Development of Learning Instruments Based on Experiential Learning Model of VIII SMP

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Abstract: Limited learning instruments for innovative mathematics where students are used as learning centers in accordance with the demands of the 2013 curriculum. The innovative learning instruments referred to in this study are a learning tool in the form of learning implementation plans (RPP) supplemented by student worksheets (LKPD) based on experiential learning model. This model allegedly corresponds to the characteristics of teaching materials and characteristics of students. This study aims to produce learning tools based on experiential learning models on the material of cube and beam of class VIII SMP with a high level of validity and practicality. The form of this research was development research (R & D) using ADDIE development procedure; analyze, design, development, implementation, and evaluation. The object of this study is to develop a learning instrument based on experiential learning model on the material of cube and beam of class VIII SMP itself. After the RPP that is equipped with LKPD is declared valid by the expert, a trial is conducted on a larger class to examine the practical aspects. The subjects of the trial were 38 eighth grade students of SMP 21 Pekanbaru. The instrument used is a validation sheet consisting of 34 statement items and student response questionnaires to LKPD. The results of the study are that all validators have agreed on every aspect of assessment of the learning instrument, namely aspects of 1) format of learning instrument, 2) activities of the entire contents of learning instrument, 3) content of learning instrument, 4) pictures or graphics, and 5) language / text and 6) overall assessment of learning instrument. Then based on the results of data analysis about student response questionnaires to LKPD, it is obtained that 95.5% is with a very practical category. It can be concluded that innovative learning instruments in the form of RPP equipped with LKPD are based on experiential learning model on cube material and grade VIII SMP beam can be used in learning with a high level of validity and practicality.

Keywords: Learning Instruments, Experiential Learning Models, Cubes and Beams

1. Introduction

Learning instruments are the main matter in supporting learning activities to run well. Learning instruments in the 2013 Curriculum that has provided by government are syllabi. While the learning implementation plan (RPP) and student worksheets (LKPD) have not been provided by the government. Means that teachers must design and develop their own RPP and LKPD in accordance with the characteristics of teaching materials and characteristics or needs of students.

Based on observations that researchers conducted in several schools in Pekanbaru such as SMP 23 Pekanbaru, SMP 8 Pekanbaru and SMP 21 Pekanbaru, there were still many teachers in making or drafting the RPP still referring to Permendikbud No. 103 of 2014 whereas it should refer to Permendikbud No. 22 of 2016. Then the researcher also asked about the process of making or arranging learning tools (RPP and LKPD), it turned out that most of the teachers searched the internet and modified it as needed and some of them were based on the work of the MGMP regardless of the condition of each school . More likely just to fulfill administrative requirements as a report that must be submitted to the school at the beginning of the semester (ElfisSuanto 2017).

The learning process carried out by the teacher still tends to the teacher explain the subject matter, provide sample questions, and then provide training and most of them have not used LKPD. It turns out that to provide LKPD, teachers are constrained in time to make it and also knowledge constraints (ElfisSuanto 2017). This is not in accordance with the 2013 curriculum which suggests that desired learning is learning that prioritizes personal experience through a scientific approach. This problem needs to find a solution. For this reason, the researcher considers that it is necessary to develop an innovative learning tool in accordance with the demands of the 2013 curriculum based on a learning model that corresponds to the characteristics of teaching materials and characteristics of student participants.

Along with the demands of the 2013 curriculum and the scientific approach, one of the learning models that the researcher views is very good and suitable to be applied in mathematical learning is experiential learning model by Kolb (Evans et al. 1998). With experiential learnig models, students are actively involved in understanding mathematical subject matter so that they are happy and more interested. Experiences based on experience benefit students and have a positive impact on teachers and students (Knisley 2003; Mulyana 2009).

Experience learning (experiential learning) states that idea is not an element of thought that must not be changed but it is formed and reshaped through experience (Kolb 1984). Therefore, learning is a process in which the concept is always modified by experience. Kolb in Rohaila et al. (2005) suggested several steps that need to be taken to make this theory productive to learning including mathematical learning, namely: 1) students need to be actively involved in new experience activities, 2) use reflection attention to connect existing experiences; indirectly from hearing, reading and so on to new attention, 3) forming abstract conceptual to form logical theories and generalizations, and 4) using new theories in shaping decisions and solving problems.

Dyahsih and Ali (2015) reported that the learning model that allows students to actively participate in learning is an experiential learning model and this model is in accordance with the characteristics of teaching material to build a flat side space. ElfisSuanto et al (2017) studied that mathematics learning with experiential learning models in junior high schools (SMP) in Pekanbaru has not been carried out well because of the lack of teacher skills in finding ideas of concrete experiences that students carry out and the lack of learning tools that use this model.

