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DESIGN CONTEXTUAL TEACHING AND LEARNING APPROACH ON GEOMETRY LEARNING MODULE

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ABSTRACT

Mathematical learning with contextual approach provides an opportunity for students to actively construct mathematical knowledge. In solving a problem which is start from the problems that can be imagined by students and giving them a freedom to find their own strategies to solve it. By posing a contextual problem, students in stage can master mathematic concept. The purpose of this research is to develop the design of Contextual Teaching and Learning approach on geometry learning module. This type of research is development research. The phases development of the model and learning tools are carried out in three steps, which are: (1) preliminary research, (2) prototyping phase. The result of design this prototype phase are: (1) design of the geometry learning module, (2) design tools of learning and (3) design of research instrument. The module component consist of: (1) module description, which consist of core competencies and basic competencies to be achieved; (2) the instruction for using the module, that consist of introduction, initial ability checks, activity sheets, conclusion, worksheet, assessment column, and answer key.

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INTRODUCTION

Mathematic is a universal science that underlies development of modern technology, it has important role in a various disciplines and advances the human thinking. Math needs to be learned to all learners from primary school to equip them with logical thinking skills, analytic, systematic, critical, and creative also ability to cooperate (BSNP: 2006). For enhancing critical thinking skills and creativity to the students it should be start early in order they can easily solve the problem that will be useful for their real life. The achievement of these abilities can be achieved by the principle of effective mathematic learning.

Appendix of National Education Minister Regulation Republic of Indonesia Number 22 (2006, 416) that state in every opportunity of learning mathematic should be begun with introduction of problems that appropriate with the situation (*contextual problem*). Theory of learning constructivism is a theory that state the students must find by themselves and transform it into complex information, check the new information with the old rules and revise it if the rules are not longer appropriate (Trainto, 2010: 74). A teacher can provide facility for this process, by giving the students a chance to discover and apply their own ideas, and teach them by consciously using their own strategies for learning.

Based on researcher's experience when taught mathematic in secondary school was the result of the students' learning about geometry was lower than learning about number. Thus, caused students were difficult to memorize formulas about the circumference, area of plane and area of face and volume of solid. Through the foundation of philosophy constructivism, CTL is promoted to be a new method alternative strategy. Through this CTL strategy, students are expected learn through 'experience' and it is not 'memorize' (Nurhadi, 2009: 10). Knowledge is not a set of fact, concept, or principle that is ready to be remembered and taken. People should construct the knowledge and give the meaning through the real experience. Then, in CTL, the strategy for how to teach the students connect between the each concept and with the real fact is a preferred element compared with emphasis on how much knowledge that students should keep in mind.

Mathematic is not only memorizing science, therefore the basic concept must be built in the mind of child. For example how to teach rectangle of area should not be informed directly that the formula is *length x width*. In the other hand teacher should introduce the concept first how is area with using unit width to be demonstrated by the students themselves. From the demonstration will be obtained that rectangle can be closed with the number of square units is equal with the number square length multiplied by the number of square on the width therefore the concept of broad rectangle will be more attached to the child and it's not only memorized, although in the next level students will be memorized it by themselves indirectly.

Placing a concept to the students are also should appropriate with the character of the students. The students in 4-6 grade aged between 10-12 years who in piaget's cognitive development theory is in a concrete operational stage, where the students start to think logic but still limited to concrete. Mathematical material containing abstract words or ides will be understandeasily by the students if previously they were given concrete example from the surrounding environment. In addition to the signs of mathematics curriculum mentioned that to teach the concept of math can be start with problem in accordance with the conditions (*contextual problem*).

