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LOGICAL REASONING ELEMENTARY SCHOOL STUDENTS IN DEBIT MEASURMENT LEARNING BASED ON PENDIDIKAN MATEMATIKA REALISTIK INDONESIA (PMRI)

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Abstract

The design research was intended to see how logical reasoning sixth grade students at SDN 114 Palembang in Debit Measurement learning based Pendidikan Matematika Realistik Indonesia (PMRI). Logical reasoning can be seen from the process of constructing the mathematical ideas in the from informal to formal. Fundamental concept of mathematical ideas in this design research is used by students in finding formal mathematical form of augmented context kederasan of water flowing from one place to another (water from a bath and the water from the gallon) with PMRI approach. Learning trajectory designed learning process includes a series of discharge measurements that show students' logical reasoning in solving any of the problems are provided in the form of informal to formal shapes. The method used is the research design, the preliminary stage, teaching, experiments, and retrospective analysis (Aker 2006). This researh describes how the logical reasoning of students in understanding the concept of flow measurement up to the abstract stage. All strategies and models that students discover, describe, and discuss the show logical reasoning students in mastering concepts discharge measurements. The stages in the trajectory learning have a role an important in understanding the measurement concept debit of informal until on.formal.

Keywords: *Logical Reasoning, Learning Based PMRI*

INTRODUCTION

Background

According to Zainuri (2007), a characteristic of mathematics is the having object having the character of abstract. The abstract nature This causes a lot of students experiencing difficulty in mathematics learning. The results of interviews informal with a mathematics teacher of SD Negeri 118 Palembang, successfully obtained information that, one of the obstacles who faced in mathematics learning school is the lack of motivation learn students' or students not enjoys math because of perceived difficult. This case have an impact on learning outcomes mathematics a low and activity students in classroom tends to is not active.

Jenning and Dunne (1999) say that the, most students experiencing difficulty inside apply mathematics into inside situations real life. Another thing which resulted in difficult mathematics for students is because the learning mathematics less meaningful. Teacher along with his study in classroom does not conected to scheme of wherewith is owned by students and students less are given the opportunity to find back. According to Zulkardi (within bulletin PMRI Vol, 2006: 9), that the the

material which taught must be context which accordance konsep and real for students. Problem contextual can be be used as a starting point the learning in helping students develop understanding against mathematical concept who be learned and also could be used as an source of applications of mathematics.

Based on the results of the research, the reason why achievement lowly mathematics is the low reasoning students. The low reasoning students can be be seen from the results of research who conducted by Sumarmo (1987) that the, both overall nor the grouped according to cognitive stage students, score ability comprehension and mathematical reasoning very low. In addition to low reasoning students also due lack of of understanding concepts-concepts mathematical.

According to Wahyudin (1999: 191), one of tendency which cause the a number of students fail master principal staple of discussion under mathematics because students are less using reason who logical within completing matter of or issue math which given. Line with this matter, Matz (within Priatna, 2003: 3) on research on students' SMP, also stating that the mistakes who done students junior school in working on matter of math due to lack of the ability reasoning against the basic rules mathematics.

The above opinion are supported also by the results of research Lovell who reveals that if students not yet have the ability to reasoning which necessary then the knowledge which obtained from learning will be forgotten or, even if still lagging behind, only constitute of remembering knowledge (Priatna, 2001: 35). Similarly with research results Sumarmo (1987: 297) against students SMA, which mentions that there was relationship which means the between reasoning logic students with abilities comprehension and reasoning students'.

Realizes importance of of understanding and reasoning mathematical, then be needed learning which can improve the understanding and reasoning mathematical students'. However, if we see in much of the learning that takes place during this school gives the opposite effect than expected. That is because the learning is still centered on the teacher, while the students just sitting listening to the teacher, noting the lesson, then do the questions routine (Zulkardi, 2000).

