USING ORIGAMI AS THE CONTEXT IN LEARNING SIMILARITY AT FIFTH GRADE

Khairun Nisak, Zulkardi, Darmawijoyo
Master Program in Mathematics Education, Sriwijaya University, Palembang
nisakhairun86@gmail.com

Abstract

This research aimed to produce learning trajectory in learning Similarity using Origami as the context, trough Pendidikan Matematika Realistik Indonesia (PMRI) approach. The method of this research was design research that consisted of three phases namely preliminary design, design experiment (pilot experiment and teaching experiment) and retrospective analysis. The research was conducted in Sekolah Dasar Negeri 24 Palembang. Data collection was obtained by interviews, observations, video recording, collecting student work, pre-test and post-test. The results of this research showed that Learning Trajectory (LT) which contained a series of learning process using Origami could help students to find the concept of Similarity.

Keywords: Origami, Similarity, PMRI Approach, Design Research.

INTRODUCTION

Similarity is closely related to our daily lives, for example starting from the buildings we occupy, the clothes we use, the tools we use in work, and so on. Similarity is one of the sub topics of the characteristics of plane figure and solid figure in fifth grade even semester. In the implementation of learning the similarity in the classroom was still a lot that was done in a teacher-centered way. The teacher gives an example in front of the class while students are not given the opportunity to test it by themselves. Usually students are asked to imagine whether the two shapes are similar. According to Piaget (Bell, 1981) elementary school students are still in the cognitive stage of concrete operations, a characteristic of children whose minds are still at this stage is the need to understand concepts with real objects. If the similarity learning is only done by imagining the students will experience difficulties in understanding it.

In connection with the concept of meaningfulness, Gravemeijer (1994) says that the delivery of material through contexts will be more meaningful and useful for students. Context in mathematics learning can make mathematical concepts more meaningful to students because context can present abstract mathematical concepts into representations that are easily understood by students (Wijaya, 2012). In relation to the context, in Indonesia it is actually familiar with the approach of Pendidikan Matematika Realistik Indonesia (PMRI) which has been going on since 2001 (Zulkardi, 2010) which makes context a starting point for students in developing mathematical understanding and at the same time using the context as a source of mathematical applications (Zulkardi & Putri, 2006).

One of the media in the form of paper that can be used is origami paper. The term origami comes from Japanese, which is 'ori' which means folding and 'kami' which means paper. So origami means folding paper. But, that doesn't mean that origami was created in Japan. This folding art was first introduced in the first century of ancient China in 105

AD by Ts'ai Lun. Then, it began to grow rapidly in Japan and became a culture. Now, the art of origami has been very popular throughout the world. In Indonesia, students have been familiar with origami since childhood.

According to Boakes (2009), origami brings great potential when used in the world of education, one of them is in teaching geometry. Georgeson (2011) and Wares (2011) state that origami is a bridge between nature and mathematics. Robichaux and Rodrigue (2003) state that origami is useful in improving students' mathematical abilities such as problem solving abilities. In addition, students and teachers feel happy while working on origami activities in math class (Fiol, Dasquens & Prat, 2011). This is because the origami paper seen from the color is interesting.

According to Dienes (Ruseffendi, 1992) each concept or principle in mathematics (in this case similarity) which is presented in a concrete form will be well understood and mathematical concepts will succeed if studied in certain stages one of them is game similarity (searching for communalities). In looking for characteristics of similarity students begin to be directed in the activity of finding the characteristics of similarity in the game being followed. Examples of activities provided with origami games, children are faced with groups of objects resulting from origami paper folding, children are asked to identify the same characteristics of objects in the group (group members).

Based on the explanation above, this study aims to produce student learning trajectories in similarity learning using origami in fifth grade .

METHOD

This research is a design research that aims to develop a local instruction theory based on existing theories (teory-driven) and empirical (empiricly based) experiments through collaboration between researchers and teachers to improve the relevance of research to educational policies and practices (Gravemeijer & Van Eerde, 2009).

According to Gravemeijer and Cobb (2006: 19) and Bakker (2004) there are 3 stages in design research. The first stage is preparing for the Experiment. At this stage, researchers conducted a literature review on similarity, PMRI approach, KTSP 2006, and design research methods as a basis for designing learning trajectories, followed by discussions between researchers and teachers regarding class conditions, research needs, schedules and methods of conducting research. Then the researcher designed Hypothetical Learning Trajectory (HLT) which at this stage, a series of activities that contained students' thinking conjectures were developed by researchers through Hypothetical Learning Trajectory (HLT). HTL consists of a minimum of three components, namely: Learning objectives, student learning activities, and students' thinking conjectures. HLT serves as a guide to anticipate students' strategies and thoughts that emerge and develop in learning activities from informal to formal. HLT is dynamic and can be adapted to students' thinking strategies that occur during design experiments. At this stage, learning tools consisting of RPP, LKPD, and teaching aids are compiled based on the HLT that has been prepared.