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Contextual Teaching and Learning (CTL) is a comprehensive system and consist of interconnected parts. If these parts that connect with the other will get the result more than given by separately parts. Johnson said learning of contextual is a system which simulating the brain to construct the patterns that give the meaning. Contextual learning is a system that matches with the brain which linking of academic content with the student's daily life. Contextual teaching is an effort to get students active in pumping self-esteem without loss in terms of benefits, because students try to learn the concept and relate in their daily life. According to Department of National Education (2008: 12) contextual learning strategy is a holistic education process and the aim is to motivate the students to understand the material by linking them with their daily life (in personal, social, culture), with contextual approach expected to be meaningful, because the learning process is naturally in form of activity students and experience, not just transmit the knowledge from the teacher to the students.

To maximize the independence of students to construct their own knowledge need a structure independent material learning, for instance is achieved through the provision of quality learning module. Module is a systematic and compelling teaching material that content of the material, method, and an evaluation that can be used independently. Module is used independently, learn according to the speed of each individual in effectively and efficiently and has the characteristics *stand alone* is a modules are developed not depend on the other media where one of the characteristics is developed into up to date and contextual.

The regulation of national education minister (Permendiknas) number 41 in 2007 is the standard of process to guide the teachers to develop of teaching materials. Teachers should develop the material based on characteristic and the environment of students. In Department of National Education (2008: 9) said that the advantage of preparation the material teaching are: (1) to obtain the materials in accordance with the curriculum and demands with the students' need, (2) overcome the dependents of the textbook which are sometimes difficult to get, (3) increase the knowledge and experience of teachers in writing teaching materials, (4) increase the credit score of teachers when they are compiled into a book and published.

Result of the observation researcher in several primaryschool in Malang obtained data that the school were still using guidebook from the government and worksheet which is still pure of question. The characteristic of used teaching materials are: (1) only contents a material summary; (2) content of daily exercise; (3) the view is less interesting; (4) the language is less communicative; (5) there is not feedback. Most of the teaching materials did not facilitate the students to find their own formulas of area and solid volume thus the students directly memorized and used it. In addition, the learning conditions that were traditional in that school would make the students do not develop optimally. Students who were highly capable and have high speed in completing their work tend to be board because they must wait the other friends to learn the other material. They also tent to be noisy and disturbed the other friends.

To overcome the problems that arise was required the learning method that can facilitate each student to develop their skills, the examples was by giving them a module that independent and contextual, which contents the activity that require students for more active and develop their critical also their creative thinking skills. The purpose of this research was to develop approach design contextual Teaching and Learning (CTL) in a geometry module.

METHODE

Focus of this research was to develop the module of geometry with CTL approach for valid primary school students, practice and effective. This type of research is include in educational development (educational design research). Development learning module in this research is following the step of model development phase proposed by Plomp (2007). The development phases are carried out in three phases, which are: (1) preliminary research, (2) prototyping phase, and (3) assessment phase. This following were consecutive activities describe in each of the development phase:

1. Preliminary research

In this step, researchers did a careful observation matters such as: (1) the availability of learning resources and the situation with various facilities including supporting books, and ongoing learning conditions, (2) how the teacher condition in the field carrying out teaching and learning activities of math, in terms of

2. Prototyping phase

From the observation, reflection and preliminary analysis, arrange the problem solving. The design consist of; (1) design of learning module (2) design of tools learning and (3) design of instrument research. Third designs are arranged together.

3. Assessment Phase

In this phase was doing the expert validation in a module, tools of learning, and instrument.

After validation module was tested by the instrument.

RESULTS AND DISCUSSION

In first investigation conclude that: (1) the unavailable of math books that support construction geometry learning because the information did get by the students themselves. (2) result of the interviews from several primary school teachers in Sukun district Malang City obtained data that the teachers had not use the module as an independent media learning. Learning still tent to *teacher centered* and used of less effective learning resources. The result of first investigation to learn geometry in Sukunsub-district Malang was also line with the previous research by Suastika (2016) about the number of learning in Lawang sub-district which was centered on the teacher.

