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Implementation Inquiry Model with *Examples and Non Examples* to Enhance The Mathematical Conceptual Understanding of Primary School Students

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Abstract. The ability to understand concept is one of the abilities which is students must possess in mathematics learning. Inquiry model allows students to be actively involved in constructing the concept. Inquiry makes students become a researcher or scientist, but in the context of learning, students are still guided by the teacher. The research aims to analyze the effect of inquiry model with examples and non-examples on primary school students' mathematical conceptual understanding. The method used in the research was a library research. The result of the research are that the inquiry model with examples and non-examples can enhance students' mathematical conceptual understanding and the steps of inquiry model with examples and non- examples is relevant with the indicators of students' mathematical conceptual understanding.

Keywords : Inquiry, Examples and non-Examples, Mathematical conceptual understanding

INTRODUCTION ~ Education is important for human life. According to Burhanuddin, Sumiati, and Sopian (2015: 20) education can be interpreted as a conscious effort to develop the human potential of students, both physical, creative, sense, and intention to become real and be able to function in their life's journey. Therefore education must be a basic human need. In accordance with what is stated in the goal of national education which is to educate the life of the nation and develop Indonesian people as a whole. The Indonesian people in question are human beings who have faith and are devoted to God Almighty and have noble character, knowledge as well as skills, physically and mentally healthy, have a steady and independent personality and have a sense of community and national responsibility. One of the efforts made by humans to achieve these national education goals is by taking formal education at an institution called a school.

Wulandari (2016: 1) states that "school is a formal educational institution whose one goal is to explore and develop the results of human culture." School is an institution in which teaching and learning activities take place. Teaching and learning activities are interactions between humans who carry out learning activities and humans who carry out teaching activities. At school, humans who carry out learning activities are called students. Whereas humans who carry out teaching activities are called teachers. Teaching and learning activities certainly refer to the curriculum in which contains various types of knowledge, one of which is commonly referred to as mathematics.

Misel and Suwangsih (2016: 27) explain that "mathematics is a means of logical thinking to solve problems in everyday life."

Therefore, mathematics is one of the important studies for human life because essentially human life is never separated from mathematics begins since humans were born and last a lifetime. According to Syahbana (2013, p. 1) "Mathematics is an intact building of a collection of concepts that are intertwined and intertwined with one another. To master mathematics must master the concepts contained therein. "Therefore, in addition to the ability in arithmetic operations, mathematics also plays a role in other abilities which are certainly useful for human life, one of which is the ability to understand mathematical concepts. This is in line with the opinion of Aprisetyani, et al. (2014: 204) which explains that mathematics is a deductive science that requires thinking and understanding. Therefore, the ability to understand mathematical concepts is very important for students.

METHOD

Data collection used in this research is literature study method. In other words, this research is based on the results of studies of several books, journals and other literature searches related to the issues raised (Nazir, 2013). According to Koentjaraningrat and Satori (1984), library technique is a way of collecting various material data contained in libraries, documents, etc. that are relevant to research. While Komariah and Satori (2011) explained that literature study is a supporter of research that began from the view of experts in writing in the form of references to books, journals, research reports or other scientific works. So, literature study is a method of finding research sources from the results of the study of several literature relating to the issues raised by researchers.

Research Procedure

According to Zed (2004) there are several steps in the study of literature studies as follows:

1. Prepare equipment

Tools that must be prepared include digital equipment as a data search tool and data entry tools such as laptops, smartphones, and internet networks, highlither to mark sentences and equipment to record important things manually such as ballpoints and notebooks.

2. Prepare a work bibliography

This study uses books as the main source. In addition, this research also uses journals and the internet to obtain additional resources.

3. Set the time

This research starts from the collection of books and journals related to the problem to be studied as a source and then looks for information related to the problem. After that, the researcher examines the information. Until the writing of the paper based on information that has been reviewed. Every research process must be carried out effectively and efficiently.

4. Read and make research notes

Important notes in research written and marked from various sources, are arranged into a paper.

Data Collection Techniques And Instruments

Data collection used in this research is literature study technique. Books, papers and journals as well as several other important notes are sources of data needed in this study.

Data Analysis Technique

Holsti (1969) says that any technique for making conclusions objectively and systematically identifies the characteristics of a specified message. The literature study method does not carry out calculations but studies from several books, journals and other reliable sources. Information obtained from these sources is then analyzed to obtain important data for research.

RESULTS

The researcher reviewed several books and journals related to the issues raised. each variable studied is associated with other variables so that it can answer the problem raised. in addition, this study is strengthened by previous research that examines the variables used in this study.