The second stage is Design Experiment which consists of a pilot experiment and teaching experiment. In the Pilot Experiment stage, the designed HLT was tested only on a few students (small classes and non-research subjects). Students from the small class

are students who have high, medium, and low abilities according to the recommendations of the class teacher. At this stage the role of the teacher is the researcher. The model teacher is expected to be in the research place so that he can clearly pay attention to the process from this stage so that he can get to know better about the learning trajectory that will be applied in the classroom. In order for HLT to be right on the target and achieve learning objectives, researchers discuss with the model teacher and interview several students to find out their understanding, progress, and difficulties in learning. The results of discussions and suggestions from the teacher as well as the results of interviews with students were used as consideration for improving HLT. The next stage is Teaching Experiment which is an implementation of HLT that has been fixed. The aim is to explore students' strategies and thoughts in actual learning. During the teaching experiment, the students' thinking allegations can be modified for further learning, in accordance with the characteristics of the research design that can be intervened. This stage is a cyclic (repetitive) process, to get a learning trajectory which is the result of the revision of the learning material tested. At this stage, the teacher acting is the teacher. While researchers focus on observing each activity and important moments during the trial process, which is then collected as a data source in the form of photos, videos, and observations. Student work was also collected and several students were selected to be interviewed.

The third stage is Retrospective Analysis. At this stage, all data obtained during the teaching experiment are analyzed. HLT serves as the main reference to determine what matters are the focus in conducting the analysis. HLT is compared to the real state of students in this case the students' thinking strategies and processes that actually occur during learning. The things that are analyzed are not only things that support HLT but also examples that contradict the designed conjecture. The results of retrospective analysis are used to answer research questions, draw conclusions and provide recommendations on how HLT was developed for further research.

The data collection techniques used for each stage in this study were interviews, observation, pre-test and post-test, documentation and field notes.

The data used in this study is limited to the pilot experiment stage, where the HLT design is tested on small groups consisting of 6 students who are not from the research class.

RESULTS AND DISCUSSION

This study resulted learning trajectories in similarity learning using origami in fifth grade. Activities in the learning process are 1) Finding plane figure shapes in origami forms of certain objects and 2) Showing the characteristics of similarity between two plane figures.

The first activity aims to find out whether students are used to playing using origami paper. Besides this activity also aims to explore students' creativity in folding origami paper and most importantly students can find shapes of plane figure in origami shapes of certain objects. At the beginning of the activity, students enthusiastically fold origami paper according to the instructions of Lembar Kegiatan Peserta Didik 1 (LKPD 1). Here are the results of the work of each group for LKPD 1.

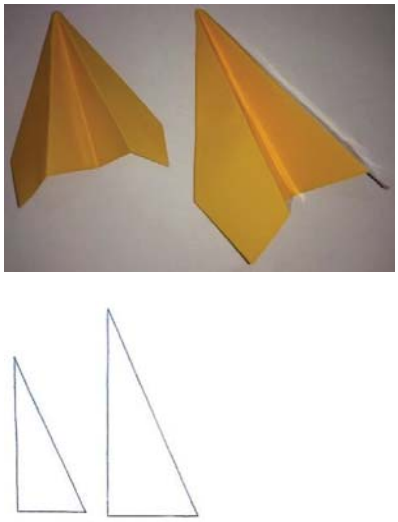


Figure 1: Group 1 work results for LKPD 1.