Experiential Learning has four learning stages, i) Concrete Experience (CE), ii) Reflective Observation (RO), iii) Abstract Conceptualization (Abstract Conceptualization (AC)), and iv) Active Experimentation (Active Experimentation (AE). Experiential learning is one of the learning models that are suitable for teaching cube and beam material, because the application of shapes from the cube and beam shapes is often found in everyday life, making it easier for students to get direct experience.

Thus, researchers are aimed to develop learning tools based on experiential learning learning models on cube material and class VIII SMP beams so that it can be a reference for teachers to carry out learning by prioritizing students' experiences directly.

2. Methodology

The form of this research was research and development. Research and development is a form of a research that was used to produce certain products and test the effectiveness of these products (Creswell 2009). The products produced in this study were learning tools in the form of syllabus, learning implementation plans (RPP) and student activity sheets (LKPD) based on experiential learning models on cube and beam material in VIII SMP classes. The learning tools produced were then measured by validity aspects and practical aspects.

The product development procedure was to use the ADDIE model in adoption from Branch (2009). ADDIE itself is a step taken in the development of learning tools, namely Analysis, Design, Development, Implementation and Evaluation. In the development stage, the researcher validated the developed learning tools. The validator consisted of one material expert and two learning experts. If according to the validator it is not feasible to use, it will be revised to be re-validated. After the learning device was declared valid, it was carried out to be implemented to see the practical aspects.

Research subjects in the trial were 38 students of class VIII SMP Negeri 21 Pekanbaru with heterogeneous academic abilities. Data collection instruments in this study were validation sheets and student questionnaire responses. Validation sheet used a Likert scale. Likert scale used consists of 4 alternative answers, namely 1, 2, 3, and 4 which states that it is very inappropriate, inappropriate, appropriate, and very appropriate (Daniel J. Mueller, 1996). Questionnaire responses of students used the Guttman scale with statement sentences that are positive and negative. For sentences that are positive, the choice of answers is worth 1 (highest score) while the choice of answers is not worth 0 (lowest score). While for sentences that are negative, the answer choice is not 1, while the answer choice Yes is 0.

3. Result and Discussion

The analysis included in this research are characteristics of students, teachers, curriculum and followed by preliminary studies analysis. The results of the analysis of the characteristics of students based on observations in several schools in Pekanbaru, the students are mostly passive tendencies in learning, the learning provided by the teacher has not fully made students as learning centers and the existing learning tools tend to only as a complement administrative requirements, and not reflects as an innovative learning device. Then in terms of age, the average grade VIII students are 13-14 years old. Students at this age are still in the concrete operation stage (Erna Suwangsih 2006). This means that if they will understand the absorptive concept or mathematical object, it still needs to be helped by using concrete objects. In accordance with this, one of the learning models that can help students is an experiential learning model (Munif and Mosik 2009).

In the 2013 curriculum analysis found that the basic competencies (KD) related to cube and beam material are at point 3.9 “Differentiating and determining the surface area and volume of building data side spaces (cubes, beams, prisms and pyramid)” and point 4.9 “Resolving problems related to surface area and volume build a flat side space (cube, beam, prime and pyramid), as well as the combination”, it turns out students have difficulty learning it. In other words this method is considered difficult by students. The data from the National Examination also shows that the material on goemetry is building space including low results (BalitbangKemendikbud 2014).

A pilot study involved 33 eighth grade junior high school mathematics teachers in the city of Pekanbaru about the implementation of experiential learning. The results are as follows.

Figure 1 below is about teacher proficiency in implementing learning based on experiential learning models. How far the teacher's skill in carrying out the learning can be seen in the following picture.

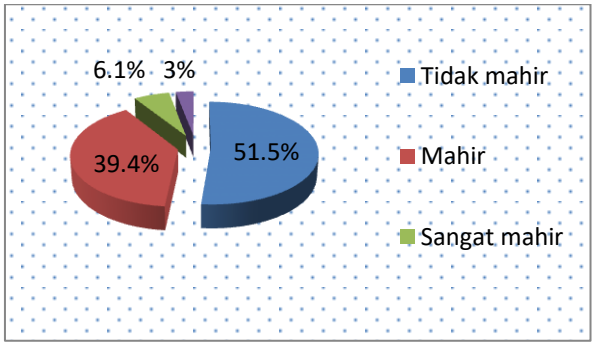

Figure 1.Teachers opinions about their skills in mathematics learning based on experience.

