Design learning development of a set topic based on the problem based learning on grade VII Junior High School

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Abstract. This research based on reality because it is found in the research fields that a study of the learning has already been worked optimally, but the results of learning are still gained some lower minimum achievement criteria in student’s activities; they do not want to ask and express their ideas or opinions, even though they often get some difficulties to solve their problems are about the expressing of learning. Teachers have low competencies in using their skill usages for learning methods, and the textbooks of the study which are not used to facilitate in the concept meanings from the materials are being learned. When they described it to their students, they will also feel the poor relation for the reality and also daily student lives. The products are gained from this research, such as, the HLT, the teachers’ books and the students’ books. That each of them They use the Plomp developed model which consists of the initial investigation phases, the prototype making and pointing phase, both of them make a discussion of the study development in this research. This is as an introduction phase. The purpose of this research wants to produce the design learning development as a set topic base on the problem based learning on the 7th at SMPN I VII Koto Sungai Sarik is validly, practically, and associatively. The data is obtained this initial stage and used to design the HLT, the teachers’ and student’s worksheet

1. Introduction
This research background has been done in it basically the facts are in the fields available that the learning has been conducted optimally, but daily assessment result of the students are still below average minimal standard criteria because that have been arranged in the matters. These cases are shown from the objects which have been worked by them when they followed the test of learning achievements after completing one or two basic competencies that have been learned. From the questions are given for them, there are still many students who are not able to write it what are known and needed to solve the question problems. In the teachers’ learning activities still dominate by learning about the clue and not vary in the learning methods available, when they were performing and expressing the clue objects, they feel less to make a relation to the reality in the natural fact and also the daily students’ lives. The teachers are only focused on the learning sources and books already available, because they are not accustomed to create and design their own studies yet what will be used to a suitable learning in accordance with the students characteristics and needs. The ways of the material expression in the learning books do not use to facilitate the students to understand the concept of the materials are being studied by them. If the teachers more focus on them to remember “the ways” how they teach them to solve the learning rather than stimulating them to construct knowledge. [1]. Efforts are made to overcome the problems so that they design and develop to the learning design that can guide the students and give some opportunities for them in order to be able to express their mathematical ideas for their efforts to get some solutions for the problems that they face on. Learning design mean is the design learning development of a set
topic base on the problem based learning on the VII th class level at SMPN. This solution is a choice because the learning design consist of the learning propose, and the hypotheses of based PBL learning process can develop the thinking skills, the problem solving skills, the social skills, the skills for the independent learning and building or acquiring to get the new knowledge by predicting how to make thinking and understanding for the students will be developed in the contexts of learning activities which are known as Hypothetical Learning Trajectory (HLT) [2]. This HLT is implemented into all their books. The design of HLT, the teachers’ and students’ books are based on data what obtained in the introduction stage.

The teaching materials are all objects consist of (the information, the tools and texts what are structured systematically, which perform the completed figures of competencies will be mastered by them and used in studying process with an aim of planning and discussing in the implementation of learning [3]. The Teaching materials are functioned as guidance for the teachers who will direct all their activities in learning process, a substance of the competence that should be taught to the students, the guidance for them who will direct all activities in the learning process, as well as a substance of competence that should be learned, it is as the evaluation tool for achievement or mastery of learning results. [4]. the book as teaching material is defined as a book that contains knowledge of the analysis results of curriculum in written forms. [5] The book used by them are called the student’ inquiry. It is a special book for them in learning activities which content the learning materials, the activities of the research are based on the concepts, the information and examples of application in daily lives. [6] The things are contained in the students’ books, this research is as basic competencies to be achieved in learning objectives, the student activities and the understanding tests.

Whereas the teachers’ books are guidance for them to have the learning in a class. The things contained in the teachers’ books are as the basic competencies, the learning objectives, the student activities, the time allocations, the mathematical concepts, the media usages, the understanding tests, the teaching planning and learning activities.

All their books are developed with a problem based learning model. “Problem based learning is the learning that results from the working process toward the understanding of resolution for a problem. The first problem is encountered into learning process”. [7] Furthermore, [8] Argues that the characteristics of problems based learning models are a series of learning activities that are directed to solve the problem, and it is done for the scientific thinking.