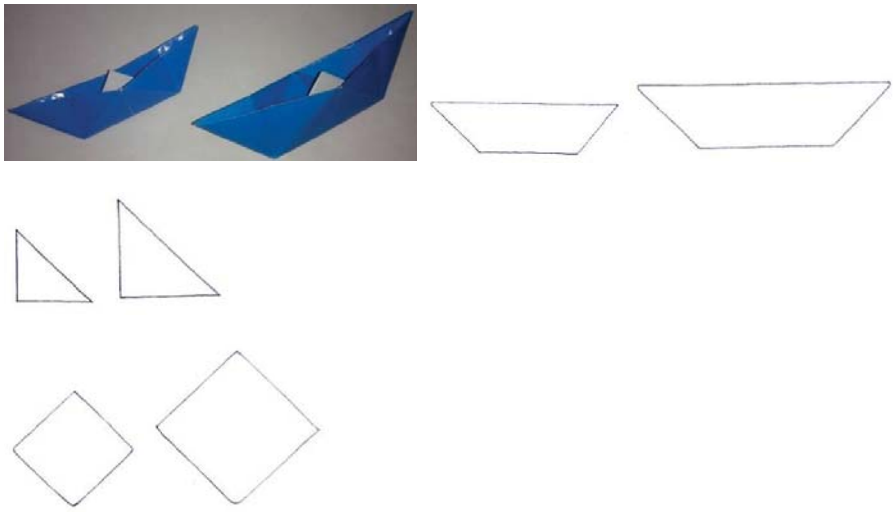


Figure 2: Group 2 work results for LKPD 1.

Furthermore, the second activity aims to build students' understanding of the characteristics that must be owned by two plane figures that are similar, students can compare the length of the corresponding sides on the two plane figures, students can understand that the comparison of the length of the corresponding sides on the two plane figures are the same, students can understand that the magnitude of the corresponding angles on the two plane figures are the same as using origami paper.

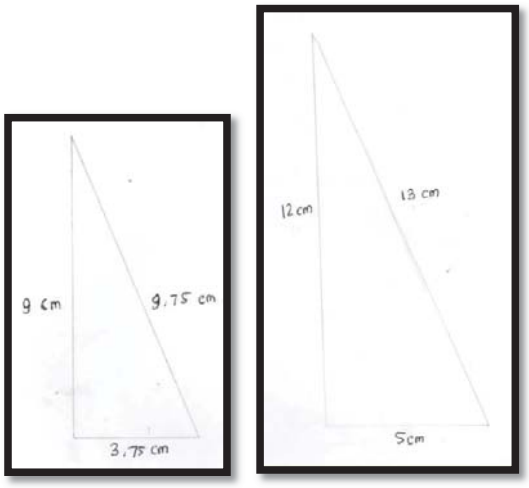
The activity to show the characteristics of similarity between two plane figures began by redrawing the plane figure pairs that had been obtained from LKPD 1, then gave different names for each plane figure. And then the students measure the length of each side from both plane figures. The next step students determine the corresponding sides of the two plane figures and compare the length of the corresponding sides of the two plane figures, whether the comparison is the same. The next step students determine

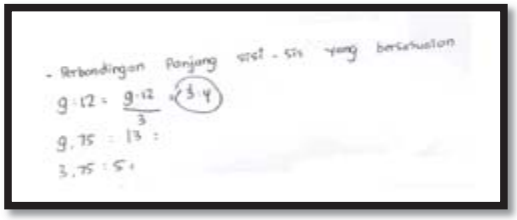
the corresponding angles of the two plane figures and check whether the angles are the same. Finally the students conclude the similarity between two plane figures.

But the Group 1 step stops when simplifying comparisons. Students have difficulty because the length of the side is a decimal number. Following are the conversation transcripts:

[1] Teacher: Why is this not simplified?
[2] Student: It's difficult because of
[3] Teacher: Decimal fraction?
[4] Student: Yes, decimal fractions

Here are the results of the work of each group for LKPD 2.





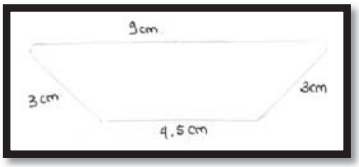
Translation:
The comparison of the length of the corresponding sides

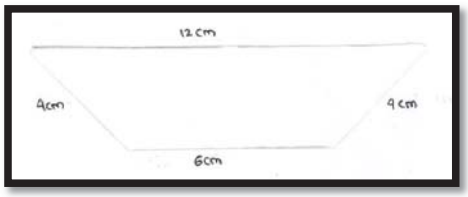
$9 : 12 = \frac{9 : 12}{3} = 3 : 4$

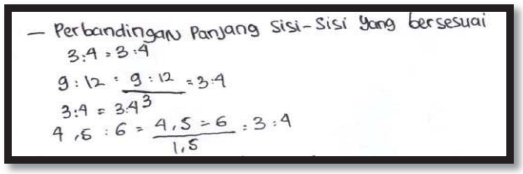
$9{,}75 : 13 =$

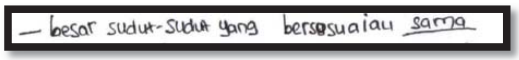
$3{,}75 : 5 =$

Figure 3: Group 1 Work Results for LKPD 2.









