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The Validity of Learning Devices with Creative Problem Solving Models to Improve Mathematical Problem-Solving Ability

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Abstract - This validity aims to find out the validity of mathematical learning devices based on creative problem solving models to improve students' mathematical problem solving abilities. Product learning is said to be valid if valid from the content and construct. Content validity is the suitability of the product developed with the specified curriculum. Validated learning tools, namely the Learning Implementation Plan (RPP)and Student Worksheet (LKPD) class X SMA, while construct validity is the suitability of the product developed with the theories that become the foundation of product development. This learning tool is validated by 3 Mathematics Experts, 1Indonesian Language Expert and 1 Educational Technology Expert. Validity is obtained from the results of validation by experts using an instrument in the form of questionnaire. The validation results of the experts indicate that the learning device meets valid criteria.

Keywords - Learning Device Validity, Creative Problem Solving Model, and Problem Solving Ability.

I. INTRODUCTION

Problem solving ability is very important for students. Because the ability to solve problems can make students motivated to make the best decisions if they face problems in their daily lives. The problem solving ability is the process that is taken by someone to solve the problem at hand until the problem is no longer a problem for him [1]. Therefore, the ability of students to solve mathematical problems needs to be continuously trained and developed in each student.

Research conducted by Sari (2017) shows that the average mathematics problem solving ability of high school students is still low[10]. The research conducted by Sumanah (2014) showed that the problem-solving abilities of students in class XI IPA acceleration programs were still low, resulting in student learning outcomes being low[11]. The problems found by previous researchers also met when conducting a preliminary study in July 2018 at 2 Painan Public High School that the learning outcomes of mathematics and tests of students' problem solving ability were still many under the Minimum Limitations Criteria (KKM), which was 78.

Based on the description of the problem above, we need a learning tool that can help math teachers and students in the learning process in the classroom. The implementation of learning that is not optimal is inseparable from learning resources developed so that students are motivated in learning mathematics. One of the innovations in the learning process of mathematics needed by students is the existence of learning resources. The learning resources used are

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Student Worksheets (LKPD) and Learning Implementation Plans (RPP) using the 2013 curriculum.

Through RPP and LKPD, teachers can direct the activities carried out by students. The learning implementation plan is a guide to the steps that will be taken by the teacher in the learning activities that are arranged in the activity scenario [2]. These activities will help students guide their knowledge and thinking abilities. LKPD is a guide for students who are used to conduct investigation or problem solving activities [3]. Based on these opinions, LKPD can be used as a guide for students who are used to carry out investigative or problem solving activities. This LKPD development will be supported by RPP.

Based on the description of the problem above, we need a learning tool that can help math teachers and students in the learning process in the classroom. The author is interested in developing learning devices based on the CPS learning model. The CPS model is a methodological framework designed to help solve problems by using creativity in achieving goals and improving creative performance [4]. The CPS learning model consists of objective finding, fact finding, problem finding, idea finding, solution finding, and acceptance finding [5]. In this learning, students are taken to follow a fun learning process.

The CPS learning model can evoke students' critical and creative thinking skills so that they can solve the problems faced [6]. There are several key tricks in the CPS process: identifying problems, identifying various alternative solutions, evaluating results and actions [7]. It can be concluded that the CPS learning model is able to develop students' thinking skills in solving a problem.

Based on the description above, it is necessary to develop a mathematical learning device in the form of RPP and LKPD with a valid creative problem solving model, so that students can understand the subject matter. Research is valid if there are similarities between the data collected with the actual data on the object under study [8]. Therefore, learning instruments use creative problem solving models that have been developed can be tested in the field if they have met all valid criteria. Content validity is a need for intervention (the device made), and the design is based on existing scientific knowledge while construct validity (consistency) is the design of the intervention (learning device) in accordance with the logic / the right reasons [9]. The formulation of the problem in this study is how the validity of mathematics learning devices in the form of RPP and LKPD with creative problem solving models developed for high school class X students?