Ability to Understand Mathematical Concepts

Nurmahanani (2016: 12) says that ability equals skill. So, the ability to understand mathematical concepts can be interpreted as a person's skill to understand concepts that exist in mathematics and understand their relationship with problems that occur around them and can do or find solutions to these problems mathematically. The above definition shows that the ability to understand mathematical concepts is very important for humans, including elementary students. Robert Havighurst (in Nurihsan and Agustin, 2016: 19) explains that 'the task of childhood development (6-12 years) is the development of concepts necessary for daily life, ...' In line with the opinion of Surya (2013 : 48) that cognitive development at the age of 6-12 years gives the child's ability to deal with the concept of classification, relationships, and quantity. Surya (2015: 122) also said that the concept of classification is the ability of children to logically see the similarities of a group of objects and choose them based on the same characteristics. Then Turmudi (in Sari, et al., 2015: 47) said that students must learn mathematics with an understanding that is actively built from the experiences and knowledge students have before. Therefore, students are required to improve their understanding of mathematical concepts in order to fulfill one of their developmental tasks.

Indicators of students being able to understand mathematical concepts according to Dirjen Dikdasmen Number 506 / C / Kep / PP / 2014 are: 1) Restate a concept; 2) Classifying certain objects according to the concept; 3) Give examples and not examples of concepts; 4) Presenting concepts in various forms of

representation; 5) Developing the necessary or sufficient conditions of a concept; 6) Using and utilizing and choosing certain procedures or operations; and 7) Apply concepts or algorithms in problem solving. The indicator is what determines the level of ability to understand students' mathematical concepts. Therefore, it is very important for students to master it.

To achieve the ability to understand mathematical concepts, students must experience meaningful learning. Meaningful learning occurs when students experience it themselves. Therefore, the teacher must be able to guide students to get their own learning experiences. One of the teacher's efforts in providing learning experiences for students is to apply the inquiry model and examples and non examples.

Inquiry Model

Inquiry is a teaching method that requires students to process information through direction and guidance from the teacher to obtain knowledge or answers to their questions (Ananda, T & Putri, HE, 2016: 40). According to Saud and Suherman (in Ananda and Putri, 2016: 38), inquiry is a learning process based on the process of searching and finding through systematic thinking. Burhanuddin and Sofyan (in Ananda and Putri, 2016: 38) state that "the inquiry model is a model that emphasizes more investigation into a problem." Then Widodo, et al. (in Ananda and Putri, 2016: 38) states that the nature of inquiry is the activity of a scientist. So, by applying the inquiry model, students are required to think scientifically.

Mark Goldner (in Stone, 2013: 39) states that good scientific thinking is capable of generating questions for inquiry, developing logical hypotheses, designing controlled experiments, collecting and presenting appropriate data, using evidence to support conclusions, and effectively conveying processes experiment. In line with the opinion of Saud and Suherman (in Ananda and Putri, 2016) regarding some systematic steps in inquiry, namely: 1) Formulating a problem to be examined; 2) Propose a temporary answer (hypothesis); 3) Collecting data related to the problem; 4) Test the hypothesis based on data that has been collected; and 5) Make conclusions about the findings regarding the problem.

In the inquiry learning model, the teacher acts as: 1) Motivator, 2) Facilitator and 3) Director (Simatupan, S & Tiarmaida, 2015: 35). Therefore, in carrying out the steps in inquiry students certainly need to be guided by the teacher.

The advantages of the inquiry learning model are that it can help students use existing memories to be associated with the concepts to be discussed, encourage students to think and work on their own initiative, give students freedom in learning, and encourage students to think and solve the problem of the problem

being faced (Setiasih, Panjaitan & Julia, 2016: 424). Therefore, the application of the inquiry model is felt to have an effect on the ability to understand mathematical concepts of elementary school students.

In addition to the inquiry model, in order to strengthen the achievement of indicators of understanding mathematical concepts, the teacher must apply a model that is related to the indicators. One such model is a non-example example that relates to indicators of the ability to understand mathematical concepts number 3 according to Regulation of the Director General of Primary and Secondary Education Number 506 / C / Kep / PP / 2014, which provides examples and not examples of concepts.

Model Example and non Example

Example and non Example is a learning model that uses images as a medium to convey subject matter. (Huda, 2014: 234). Meanwhile, according to Heriawan, A., Darmajari, and Senjaya, A., (2012: 112) Example and non Example is a learning model that uses examples. From both of these meanings, it can be interpreted that the example and non example model is a learning model that uses drawing media or concrete objects to distinguish examples and not examples from a concept being studied.

