DEVELOPMENT OF MATHEMATICAL LEARNING DEVICES BASED ON THE POE (PREDICTION, OBSERVATION, EXPLANATION) MODEL IN THE MATERIAL OF CONSTRUCTING FLAT SIDE SPACES

Faisal Bakti[1*)], Rezi Ariawan[2]

[1,2]Universitas Islam Riau
[1*)]Faisalbakti1997@gmail.com
[2)]reziariawan@edu.uir.ac.id

Abstract. Mathematical creative thinking is the ability to produce varied answers or ideas to solve problems in mathematics. This study aims to build a valid learning device on flat-sided geometry using the POE model *(Prediction, Observation, Explanation).* The learning tools developed were syllabus, lesson plans, and LKPD on the flat side space building material. This type of research is development research with the ADDIE model, modified into three stages (*Analysis, Design* dan *Development)* without the implementation and evaluation stages. The research data collection instrument was a learning device validation sheet in a syllabus, lesson plans, and LKPD. Analysis of the data used is descriptive data analysis that describes the level of validity of the product. This study resulted in a valid syllabus, lesson plans, and LKPD with 83.65%, 87.86%, and 86.31%, respectively. This study concludes that the Development of mathematical learning tools based on the POE model on the flat-sided geometry material has been tested for validity
Keywords: ADDIE, Explanation, Observation, Math Learning Tool, Prediction, (POE)

1. INTRODUCTION

Education is a process to influence students to adapt as well as possible to their environment, which will cause changes in themselves that allow them to function adequately in people's lives. Teaching functions to direct this process so that the goals of the change can be achieved as desired [1].

Mathematics is a powerful communication tool, concise and clear, can be used to present information, improve logistical thinking skills, accuracy, and ability to solve challenging problems [2]. The objectives of learning mathematics according to the 2013 Curriculum are 1) Improving intellectual abilities, especially high-level abilities of students; 2) students' ability to solve a problem systematically; 3) Obtaining high learning outcomes; 4) Train students in communicating ideas, especially in writing scientific papers; 5) Develop student character. The purpose of learning mathematics at the SD/MI level is to recognize simple numbers, simple arithmetic operations, measurements, and fields. The objectives of the 2013 curriculum are: to prepare Indonesian people to have the ability to live as individuals and citizens who are faithful, productive, creative, innovative, effective, and able to contribute to the life of society, nation, state, and world civilization [3].

There are three types of learning models suggested by the 2013 Curriculum, namely discovery learning models, problem-based learning models, and project-based learning.

The difference between the three lies in the objectives, namely 1) The discovery learning model aims to find the meaning of the characteristics, differences, similarities of an object, concept, or other learning objects; 2) Problem-based learning model aims to solve a problem faced by students related to certain basic competencies; 3) The project-based learning model aims to work on certain works or activities related to certain basic competencies. The devices used in the learning process are called learning devices. Learning tools needed in managing the teaching and learning process can be in the form of: student books, syllabus, Rencana Pelaksanaan Pembelajaran (RPP), Lembar Kegiatan Peserta Didik (LKPD), Evaluation Instrument or Tes Hasil Belajar (THB), and Learning Media [4].

The teacher is a professional educator because he has sincerely volunteered himself to accept and carry part of the education mandate borne on parents' shoulders [5]. The teacher's main task is to educate, teach, guide, direct, train, assess, and evaluate students in early childhood education through formal education, basic education, and education, as well as additional tasks relevant to school/madrasah functions [6].

The learning process is a system consisting of several interrelated components that interact with each other in achieving learning objectives. One of these components is a learning device. From the description above, it can be seen that a professional teacher must be able to make learning tools in the form of a syllabus, lesson plans, and LKPD before starting the learning process. Professional teachers must make plans before carrying out learning in the classroom. A good teaching and learning process must be preceded by good preparation.

In the process of implementing learning, the teacher does not use LKPD. The teacher only uses textbooks. The teacher's learning activities are explaining the subject matter, giving examples, and then providing exercises. In addition, the teacher only gives questions taken from books so that students are lazy to work on the questions given. This causes students not to try to find their own concepts of the material being studied. In the learning process used in schools, many approaches are dominated by the lecture method and giving assignments [7].

Based on the factors causing the low learning outcomes, it is very important for educators, especially teachers, to understand the characteristics of the material, students, and the selection of learning models. Thus learning will be more varied, innovative, and constructive in building students' knowledge. To achieve these learning objectives is determined by many factors, one of which is supported by the use of appropriate learning models. One learning model exploring students' prior knowledge is the Prediction Observation Explanation (POE) learning model. The purpose of this research is to develop learning tools in the form of syllabus, lesson plans, and LKPD that are able to help teachers and encourage students to be more active by developing learning tools based on the POE model.