The result of design in prototype phases were: (1) design of learning module, (2) design of tools learning, (3) design of instrument research. Third designs are arranged together.

a. Designing a Learning Module

This design phase was creating component learning module with approach CTL to teach the material of plane and geometry in primary school. This module was named as a geometry learning which are: (1) properties of plane, (2) circumference and plan area, (3) properties of solid, (4) net of solid, (5) area and volume of solid. Component module consist of: (1) description module that content the core of basic competency would be achieved; (2) instruction for using a module, that content preface, initial capability checks, activity sheets, conclusion, work sheet, assessments column, and the answer key.

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Table 1. The component of CTL approach in a module geometry learning for primary school students that adopt from Johnson (2002: 24)

| Number | Component | Activity |
|--------|--------------------------------|---|
| 1 | Making meaningful connections | Teacher connect between teach and learn with the daily context of students |
| 2 | Doing a significant work | Find the examples of application materials which learned in daily life |
| 3 | Self regulated learning | Students do certain things which are taking an action, answer, make a decision, critic and creative thinking, have the awareness, and collaborating |
| 4 | Critical and creative learning | Students interact with friends with the other in troubleshooting and experiment activities |
| 5 | Collaborating | Students do a problem solving activities by generating a new idea |
| 6 | Nurturing the individual | Teacher give good stimulus motivation to the student's learning environment |
| 7 | Reaching high standard | Students solve the non-routine exercise which related to critical and critical and creative thinking |
| 8 | Using authentic assessment | students collect their work that packaged in regularly module. |

The component of CTL approach that developed in a learning geometry module was same as (Wahyuningtyas, 2017), that before already develop numeric module with approach the CTL.

b. Design of Lesson Plan

This lesson plan was a guide for teacher to carry out the learning steps. This lesson plan was as a reference for teacher in teaching the module for the students. While the students work based on command in the module. Thus components in lesson plan were: (1) identity: an education, name of lesson, class, semester and schedule, (2) core competences (KI) and base competences (KD), (3) indication, (a) material description, (5) learning method (6) learning scenario, (7) equipments and learning resources (8) assessment. In the learning steps describe the process of learning CT clearly.

c. Instrument Design

The instrument that had been designed was a validation sheet, observation sheet, questionnaire student response, and test learning outcomes. The description of instruments will be described as follow:

1) Validation Sheet

Validation sheet had been designed as : (a) module validation sheet, (b) validation sheet of activity teacher and student observation, (c) test result validation sheet.

2) Observation Sheet

This observation sheet as a follow: (a) teacher activity observation sheet, and (b) students activity observation sheet.

3) Students Questionnaire Response

Students' questionnaire response that had been designed was used to record students' response data on module and the implementation of module, such as: the

module it was interesting or not, the students understanding or not with the message delivered, consistency of purpose and material, language clarity and the suitability of material and procedure with level of understanding of its users.

4) Mastering Test Of Learning Outcomes

The test kit consists of a test sheets that contain the description of questions and score guide. This test was used to measure the ability of students in the mastery of the teaching materials or build the understanding of CTL based on geometry. In designed the test, the things to do was making a question in accordance with the objective to be achieved based on lesson plan which have been arranged and giving the attention to the rules of the correct item writing.

CONCLUSION

Design of Contextual Teaching and Learning (CTL) approach in developing geometry learning module consist of 8 components: (1) making a meaningful connections; (2) doing the significant work; (3) self-regulated learning; (4) collaborating; (5) critical and creative thinking; (6) nurturing the individual; (7) reaching high standards; (8) using an authentic assessments. On these steps were not absolute all the activities carried out and controlled by students but also teachers still had a role, especially in nurturing the individual step. In these step, gave the motivation and module working instruction could be helped by the teacher as we know the students was still in primary school where the independent of students are not maximal.

There was some things that the author could suggested for teachers who have taught (In-service) related to the development of geometry learning module with CTL approach due to limited time and cost of this limited learning of module geometry that was plan and solid, then it needed to be developed on the other material, whether material that supports of learning geometry or the other material of math.

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