The steps in the Example and non Example model according to Rahman (2017: 7-8) are: 1) Preparing the drawings; 2) Showing a picture; 3) Provide instructions and opportunities for students to pay attention / analyze pictures; 4) Discuss groups to analyze images; 5) Read out the results of the discussion; 6) Explain the learning material in accordance with the learning objectives; and 7) Making conclusions. In line with the opinion of Huda (2014: 235) regarding the steps in the Example and non Example model, namely: 1) preparing drawings; 2) paste or display pictures; 3) forming groups; 4) Provide instructions and opportunities for students to pay attention / analyze pictures; 5) record the results of the discussion; 6) read out the results of the discussion; 7) explain the material; and 8) cover.

According to Buehi (in Huda, 2014: 235) one of the students' activities in the Example and non Example model is to carry out a process of discovery to develop concepts progressively through direct experience of the examples they learn. Thus the application of the inquiry model fits perfectly with the Example and non Example model.

With inquiry learning models and examples and non examples, students can think scientifically in finding their own answers to a problem and can add to the learning experience. Pratomo (in Ananda and Putri, 2016: 38) states that the learning experience experienced by students will help students achieve learning goals as effectively and efficiently as possible, and allow students to learn more actively, not just read and listen to explanations from the teacher. By increasing the learning

experience and scientific thinking, students are expected to be able to improve their mathematical concept understanding of teaching material.

DISCUSSION

The following is a study carried out by several researchers who applied inquiry models to mathematics learning, among others:

1. Makar, Katie; Fielding-Wells, Jill. (2018). Shifting More than the Goal Posts: Developing Classroom Norms of Inquiry-Based Learning in Mathematics. *Mathematics Education Research Journal*, 30 (1). (ERIC p53-63). The 3-year study described in this paper aims to create new knowledge about inquiry norms in primary mathematics classrooms. Mathematical inquiry addresses complex problems that contain ambiguities, yet classroom environments often do not adopt norms that promote curiosity, risk-taking and negotiation needed to productively engage with complex problems. Little is known about how teachers and students initiate, develop and maintain norms of mathematical inquiry in primary classrooms. The research question guiding this study is, "How do classroom norms develop that facilitate student learning in primary classrooms which practice mathematical inquiry?" The project will (1) analyse a video archive of inquiry lessons to identify signature practices that enhance productive classroom norms of mathematical inquiry and facilitate learning, (2) engage expert inquiry teachers to collaborate to identify and design strategies for assisting teachers to develop and sustain norms over time that are conducive to mathematical inquiry and (3) support and study teachers new to mathematical inquiry adopting these practices in their classrooms. Anticipated outcomes include identification and illustration of classroom norms of mathematical inquiry, signature practices linked to these norms and case studies of primary teachers' progressive development of classroom norms of mathematical inquiry and how they facilitate learning.

2. Calder, Nigel; Brough, Chris. (2013). Child-Centred Inquiry Learning: How Mathematics Understanding Emerges. *International Journal for Mathematics Teaching and Learning*. (ERIC Number: EJ1025580, ISSN: ISSN-1473-0111). This paper examines how mathematical understandings might emerge through student-centred inquiry. Data is drawn from a research project on student-centred curriculum integration that situated mathematics within authentic problem-solving contexts and involved students in collaboratively constructed curriculum. The project involved case studies in three New Zealand primary school classrooms. Mixed methods were used to collect data while participatory action research was the methodology

employed. Three scenarios were described and analysed. The findings indicated that mathematics centred on real-life learning was highly engaging and that the measurement and geometric thinking explored went beyond New Zealand curriculum requirements.

3. Greene, M. dan von Renesse, C. (2017). A PATH TO DESIGNING INQUIRY ACTIVITIES IN MATHEMATICS. *PRIMUS*, 27 (7). (ERIC p646-668 2017). This paper aims to illustrate a design cycle of inquiry-based mathematics activities. We highlight a series of questions that we use when creating inquiry-based materials, testing and evaluating those materials, and revising the materials following this evaluation. These questions highlight the many decisions necessary to find just the right tasks for our students. Throughout the paper the use of multiple representations (graphical, numerical, symbolic, and narrative) and the distinction between facts, skills, methods, and conceptual understanding is explained and illustrated with examples. Additionally, we present evidence of student learning through excerpts from student journals and exam analysis.