2. RESEARCH METHOD

This research is development research. There are two models in development research, namely 4D and ADDIE. In this study, the researchers used the ADDIE model because the ADDIE learning tools could be used briefly and following the products developed by the researchers and used this learning model in developing learning tools. After all, according to Mulyatiningsih, this model can be used for various forms of product development such as models, learning strategies, learning methods, media, and teaching materials [8].

This research will be implemented at MTsS Masmur Pekanbaru in class VIII students, but this research does not conduct trials on the products developed. This is due to the Covid-19 pandemic, so students carry out the online learning process. The product validity test starts on July 25 – August 28. In this development research, the product validity test was carried out by two lecturers of mathematics education at FKIP UIR and two teachers of MTsS Masmur subjects. The questionnaire given aims to measure the validity of the developed device.

3. RESULTS AND DISCUSSION

Research Results

From the research that has been done on the material of the flat side, the results of the study are obtained from the validation process. The validation and revisions carried out on the syllabus include 1) There are components of the syllabus; 2) Relevance of KI, KD, and indicators; 3) Determination of material in accordance with KI, KD, and indicators; 4) Formulation of learning activities with the POE model; 5) Development of assessment tools in accordance with KI, KD, and indicators; 6) Details of lesson time allocation according to KI, KD, and indicators; 7) Selection of media, tools, and learning resources in accordance with indicators and learning activities; 8) Use of good and correct language.

Table 1. Validation Results of the Fourth Validator

Validator	Empirical Score	Maximum Score	Average Percentage	Validity Level
Validator 1	43	52	82,69%	Valid
Validator 2	44	52	84,61%	Valid
Validator 3	43	52	82,69%	Valid
Validator 4	44	52	84,61%	Valid
Combined Validator	**174**	**208**	**83,65%**	**Valid**

The table above shows the data on the results of the syllabus validation scores developed for class VIII MTsS Masmur Pekanbaru. The validation score given by validators 2 and 4 is the highest score compared to the scores given by validators 1 and 3. Based on the assessments of the four validators in Table 1, the average percentage of Validators 2 and 4 is higher than validators 1 and 3 with a difference the score between validators 2 and 1 is a difference of 1 point. Thus the average percentage given by all validators, the average percentage value given ranges from 82% - 84%.

Furthermore, validation of the Learning Implementation Plan (RPP) includes 1) Formulation of clear, complete, logically structured learning objectives, encouraging students to think at higher levels; 2) The material description is clear, in accordance with the learning objectives, student characteristics, and scientific Development; 3) The organization of learning materials is clear enough in terms of material, depth and breadth, systematic, coherent, and in accordance with the time allocation; 4) Learning resources according to student development, teaching materials, contextual environment with students, and varied; 5) Learning scenarios (beginning, core, end), in detail, complete, and the learning steps reflect the learning methods/models used; 6) The learning steps are in accordance with the objectives, describing the methods and media used, the possibility of forming an accompaniment impact, allowing the following process to occur for students, and the allocation of each step; 7) The explicit learning technique in the learning step, according to the learning objectives, encourages students to actively participate, motivate, and think actively; 8) Included is the completeness of the RPP in the form of procedures and types of assessment according to learning, there are various assessment instruments (test and non-test) and an assessment rubric.

Table 2. Results of RPP Validation by the Four Validators

RPP	Validity Percentage (%)				Average (%)	Validity Level
	V1	V2	V3	V4		
RPP 1	96,42	87,50	80,35	82,14	**86, 60**	Very Valid
RPP 2	91,07	89,28	87,50	82,14	**87,49**	Very Valid
RPP 3	91,07	91,07	87,50	82,14	**87,94**	Very Valid
RPP 4	92, 85	91,07	96,42	82,14	**90,62**	Very Valid
RPP 5	96, 64	89,28	83,92	82,14	**87,49**	Very Valid
RPP 6	94,64	83,92	87,50	82,14	**87,05**	Very Valid
Average Total (%)					87,86	**Very Valid**