II. Research Method

Earning tools are validated by experts to determine the validity of products in the form of RPP and LKPD. The data used in this study were analyzed descriptively and quantitatively by filling out the validation assessment sheet. Descriptive techniques are used because this study attempts to describe the validity of learning devices in the form of RPP and LKPD in class X high school, while quantitative techniques are used because the data obtained are in the form of numbers with the analysis process using the validity criteria table. The method of filling in the validity sheet by giving a checklist for each indicator.

This learning tool was validated by 5 Expert Experts consisting of 4 lecturers from Padang State University, and 1 mathematics teacher at SMAN 2 Painan. 3 people in the field of mathematics namely Dr. Dony Permana, M.Sc, Dr. Rudi Chandra. Wj, S.Pd., M.Pd., M.H, M.M., Dra. Yasmawarni, M.Sc, 1 person for the field of language, namely Dr. Abdurrahman, M.Pd and 1 person for the Education technology field, namely Dr. Jasrial, M.Pd

III. Results And Discussion

At the stage of development and making a prototype, a design and validation process was carried out by several experts. The phase of making a prototype begins with designing the LKPD based on a creative problem solving model. The results of this design are called prototypes 1. After the LKPD is produced based on creative problem solving models then self-evaluation is done.

When self-evaluation is still found typing errors, imperfect sentences and inappropriate punctuation. After correcting errors encountered in self-evaluation, the learning device is submitted to experts to be validated. The aspects that are validated in the RPP are aspects of the RPP component, learning activities, and language. RPP validation is carried out by 3 experts consisting of 3 mathematicians. The results of the lesson plan validation by experts can be seen in Table 1 below.

Table 1. Results of Assessment of Validation of Learning Implementation Plans

No	Aspect of Validation	Average Assessment Score			Average	Criteria
		V1	V2	V3		
1	Subject Identity	1	1	0,67	0,89	Valid
2	Core Competencies (KI) and Basic Competencies (KD)	1	0,67	1	0,89	Valid
3	Formulation of Learning Indicators.	1	1	0,67	0,89	Valid
4	Formulation of Learning Objectives	1	0,67	0,67	0,89	Valid
5	Material Selection	1	1	1	1	Valid
6	Learning Activity Steps	1	1	0,67	0,89	Valid
7	Selection of Learning Resources.	1	1	0,67	0,89	Valid
8	Selection of learning media	1	1	0,67	0,89	Valid
9	Assessment	0,67	1	1	0,89	Valid
10	Selection of Learning Approaches.	1	0,67	0,67	0,78	Valid
11	Language and Writing	1	1	0,67	0,89	Valid
12	Benefits of RPP	0,67	0,67	1	0,78	Valid
Overall Average					**0,86**	**Valid**

Information:
V1 = Validator 1 is Dr. Dony Permana, M.Sc
V2 = Validator 2 is Dr. Rudi Chandra. Wj, S.Pd., M.Pd., M.H, M.M
V3 = Validator 3 is Dra. Yasmawarni, M.Sc

In Table 1, the results of the validity test of the Learning Implementation Plan (RPP) are obtained using a valid creative problem solving model according to experts. The average assessment of each aspect is in the valid criteria, even though there are still improvements from the RPP that have been designed by the researcher. Validator provides suggestions for making learning objectives according to the ABCD formula (Audience, Behavior, Conditioning, Degree). Based on the suggestion of the validator, the researcher made a revision of the Learning Implementation Plan developed, so that it can be used to assist in the process of learning activities. One example of learning objectives in the RPP before and after revision can be seen in Table 2 below.