4. Purwasih, Ratni. (2015). PENINGKATAN KEMAMPUAN PEMAHAMAN MATEMATIS DAN SELF CONFIDENCE SISWA MTs DI KOTA CIMAHI MELALUI MODEL PEMBELAJARAN INKUIRI TERBIMBING. Didaktik, 9 (1). (Google Scholar Print ISSN: 1978-5089). The purpose of this study examines the improvement of the ability of mathematical understanding and self confidence of MTs students in the city of Cimahi through the guided inquiry learning model. The background of this study is the low ability of mathematical understanding and self confidence of MTs students in the city of Cimahi. So that students' mathematical understanding and self-confidence abilities can be realized properly, an mathematics learning effort can be strived to encourage students to be able to understand the concept of self confidence in the learning process. One such learning is mathematics learning using guided inquiry. The research method used was an experiment with a pretest-posttest control group design involving two groups. The population in this experimental study were all MTs students in the city of Cimahi whose one of the characteristics had a mean score of the National Mathematics Examination of around 8.00. From all MTs in the city of Cimahi, MTs Asih Putera was chosen, which had similar characteristics, which had an average National Mathematics Examination score of around 7.80 for the 2013/2014 school year. Sampling in this study is a random class, in a random sampling technique, where each sampling unit as an element of the population has the same opportunity to be sampled or represent the population. Through the

draw conducted on 5 classes of class VIII MTs Asih Putera obtained class VIII-B (experimental class) given guided inquiry learning treatment and class VIII-A (control class) given conventional learning treatment. The instrument used was a test of ability understanding, communication skills and self confidence scale. From the results of calculations and hypothesis testing it was concluded that increasing the ability of mathematical understanding of the experimental class was significantly better compared to the control class. In addition, the majority of students who get mathematics learning with guided inquiry learning models get significantly better self confidence compared to conventional learning.

5. Yensy, Nurul Astuty. (2012). *PENERAPAN MODEL PEMBELAJARAN KOOPERATIF TIPE EXAMPLES NON EXAMPLES DENGAN MENGGUNAKAN ALAT PERAGA UNTUK MENINGKATKAN HASIL BELAJAR SISWA DI KELAS VIII SMP N 1 ARGAMAKMUR*. EXACTA, 10 (1). pp. 24-35. (Google Scholar ISSN 1412-3617). The purpose of this study is to: 1) Increase the learning activities of students in class VIII SMP N 1 Argamakmur through the application of the Cooperative learning model Examples Non Examples by using teaching aids on the subject of cubes and beams; 2) Improving student learning outcomes in class VIII SMP N 1 Argamakmur through the application of the Cooperative learning model Examples Non Examples by using teaching aids on the subject of cubes and beams. The subjects of this study were students of class VIII D of SMP N 1 Argamakmur in the 2010/2011 school year, totaling 29 students, 14 male and 15 female. This type of research is a CAR with three cycles with research flow including: action plan → action implementation → observation → reflection → next cycle action plan. Indicator of the success of the action if the average student test scores increase and a minimum of 60.0; classical learning completeness ≥ 85% and the results of observations of student activity reached good criteria. Data collection using test sheets and observation sheets of student activities. The results showed that student activity increased with grades and categories for each cycle I, II and III were 27 (enough), 31 (good) and 32 (good). The results of learning cycle I for the understanding of the concept showed an average value of 58.68 and mastery learning 51.72%. Cycle II averaged 72.81 and mastery learning 79.31%. Cycle III averaged 82.34 and mastery learning 96.57%. Student learning outcomes improve because with the provision of Discussion Sheets to be done in groups and the use of teaching aids in learning in accordance with teaching materials and basic competencies. Student activity increases due to heterogeneous grouping, group discussion and

presentation, direction, conclusion and evaluation from the teacher.

From the results of this research, it can be seen that the application of inquiry models and examples non examples can influence the ability of students to understand mathematical concepts. In addition there are descriptions of student activity and student understanding in learning mathematics.

CONCLUSION

The ability to understand concepts is very necessary. Teachers should often insert these abilities in each learning. Inquiry and non-examples are alternative solutions to solve the above problem. Based on several sources, inquiry and non-examples examples can improve students' understanding of mathematical concept skills. There is a significant value when researchers examine some of the research results taken from several journals. Some research results say that the success in increasing students' understanding of mathematical concepts due to inquiry models and non-examples examples. Learning focuses on the discovery of concepts by students themselves who, according to some learning theories, are more meaningful to students.

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