Based on Figure 1, it can be seen that 51.5% of teachers stated that they were not proficient in mathematical teaching with experience-based learning methods and only 39.4% stated that they were proficient. This may be that the teachers are not used to utilized it, and lack experience and always use the lecture method and the question of answer with the intention of wanting to finish the material quickly. Learning will run well if the teacher has skills and experience about the material and learning strategies that will be implemented. In accordance with the opinion of SyaifulAfiqSamudin&SitiMistimaMaat (2017) that there are significant differences in the availability of teaching between experienced teachers and new teachers. It also draws on the teacher's knowledge and experience with very low of experiential learning, in terms of experiential learning, it is one of the learning that is in accordance with the 2013 curriculum requirements.

When asked whether learning based on experiential learning models can make students creative and innovative, the results are shown in Figure 2.

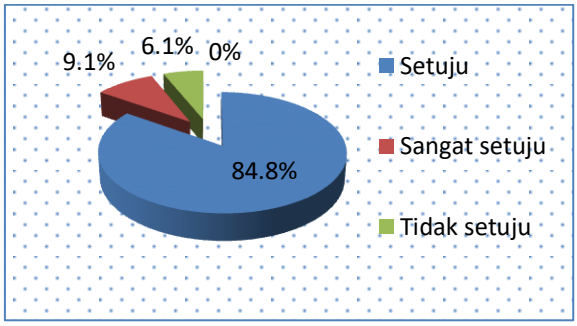

Figure 2. Teacher's opinion about experiential learning that can make students creative and innovative.

Based on the circle diagram above, it is seen that more than 84.8% of teachers agree with the statement. This means that teachers know that learning based on experiential learning models is very good to apply. Many of the benefits students get through experiential learning such as developing thinking, understanding and creativity skills (Svinicki& Dixon 2015). One form of experiential learning is problem-based learning. According to NazirahMohdIzani&SitiMistimaMaat (2017) problem-based learning approaches can also improve students high-level thinking skills in mathematics.

Based on this preliminary study, researchers see that it is very necessary to develop a learning tool (syllabus, RPP and LKPD) that is based on experiential learning models and introduces how to apply them to teaching for junior high school mathematics teachers.

Then the researcher made a preliminary draft of syllabus products, RPP and LKPD based on experiential learning model referring to agriculture at the analysis stage. The components of the syllabus that will be developed based on Permendikbud No. 22 of 2016 and Sri Wardhani and RatnaHerawati (2009) consisting of (1) identity of subjects; (2) school identity; (3) core competency; (4) basic competencies; (5) subject matter or learning; (6) learning activities; (7) indicators of achievement of competence; (8) assessment; (9) time allocation; and (10) learning resources. The syllabus design was made following the following format:

SILABUS

Mata Pelajaran :
Nama Sekolah :
Kelas/Semester :
Kompetensi Inti
KI 1 :
KI 2 :
KI 3 :
KI 4 :

Kometensi Dasar	Materi Pokok/ Pembelajaran	Kegiatan Pembelajaran	Indikator Pencapaian Kompetensi	Penilaian		Alokasi Waktu	Sumber Belajar
				Teknik	Bentuk		

Pekanbaru, 2017

Mengetahui, Guru Matematika	Peneliti
NIP:	

Figure 3. Format of Syllabus

In Permendikud Number 65 of 2013 and Permendikud Number 22 of 2016 there are no components of achievement indicators of competence. In Permendikud Number 41 of 2007 and Syllabus and Junior Mathematics RPP development techniques (Sri Wardhani and RatnaHerawati in 2009) there are components of indicators of achievement of competencies so that researchers add the component to the syllabus that the researcher will develop because according to the researcher it is necessary to include indicators of achievement of competencies. It is becaused it will make it easier for educators to develop lesson plans. Then learning activities refer to experiential learning models.

Furthermore, the RPP components that were developed guided the Permendikbud No. 103 of 2013 and No. 22 of 2016 and Sri Wardhani and RatnaHerawati (2009) by PPPPTK consisting of: (1) school identity; (2) subject identity; (3) class / semester; (4) subject matter (5) learning material; (6) time allocation; (7) Core Competencies (KI); (8) Basic Competencies (KD) and competency achievement indicators; (9) learning objectives; (10) description of learning material; (11) learning approaches / models / methods; (12) learning media / tools and materials; (13) learning resources; (14) learning steps; (11) assessment of learning processes and outcomes.