According to Ruseffendi (1991) one of the factors who affect learning students' is presentation of the material, whether the presentation of such material make students interested, motivated, and arise feelings of on self students to please such material. Or is precisely make students saturated against the material.

Currently there are a variety of new innovations in the education of both the general education and for mathematics education. One such innovation is PMRI. Selection of this approach is more due to that the learning makes students enthusiastic about the existing problems so that they would try to solve the problem.
Ausubel (In Dahar, 1988: 99) says that the most important factor affecting student learning is what you already know students or new concepts or intormasi new must be associated with the concepts that already exist in the cognitive structure of students. Because actually the student has had a set of ideas and experiences that make up the structure of the cognitive through their interaction with the environment. Whereas duty of a teacher is the assist students in order that capable of construct his knowledge in accordance with situation who concrete.

Logical Reasoning

Reasoning can be defined as the process of reaching logical conclusions based on the facts and the relevant source according, Shurter and Pierce (in Sumarmo, 1987: 31). Kenedi also mean that the reasoning is the ability to identify or add a logical argument that it needs the students to solve problems (in Priatna, 20012). Cop (in Jacob, 2000: 1) defines reasoning as a particular form of thinking in an effort to capture the conclusions drawn premise. Sastrosudirjo (within Al Jupri, 2004: 16) also argued that the the ability of reasoning covers: the ability to find settlement or solving problem, the ability to draw conclusions a statement and saw relationships implications, as well as the the ability to see the relationship inter idea-idea.
Reasoning interpreted as withdrawal conclusion within an argument and way of thinking which is the explanation in the effort showed an association between two things or more based on the nature-properties of or law-certain legal who recognized its truth, with using step-specific measures that would ended with a conclusion (Kusumah, 1986: 1).

According to Tim Balai Pustaka (in Shofiah, 2007) the term reasoning contains three terms, including: How to (it) using reason, thinkers or logical way of thinking. It develops or controls something with reason and not with the feelings or experiences. Mental processes inside developing or controlling the mind of some fact or principle.

According Galotti (in Jacob, 1997: 30) that logical reasoning is to transform the information provided to obtain a conclusion. Logical reasoning is reasoning in accordance with the rules of logic or consistent with the rules of logic (Jacob, 2001: 2). Logical reasoning according to Matlin (in Jacob, 1997. 30) consisting of:

The conditional reasoning related to the statement or proposition: "If ..., then ...", the "If ..." called the antecedent or implikan or protasis (antecedent or implicant or protasis), while the "then ..." called the consequent or implicatet or apodosis (consequent or Implicate or apodosis) by Irving (in Jacob, 1997: 31).

Syllogistic reasoning or syllogism (hereinafter referred to as the syllogism only) contains two premises or should we assume that the statement is true, plus a conclusion (Jacob, 1997: 32). Syllogism include quantity, so use words. all, for any, any, none, or the same terms other. In conditional reasoning, the statement is often expressed by the letters p and q, while the syllogism using traditional symbols A, B, and C (Jacob, 1997: 33). One "true conclusion of a syllogism depends on type of inference (Jacob, 1997: 35).

Logical reasoning is very important for trained and optimally enhanced learning for students to make the right decisions and rational. Given the importance of logical reasoning ability and the obligation to seek and implement teacher learning approaches as well as in accordance with what the students should learn (Sulistianti, 2008: 19).

Learning Based Pendidikan Matematika Realistik Indonesia (PMRI)

Realistic Mathematics Education (RME) is a learning approach that starts from the things that 'real' for students. In Indonesia "RME in Indonesia known as Pendidikan Matematika Realistik Indonesia (PMRI). RME developed by Freudenthal Instituut, Netherlands started by Hans Freudenthal 1970. Opinion, mathematics must be connected with the fact, be close to the students, and relevant to the lives of people to

have a humane values. The emphasized that the materials should be tranmited to mathematics as human activity or mathematics is a human activity (Freudenthal, 1991). Mathematics as a human activity is intended that students should be given the opportunity to learn matematisasi activity on all topics in mathematics and mathematics should be linked to the situation he had experienced both in mathematics and in everyday life. Two types matematisasi known in the horizontal and vertical PMRI. In the horizontal, so that the students can use math to help them organize and solve a problem in a real situation. In contrast, the vertical type the reorganization process using mathematics itself.