Translation:
- The comparison of the length of the corresponding sides

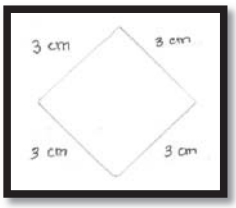
$$3 : 4 = 3 : 4$$

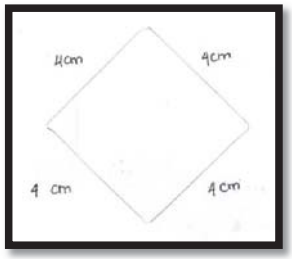
$$9 : 12 = \frac{9 \ : \ 12}{3} = 3 : 4$$

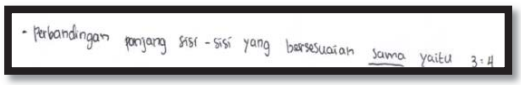
$$3 : 4 = 3 : 4$$

$$4{,}5 : 6 = \frac{4{,}5 \ : \ 6}{1{,}5} = 3 : 4$$

- The magnitude of the corresponding angles are the same.



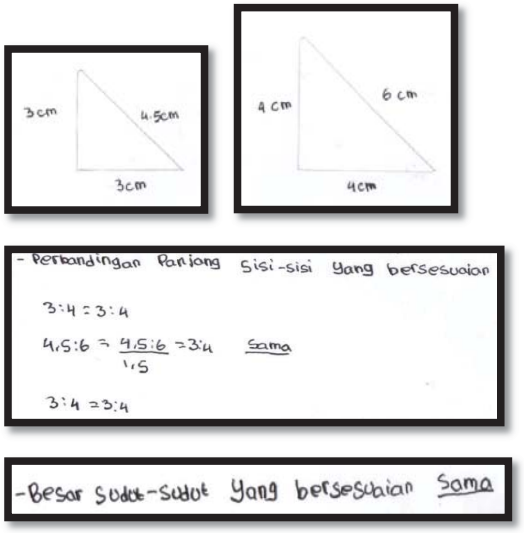




Translation:
- The comparison of the length of the corresponding sides are the same

$$3 : 4$$

- The magnitude of the corresponding angles are the same.



Translation:
- The comparison of the length of the corresponding sides

$3 : 4 = 3 : 4$

$4{,}5 : 6 = \frac{4{,}5 \ : \ 6}{1{,}5} = 3 : 4$

$3 : 4 = 3 : 4$

- The magnitude of the corresponding angles are the same.

Figure 4: Group 2 Work Results for LKPD 2.

This study consisted of 2 activities. In LKPD 1, students do activities to make origami shapes from certain objects using two different sizes of origami paper. So we got two different forms of origami with different sizes. From the activity of observing each side of the origami form, students find various forms of plane figures. In line with this, Zulkardi (2002) states that mathematics learning is a human activity and mathematics must be clearly linked to the context of students' daily lives as a source of development and as an application area through mathematical processes both horizontally and vertically. In LKPD 2 students work on steps to investigate the characteristics of similarity between two plane figures, after that students conclude whether the two flat buildings are similar.

The closing activity of learning is presenting the results of the group discussion in front of the class. Presentations provide students with opportunities to express their opinions so that students feel valued and feel happy in following learning (Suherman, 2008). In addition, students whose presentations have the opportunity to express and defend their opinions.

Before and after conducting a series of learning activities, students are given pretest and post-test. From these two tests, the researcher obtained information that the results of the students' work showed that there were differences between pretest and post-test in understanding the concept of similarity. Through two activities designed to increase students' knowledge in solving problems about similarity. Based on the results of a retrospective analysis, there were still many students who had not been able to answer

most of the questions given at the pretest. But in the post-test students have been able to solve various problems regarding similarity. Thus, it can be concluded that students' knowledge and thinking skills regarding the problem of similarity have increased.

CONCLUSION

During the learning process, learning activities using origami context can help students understand similarity in fifth grade. The use of contextual problems that are very close to students' lives makes students more familiar with the problems given, such as the use of origami contexts as problems given to students can help students learn to identify similarity situations in everyday life. The similarity situation used is the problem of making origami shapes from an object by using 2 pieces of origami paper which have different sizes, where in this problem students are asked to be able to understand and identify similarity situations. This activity is an informal stage namely the situational stage. Besides that, it also makes students more motivated and interested in solving problems given. In the formal stage, students determine the corresponding sides and the corresponding angles by compare the positions of the two origami forms. Tracing it on paper to find out the length of each side. Then compare the length of each pair of corresponding sides. Finally attach the legs of the corresponding angle pair to find out whether the magnitude of the corresponding angle pair are the same.

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