The table above shows the data from the validation of the lesson plans developed for class VIII students at MTsS Masmur Pekanbaru. RPP 4 is data that has an average score with the best percentage gain. Only 9.38% of the data still needs to be improved, followed by RPP 2 and 5, which have the same average score where the score has a superior score compared to RPP 4 where there are still 13.40% of the data that still needs to be revised.
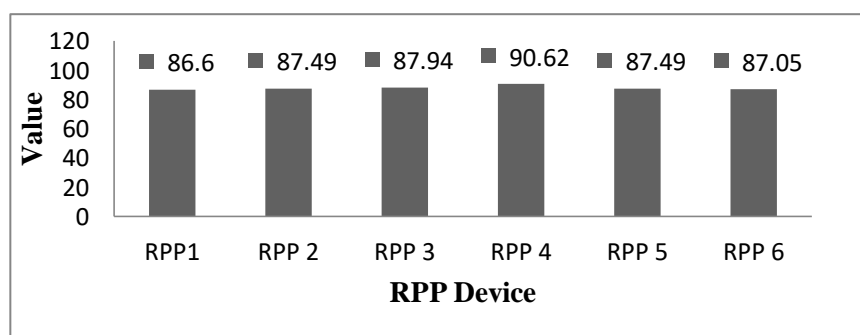

Figure 1. RPP Validation Results

Based on the assessments of the three validators in Table 2, the average lesson plan meets the very valid category with a total average of 87.86, which can be used without revision.

Furthermore, the validation and revisions carried out on the Student Activity Sheet (LKPD) include:

1) Didactic aspects, including:

LKPD is designed in accordance with Core Competencies (KI) and Basic Competencies (KD).

   (1) The order of the material on the LKPD is arranged according to a logical learning flow.
   (2) LKPD facilitates students to identify problems given by the teacher.
   (3) LKPD facilitates students to compile, process, organize and analyze the data obtained to rediscover mathematical principles and procedures.
   (4) LKPD facilitates students to conclude.
   (5) LKPD facilitates students to apply the ideas they already have to work on problems.
   (6) LKPD has questions about POE activities.
   (7) There are clear instructions for using LKPD.

2) Content Aspects, including:

   (1) LKPD contains components including title, KI, KD, indicators, learning activities.
   (2) LKPD contains problems related to daily life.
   (3) The material is adjusted to the ability of students.
   (4) The problems or questions presented are in accordance with the learning objectives.
   (5) Practice questions are adjusted to the cognitive abilities of students.
   (6) The images presented help students understand.

3) Language Aspect, including:

   (1) Sentences used in accordance with the correct Indonesian.
   (2) The language used is simple and easy to understand.
   (3) The questions in the LKPD are arranged in clear sentences.

4) Presentation Aspect, including:

   (1) LKPD uses the appropriate font (type and size).
   (2) LKPD is designed with bright colors.
   (3) LKPD is designed with attractive animation options.
   (4) Headings and sections that need emphasis are bolded or given a different color.

5) Time Aspect, including:

   (1) The time given to do the LKPD is enough.

6) LKPD Cover Desain

   (1) The color of the LKPD title contrasts with the background color.
   (2) LKPD skin illustration describing the content/teaching materials.
   (3) Don't use too many typeface combinations.

Table 3. Results of LKPD Validation by the Four Validators

LKPD	Validity Percentage (%)				Average (%)	Validity Level
	V1	V2	V3	V4		
LKPD 1	97,82	90,21	90,21	78,26	**89,12**	Very Valid
LKPD 2	90,21	90,21	80,43	78,26	**84,77**	Very Valid
LKPD 3	95,65	90,21	80,43	78,26	**86,13**	Very Valid
LKPD 4	96,73	89,13	80,43	78,26	**86,13**	Very Valid
LKPD 5	90,21	91,30	89,13	78,26	**87,22**	Very Valid
LKPD 6	90,21	89,13	80,43	78,26	**84,50**	Very Valid
Average Total (%)					86,31	**Very Valid**

The table above is the data on the achievement of the device scores developed in class VIII MTsS Masmur Pekanbaru. LKPD 1 is data that has an average score with the best percentage gain. Only 11.88% of the data still needs to be improved and followed by LKPD 5, which has an average score that is superior to LKPD 3 and 4 with a score difference of 1.09%. Furthermore, LKPD 2 and 6 are LKPDs that get the lowest score with a difference of 4.62% from the best score in LKPD 1.
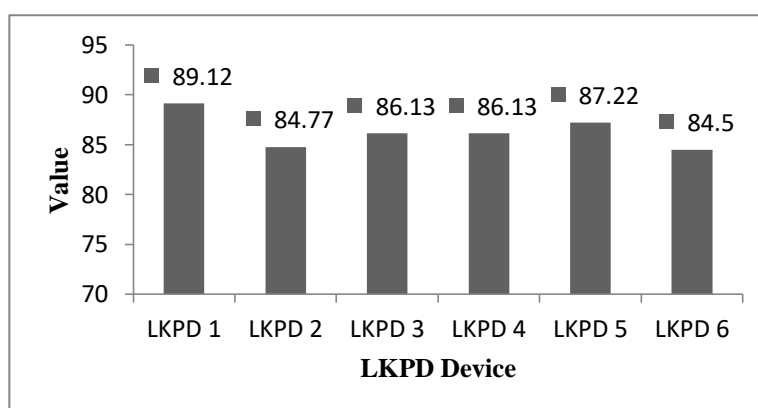