According Freudental in Zulkardi (2005 - 8-9), there are three principles that can be reference by designing devices that learning both material and other educational products. Three principles:

1. Guided reinvention through mathematization
2. Didacitical Phenomenology
3. Self-developed models

According to Jan de Lange (1987); Treffers (1991), and Gravemeijer (1994) in Zulkardi (2005:9) PMRI has five characteristics are as follows:

1. Using contextual issues (contextual issues as an application and as a starting point from which the desired mathematics can appear).
2. Using a model that emphasizes an informal settlement before using formal methods or formulas. (Attention is focused on the development of models, schematics and symbols than simply transferring or mathematical formulas directly).
3. Appreciate the variety of answers and contributions of students (a large contribution to the process of teaching and learning expected of students sendin contribution that led them towards more informal methods formal).
4. Interakfivitas (explicit negotiation, intervention, and evaluation of cooperative fellow students and teachers is an important factor in the process of constructive learning where students are used as informal strategies to achieve a formal heart).
5. Integrated with other learning topics (holistic approach, shows that the learning units can not be achieved in isolation but must be exploited keterintegrasian linkages and problem solving).

Method

In this study, researchers used research methods 'design research', (Gravemeijer, 2006) aims to develop the local theory intruction. This research uses real classroom setting (Authentic classroom) to implement a theory of learning in order to improve the quality of learning. According Akker (2006:19) Research Design consists of: (1) preparing for the experiment, (2) experimenting in the classroom, and (3) conducting restrospective analyzes.

The study was conducted in the second semester of academic year 2010/2011. The subjects were all students of class VI Palembang Elementary School 118 of 40 people, comprising 18 men and 22 women who were involved during the process of mathematics learning activities using PMRI based teaching materials.

Data collection techniques used in this study are:

a. Observation

Observations are used to determine the practicality and effectiveness of instructional design that has been designed. These observations were carried out during the learning process by using a researcher-developed observation sheet. In this study, researchers assisted by 3 observers in charge of observing the activity of students during the learning process.

Table 1. Designing the Learning Measurement Debit

Subject	Grade IV Elementary School 118 Palembang
Time	Februari-April 2011
Focus	Learning
Methods	Observation, discussion, etc
Media	Mineral Galon water, bottled mineral water, mineral water glass, measuring cup, stopwatch
Procedure	3 Observer observe the students during the learning

b. Interview

Interviews were conducted to different individuals at different phases. This interview aims to obtain information related to the research.

c. Documentation

Documentation required as materials to analyze on what is found during the learning activity, where previously Decrypt data in advance. The type of documentation used in this study include:

Completeness of the materials and teaching materials that have been validated by researchers and colleagues documented as teaching material that meets the criteria of practicality.

Answer a strategy that researchers collected students completed as documentation used to help assess students' logical reasoning in understanding the material discharge measurements.

The observation observer after observer assessed by investigators as a documentation collected is used to assess the activity of students in the learning process following the discharge measurements.

Photo learning activities by researchers collected as documentation keterlaksanaan learning process.

d. Field Notes

During the implementation of the learning takes place researchers make notes on students, researchers collected the records to see the students' progress in learning to follow the discharge measurements.

This type of research is a quantitative research design, so that the data analysis is done with the principle of qualitative research. For a study that takes into account the validity and reliability, both of these are described as part of the process of data analysis. More details are described as follows.

1. Validity

Implementation of this design study to answer the research questions posed. For it made HLT instruction is integrated with the local theory to support the feasibility of the plan. The validity of the data obtained refer to: HLT and Decision conclusions

2. Reliability

Qualitatively reliability can be done in two ways: Triangulation of data and Interpretation cross.