Table 2. Results of Revision of Learning Implementation Plans Based on Validator Suggestions

Before Revision

C. Tujuan Pembelajaran

Tujuan Pembelajaran	RPP
3.3.1. Peserta didik dapat menyusun konsep sistem persamaan linear tiga variabel dari masalah kontekstual	Pertemuan I
3.3.2. Peserta didik dapat menentukan model matematika dari sistem persamaan linear tiga variabel	
3.3.3. Peserta didik dapat menentukan himpunan penyelesaian sistem persamaan linear tiga variabel dengan metode substitusi.	Pertemuan II
4.3.1. Peserta didik dapat menyelesaikan masalah kontekstual yang berkaitan dengan sistem persamaan linear tiga variabel dengan metode subtitusi	
3.3.4. Peserta didik dapat menentukan himpunan penyelesaian sistem persamaan linear tiga variabel dengan metode eliminasi	Pertemuan III
4.3.2. Peserta didik dapat menyelesaikan masalah kontekstual yang berkaitan dengan sistem persamaan linear tiga variabel dengan metode eliminasi	

After Revision

C. Tujuan Pembelajaran

Tujuan Pembelajaran	RPP
3.3.1. Melalui diskusi kelompok peserta didik dapat menyusun konsep sistem persamaan linear tiga variabel dari masalah kontekstual dengan benar	Pertemuan I
3.3.2. Melalui diskusi kelompok peserta didik dapat menentukan model matematika dari sistem persamaan linear tiga variabel dengan benar	
3.3.3. Melalui diskusi kelompok peserta didik dapat menentukan himpunan penyelesaian sistem persamaan linear tiga variabel dengan metode substitusi dengan benar.	Pertemuan II
4.3.1. Melalui diskusi kelompok peserta didik dapat menyelesaikan masalah kontekstual yang berkaitan dengan sistem persamaan linear tiga variabel dengan metode subtitusi dengan benar	
3.3.4. Melalui diskusi kelompok peserta didik dapat menentukan himpunan penyelesaian sistem persamaan linear tiga variabel dengan metode eliminasi dengan benar	Pertemuan III
4.3.2. Melalui diskusi kelompok peserta didik dapat menyelesaikan masalah kontekstual yang berkaitan dengan sistem persamaan linear tiga variabel dengan metode eliminasi dengan benar	

Student worksheets (LKPD) are designed based on preliminary analysis conducted by researchers on the analysis of students, analysis of learning problems, curriculum analysis and concept analysis. Based on the results of the preliminary analysis, the Student Worksheet is designed based on a creative problem solving model. The Student Worksheets that have been designed are validated by 5 experts consisting of 3 mathematicians, 1 linguist and 1 education technology expert. The aspects that are validated in the LKPD are aspects of presentation, content feasibility, graphics or appearance and language. After the improvements are made, the validators provide an assessment of the learning device. The results of LKPD validation by experts can be seen in Table 3 below.

Table 3. Validation Results of Student Worksheets

No	Aspect of Validation	Average Assessment Score					Average	Criteria
		V1	V2	V3	V4	V5		
1	Presentation	0.81	0.81	0,78	-	-	0.80	Valid
2	Feasibility of content	0.67	0.73	0.81	-	-	0.74	Valid
3	Linguistics	-	-	-	0.91	-	0.91	Valid
4	Integrity	-	-	-	-	0.76	0.76	Valid
Overall Average							**0.81**	**Valid**

Information:
V1 = Validator 1 is Dr. Dony Permana, M.Sc
V2 = Validator 2 is Dr. Rudi Chandra. Wj, S.Pd., M.Pd., M.H, M.M
V3 = Validator 3 is Dra. Yasmawarni, M.Sc
V4 = Validator 4 is Dr. Abdurrahman, M.Pd
V5 = Validator 5 is Dr. Jasrial, M.Pd

Overall LKPD based on creative problem solving model validated by mathematicians has met valid criteria with an index of validity in the aspect of presentation is 0.80. The results of the validation illustrate that the LKPD is in accordance with the competencies to be achieved. In addition to the presentation aspects of the LKPD, other aspects seen were aspects of content eligibility in LKPD with a validity index of 0.74. The validation results illustrate that there is a match between material and practice.