Figure 2. Validation Results LKPD

Discussion

Based on the results of research conducted at the level of MTs, class VIII is development research. In this study, three products were developed: the syllabus, lesson plan (RPP), and student worksheets (LKPD). Using the POE model, learning tools were developed based on the 2013 curriculum. This learning model has 3 steps, namely: 1) Prediction (predict); 2) Observation (observation); 3) Explanation (conclude). This study uses the ADDIE model with the sequence of stages 1) Analysis; 2) Design; 3) Development; 4) Evaluation; 5) implementation, but this research only reached the Development stage due to the Covid-19 pandemic.

The researcher conducted interviews with the mathematics teacher for class VIII in the analysis stage. The analysis was carried out to determine the material and learning models to be used in the study. Furthermore, at the design stage, the researcher designs a product that can provide solutions to problems faced by teachers during the learning process. Then the product design that has been developed must pass the validity test stage to determine the feasibility of the device. The learning device is said to be valid if it has

gone through the validation process by the validator and the results of the validator's assessment are included in the valid category and are eligible to be used in this study, resulting in a valid syllabus, lesson plans, and LKPD with consecutive values of 83.65%, 87.86%, and 86.31%. The results of the trial get the feasibility of the product where researchers can see the learning process is still new where students are not familiar with the methods applied to the RPP and LKPD developed by researchers [9].

From the explanation above, it can be concluded that the Development of mathematics learning tools, namely: Syllabus, Learning Implementation Plans (RPP), and Student Activity Sheets (LKPD) based on the POE Model on the subject of Constructing Flat Sided Space for Class VIII MTs are declared very valid. Valid because it has been validated and revised according to suggestions and deserves to be tested.

4. CONCLUSION

Based on the results of data analysis, it can be concluded that mathematics learning tools have been produced with the Prediction, Observation, Explanation (POE) model on the material for Building Flat Side Space at MTsS Masmur Pekanbaru in the form of Syllabus, Learning Implementation Plans (RPP) and Student Activity Sheets (LKPD) that have been prepared. Tested validity. Then this device can be continued in the trial phase to find out the practical value of the developed device.

REFERENCE

[1]   O. Hamalik, *Kurikulum dan Pembelajaran*. Jakarta: PT Bumi Aksara, 2014.

[2]   Permendikbud, *Peraturan Mentri Pendidikan dan Kebudayaan No 58 Tahun 2014 Tentang Kurikulum 2013 Sekolah Menengah Pertama/Madrasah Tsanawiah*. 2014.

[3]   Kusnandar, *Penilaian Autentik (Penilaian Hasil Belajar Peserta Didik Berdasarkan Kurikulum 2013)*. Jakarta: PT Raja Grafindo Persada, 2015.

[4]   Trianto, *Mendesain Model Pembelajaran Inovatif-Progresif*. Jakarta: PT Fajar Interprata Mandiri, 2013.

[5]   Ramayulis, *Profesi & Etika Keguruan*. Jakarta: Kalam Mulia, 2013.

[6]   Permenpan, *Peraturan Menteri Negara Pendayagunaan Aparatur Negara dan Reformasi Birokrasi No 16 Tahun 2009 Tentang Jabatan Fungsional Guru dan Angka Kreditnya*. 2009.

[7]   Yupani, Garminah, and Mahadewi, *Pengaruh Model Pembelajaran Predict-Observe-Explain (POE) Berbantuan Materi Bermuatan Kearifan Lokal terhadap Hasil Belajar IPA Siswa Kelas IV*. Laporan Penelitian Universitas Pendidikan Ganesha.

[8]   E. Mulyatiningsih, *Riset Terapan Bidang Pendidikan dan Teknik*. Yogyakarta: UNY Press, 2011.

[9]   T. Purnaningsih, "PengembanganPerangkat pembelajaran Untuk Metode Penemuan Terbimbing Pada Materi Bangun Ruang Untuk Siswa Kelas VIII-5 SMP Negeri 4 Siak Hulu. Skripsi," Universitas Islam Riau, 2015.