Based on the analysis results, the researcher added a component of learning material to the RPP identity because the researcher considered that the component needed to be included in the RPP identity so as to make it easier for educators (teachers) to distinguish between RPPs. Then in RPP researchers replaced the naming which initially "Learning Material" researchers replaced with "Learning Material Descriptions" this researcher did so that there was a difference between the learning material that is in the RPP identity and that in other parts of the RPP. Then the learning steps are applied in the experiential learning model.

During the development phase, two activities were carried out, namely syllabus development, RPP and LKPD and formative evaluation of syllabus development, RPP and LKPD which included validation activities, revision of learning tools and limited trials. At the syllabus development stage, researchers make learning tools (RPP and LKPD) in accordance with the results of the analysis. The tools that were developed in advance were syllabus then RPP. Learning activities in the syllabus and RPP are adapted to the experiential learning model and scientific approach. Then the researchers developed the LKPD by applying the steps in the experiential learning model and the scientific approach to the material of cube and beam in grade VIII SMP. In the LKPD, activities are made so that students are motivated to find formulas through direct experience and apply mathematical concepts to solve existing problems. LKPD design is made interesting visually so that students are enthusiastic in participating in learning activities.

The syllabus, RPP and LKPD that have been developed are then validated 2 times by the validator. In the first validation the validator provides improvement suggestions and comments. The validator's suggestion on the first validation is:

Table 1. Suggestions by validators in the first validation

Learning Instruments	Validators Remark
Syllabus	In the aspect of assessment of knowledge, the oral tests are not given to students, the assignment of LKPD is not to assess learning outcomes, and on aspects of assessment of skills replaced with written test techniques.
	Need to add demonstration devices
RPP	Time constrain for 2×40 minutes but the learning should be ±90 minutes
	Indicators of competence achievement should be readjusted Re-adjust learning goals
	Learning objectives should be readjusted
	Double check the understanding of the beam
	Double-check the formula derivation
	The questioning activity is not appropriate
	Separate questions about knowledge and skills
	Instrument assessment rubrics need to be adjusted to the problem solving steps
LKPD	Cover LKPD too many pictures
	At concrete experience should use images that are close to students and given a discourse
	The main cube image needs to be fixed in color so that it is clear and bright
	Check again at the writing because there are several posts cut off because of the image
	The writing color in the experiential learning stage changes to white
	The blue color on the page number is too thick so the writing is not clearly visible
	Please note that the sentences for the activities are reasoning
	Sentences in questions need to be clarified

The syllabus, RPP and LKPD in the first validation were revised according to the validator suggestion before the second validation. The results of the validator assessment to assess the validity of the syllabus, RPP and LKPD with experiential learning models on cube material of VIII SMP on beam for the second validation can be seen in Table 2 below.

Table 2. Average value for Syllabus, RPP and LKPD validation

Learning Instruments	Average	Validation Category
Syllabus	3,75	Sangat Valid
RPP	3,65	Sangat Valid
LKPD	3,47	Sangat Valid

In the second validation, the validator did not provide improvement suggestions and comments and concluded that the equipment developed was feasible without revision testing with the average value for the syllabus was 3.75, RPP 3.65 and LKPD 3.47. Syllabus, RPP and LKPD get a valid validation category.

After the syllabus, RPP and LKPD are decided to be valid and worth the trial without further revisions the researcher conducted a trial. Research subjects in the trial were 38 students of class VIII SMP Negeri 21 Pekanbaru with heterogeneous academic abilities. In this trial students were asked to do and complete the activities that exist in LKPD. After the students finish working on the LKPD, the researcher distributes the questionnaire and asks students to fill out

the questionnaire. The percentage of responses of students to the practicality of LKPD at the trial stage can be seen in Table 3.

Table 3. Percentage of Student Response to LKPD Practices in Limited Trials

Learning Instrument	The class meeting-(%)				Mean	Category
	1	2	3	4		
LKPD	97%	93%	95%	97%	95,5%	Very Practical

Table 3 shows the responses of students. it can be said that the LKPD devices developed are very practical.

4. Conclusion

Syllabus, RPP and LKPD are based on the experiential learning model for the materials of cube and beam of class VIII. They have been produced and have passed for every stage of the development of the ADDIE development model. All validators have provided an assessment and agreed to every aspect of the instrument validation of the learning device. From the results of the validation and trial, it was found that the development of syllabus, RPP and LKPD with experiential learning models in cube and beam material had fulfilled valid and very practical aspects to be used in the teaching and learning of mathematics on cube and beam class VII junior high school.

Some suggestions that researchers can provide regarding research in order to develop learning tools include (i) recommended to develop learning tools based on experiential learning models for other material or topics, (ii) researchers suggest that the learning tools that have been tested can continue to trial in large groups again

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