The next aspect is the aspect of language with a validity index of 0.91. The results of the validation illustrate that the use of sentences in the LKPD is in accordance with the rules of Indonesian that are good and already communicative. The last aspect seen is the graphic aspect of 0.76. The validation results describe the characteristics and suitability of LKPD with creative problem solving models can help students to improve mathematical problem solving skills. So, it can be concluded that LKPD with creative problem solving model based learning is valid according to experts.

The validator gives suggestions to improve the LKPD, one of them by paying attention to punctuation. One example of LKPD before and after revision can be seen in Table 4 below

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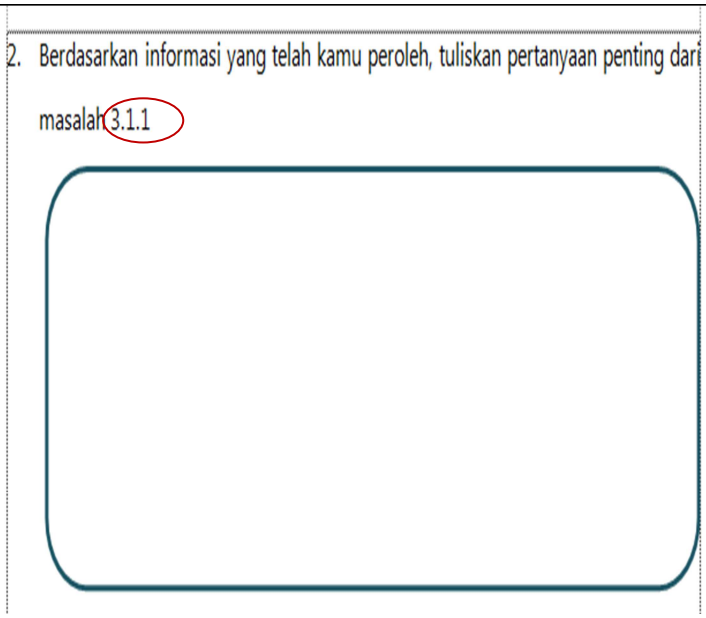
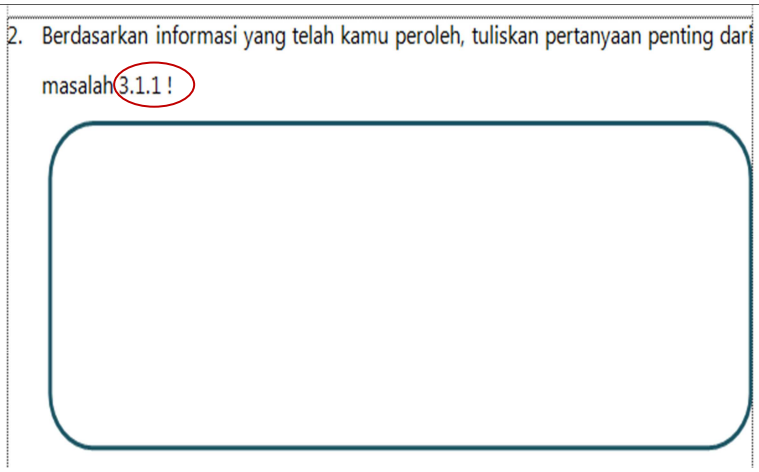
Table 4. The Student Worksheet Revision Results Based on Validator Suggestions

Before Revision

After Revision


IV. The Conclusion

The results and discussion in the description above, the devices developed with the creative problem solving model can already be said to be valid and have been used properly. The validity assessment on the device in the form of RPP results in an overall validity value of 0.86 with valid categories. Whereas for the device in the form of LKPD the overall validity score is 0.81 with a valid category. The creative problem solving model-based learning tools produced from this study have met valid product quality criteria

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