RESULT AND ANALYSIS

This study consists of two major cycles that preparation for the study (preparing for the experiment) and experimental phase (experiment in the class room). During the preparation stage consists of 4 small cycles and at an experimental stage consists of 5 minor cycles. Retrospective analysis the final discussion.

During the preparation stage is done the preparation / learning design trajectory as a sequence of learning through which students in learning activities. The sequence of learning through which students from early learning is: begins telling the daily activities associated with tap water, followed by measuring the discharge experience is designed in the form of events observed water flow bathroom faucets and faucet gallons of water and then given a situational problem related to the context and includes learning materials. After preparation of the learning path followed by the groove tried out in small groups. In the process of trying this happened a few design changes, such as to the effectiveness of taking observations gallon water dispenser is changed to use a dispenser gallon is not wearing, and there are some correction fixes the problem given to the students.

At this stage of the experiment (experiment in the classroom) learning path design results and some activities pursued in the class with several groups. Activity goes according to plan and demonstrate logical reasoning student activities and as expected.

The Learning trajectory design for basic concepts of debit measurement that arise from the context of the tap water can be described as follows:

Activity 1

viewing images containing tap water as the starting point which is also a learning context in discharge measurements. Here, students connect the existing activities with students' daily activities.

Problems 1

Compare lot of water and a water reservoir at the same time but the swift water and different water sources. On this problem easily students compare water at the source of water from a fire hose than ordinary tap water. In this problem students learn debit by compare much water on the same time from fire hose than ordinary tap water. They get water from fire hose is much than from tap water. They called it because water from fire hose more ‘deras’ then ordinary tap water. ‘Deras’ is base logical reasoning of students for debit measurment learning.

Activity 2

Observations discharge water faucet. This activity leads students in a more scientific search for the discharge formula unit volume per unit time. Here students start to

conect the context to their knowladge about debit measurment by their daily activity. This activiy students study debit by measure debit water from bath foucet and water from gallon foucet by mineral water glass. This activity is a referential or model of debit mesurement learning. This activity was continued by compare much water between two deference source of water (model for). And students can making conclusion abut debit by their own reason. Ther answer can be conclusion to formula of debit (Formal step).

Problems 2
with the discharge measurement unit equal volume but different time unit. On these issues in addition to linking students with problems and previous activities also begin to associate it with the previous unit lesson.

Problems 3
with the discharge measurement unit time unit of volume equal but different. On this issue began skilled students resolve problems that exist with different formulas and units.

Problems 4
with the discharge measurement unit time and unit volume differently. 4 At issue is the level of understanding of students formally been very mature, they settle easily visible from the given problem.

Problems 2, 3 and 4 are formal problem about debit measurement learning. In this step student have been understand about debit measurement n hou to calculate it.

Then, logical reasoning of debit measurment learning from this design research can be arrange from **situational** with viewing images containing tap water as the starting point which is also a learning context in discharge measurements. Where, students connect the existing activities with students' daily activities. Next to **model of**, by activity observation diferent water foucet. Then **model for**, when student compare much water between diferent water foucet. And the **formal** reasoning is student make their own conclusion about debit.

CONCLUSION

Based on the results of data analysis of the results of observation sheets, documentation, and so forth can be made the research support the following conclusions:

Description of the trajectory of learning that guides students' understanding of the logic of his own experienced by students ranging from informal to formal can be seen in the emergent modeling. At the informal level, students understand that each tap has a different kederasan and this is one of the basic one consep discharge. In the referential level, observation tap water discharge measurements representation (models of) the basis for the emergence of gauge students themselves. Documenting the volume of water and the amount of time used to hold water on the observation that was later made into a model for the observations reported in the general level to get a discharge is sought, including a standard formula discharge measurements. After achieving some basic concepts of flow measurement, students are able to solve problems on a formal level that demands knowledge and experience at the level of situational, referential and general.

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