In mathematics learning problem is said to be a “problem” if the problem becomes a challenge and its solution does not use the usual procedures. The learning with solving approach of the problem in its learning implementation refers to the steps of solving problems. According to Polya in his book How to Solve It, it is the understanding problem, the problem solving plan and strategy to do a plan and to see the result of reviews that have been obtained. [9] In line with. [10] It means that problem solution is the activity of solving story problems, they are not routine applying mathematics in lives it is also mentioned as the other circumstances, the proving, the creating or the testing conjectures.

Then steps solve the problem to be translated into indicators of the problem solution. [11] the Indicators of the solving problem are meaning in the problems, the organizing data and the selecting information those are relevant in identifying the problems, presenting the systematic problem formulation in the various forms, choosing the right approach and strategy to solve them, by developing a strategy solution and interpreting the results of the answers obtained to solve the problems.

Many explanations above that the goal must be achieved in this research to produce a learning topic on the set of problem based learning and describe its impact on the problem solving ability of the students on the VIIth class at SMP.

2. Research Methods
The development model is used so that the plomp development model which is consisting of three stages, namely, the preliminary investigation stage, the prototyping stage, and the assessment phase. [12] The reason is for using this model because the Plomp model has several advantages especially in assessing practically in the terms of one to one, and the small group and field tests. [13] In this research
that a researcher uses the preliminary analysis to develop the learning design based on the problem based learning on the topic set for the VIIth class level of the students at SMP.

The research subjects are the students of the VIIth class level at SMPN 1 VII Koto Sungai Sarik in 2019 to 2020 periods of the school years. The types of research data what will be conducted in the form of qualitative data. The instruments that will be used in the research are such as, the interview, the observation and the questionnaires forms. The data analysis technique is used such a descriptive technique. It is used to describe the results of the preliminary analysis. The data are collected as the data from the analysis results for needs, the curriculum, the concepts and the student participants. There are three stages for analyzing this data, namely the reducing data, the presenting data and the drawing conclusions. Reducing data is a process of the selecting, focusing and transforming data raw obtained through the results of the interviews, the questionnaires and the observations.

3. Research Investigation

The development of this learning design uses the Plomp development model like it has been stated before. In the preliminary stage on the activity is done, it is a needed analysis to the students and teachers in the learning process by giving the questionnaires, interviews and observation sheets in each of them. Then in the curriculum phase of analysis has been done for a statement about the mathematic curriculum, the seventh grade junior high school for the mathematics curriculum is about the main competencies and the basic competencies in mathematics on the VIIth class at semester I, with a guidance to [14]. Then to analyze the material with guidance to [15] about a main and base competition of the mathematics study on the VIIth class at semester I, such a set material. It is one of the materials contained in the mathematics learning. The main and base competencies of the material set can be seen in the following table 1.

| MAIN COMPETENCY | BASIC COMPETENCE |
|-----------------|-----------------|
| 3. To understand knowledge (factual, conceptual and procedural) based on his curiosity about science, technology, art and culture related to phenomena and visible eye events | 3.4. To explains the set, subset, universal set, empty set, set complement and performs binary operations on the set using contextual issues |
| 4. Trying, processing and presenting in a concrete (using, unraveling, composing, modifying and making) in the abstract area (writing, reading, calculating, drawing and writing) in accordance with what is learned at school and other sources in the same perspective or theory | 4.4 Resolving contextual problems relating to sets, subsets, universal set, empty sets, and binary operations on sets |

Furthermore, the basic competencies are translated into several indicators of competencies achievement and reduced to be the learning objectives again. There will aim to be achieved after the students participate in learning activities on the set material that students have the ability to:

3.1 To state daily problems in the form of set by listing its members
3.2 To mention members, dismembers of set associations and notations
3.3 To get to know the notions of universal sets and empty sets
3.4 To present the set in diagrams Venn
3.5 To determine the subsets and determine many subsets of a subset
3.6 To resolve problems to be related to the set operation and the nature of set

After that, it has been done for analysis of the students to be a considering in the design learning development of the set topic base on the problem based learning on the VIIth class at SMP. The student analysis includes cognitive level, age, learning styles and motivation towards subjects.

Based on the results of observations, interviews and questionnaires, it is gained that mathematics learning has not brought the students into the learning situation which can develop all their abilities. The teachers can not be able to design learning with suitable model that makes it easy for the students to learn to understand the materials, concepts and solve the problems to be related with the ability solving
problems. The materials of learning are the teachers’ books and the students’ books not carried them at the daily situation of lives yet, therefore it is needed the development of learning design base on problem based learning that it can be overcome.

4. References

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