of validators obtained an average validation for RPP as much as 88.48% with a very valid category and for LKPD as much as 90.83% with a very valid category and can be used without revision.

2. CONCLUSION

The results of the research and validation of learning tools that have been carried out, it can be concluded that mathematics learning tools have been produced in the form of Learning Implementation Plans (RPP) and Student Worksheets (LKPD) based on

Contextual Learning on the subject matter of the VII Junior High School Association which have been tested for validity.

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