DESIGN LEARNING ABOUT REFLECTION WITH PMRI APPROACH IN CLASS VII

Firdaus[1], Yusuf Hartono[2], Somakim[2]
[1]Alumni
[2]Dosen Program Studi Magister Pendidikan Matematika UNSRI

Abstract

In the process of learning about reflection, some teachers teach the concept of reflection in an abstract way. As a result students have difficulty in understanding the concept transformation of reflection. This study aims to build students' understanding of the reverse context of "AMBULANCE" and to design the learning path of reflection learning in class VII with PMRI approach. Before the learning process first designed learning tool that is in the form of Ice berg, Hypothetical Learning Trajectory (HLT), syllabus, Lesson Plan and Student Activity Sheet. This reflective learning involves four activities: observing the context, identifying reflecting properties with an inverted 'AMBULANCE' writing context, drawing the letters reflected in the reversed "AMBULANCE" and determining the result of point and wake reflection on the Cartesian plane. From the learning result shows that by using the context of writing "AMBULANCE" is reversed, able to build students' understanding and give opportunity to students to understand the concept of reflection and produce trajectory of learning about reflection in the form of learning process path or learning experience passed by students.

Keywords: reflection, "reversed" AMBULANCE, learning path

INTRODUCTION

According to Gravemeijer (2010) that the goal of mathematics education is as a prerequisite for further education. If the student has understood the concept of reflection in the previous school level then the student will also easily understand the same material at higher school level.

Learning materials on reflection are taught to students continuously, starting from learning about the folding symmetry and mirroring in the fourth grade of elementary school, followed by lesson material about transforming mirroring in Grade VII of Junior High School, then in grade XII Secondary School Upper (high school) students will learn more about the mirroring matrix. In addition, reflection is a subject matter that is widely used in everyday life. According to Walle (2008) images similar to those in mirroring are often designed into wallpaper, mosaics, artwork in buildings, paintings and textiles. Therefore, the geometry of transformation, including reflection, is a branch of mathematics that needs to be studied and studied in depth.

But according to Edwards (1991), junior high school students have difficulty in understanding transformation (reflection, rotation, translation and dilation). The difficulties include execution errors (incorrect image orientation, incorrect size and error identifying transformation). Research conducted by Morris & Paulsen (2011) also revealed that some students have been able to do the transformation for simple geometric objects. However, it is difficult to find a more complex problem of wake transformation. In addition students also have difficulty in building evidence of algebraic reflection or

reflection transformation (Naidoo, 2010). Whereas algebraic proof which is common evidence is very important to improve the ability of mathematical proof. For example students can not yet generalize that the reflection of point A (x, y) to the x-axis will produce the shadow A '(x, -y). (Schultz, 1983).

In the process of learning about reflection or reflection, according to Johar, Nurhalimah and Yusrizal (2016) some teachers teach the concept of reflection in an abstract way. As a result, not all students understand the concept well. To solve the problem, the student must first understand the concept or the properties of the mirroring so that it is easy to understand and does not make mistakes. It is also stated by Hall, W. (2016) that in the teaching of geometry transformation, how to change some form of geometry (such as rotating, mirroring, zooming in and out waking position or other mobile) that takes into account the properties of the same on the geometry of the (in mathematics it is referred to as a congruent form). In addition, Edwards (1997) also stated that in the teaching of transformation geometry, one of them with building the skills of visualization of spatial (the ability to manipulate images of two-dimensional or three-dimensional) and reasoning abilities geometry or the thought process that is done in a way to draw conclusions. Dixon's opinion, J. K (1995) describes the 5th to 8th grade students, mathematics learning can include learning the geometry of one, two and three dimensions in various situations so that students can visualize the shape of the geometry.

Curriculum 2013 as a curriculum used today, focusing on learning with specific situations to then draw conclusions as a whole through a scientific approach (Kemdikbud, 2013). The specific situation presented in the scientific approach can be done with Indonesian “Pendidikan Matematika Realistik Indonesia” (PMRI). The PMRI, which is an adaptation of the Realistic Mathematics Education (RME) approach, suggests that instead of teaching from the formal level, it is better for students to be taught from an informal level where they know it in everyday life (Gravemeijer, 2010). According to Freudenthal in Wijaya (2012) a knowledge will be meaningful for the student if the learning process involves realistic problems or is implemented in and with a context. Contexts can be real-world problems, games, use of props or other situations as long as they are meaningful and imaginable in the minds of students. Meanwhile, according to Zulkardi (2009) the use of context in the PMRI as a source of mathematical applications. PMRI provides an opportunity for students to create their own ideas to solve math problems, not just to solve them using the given example. In this regard, it is necessary to design learning about mirroring that gives students the opportunity to do math activities. Helsa and Yusuf (2011) argue that through activities designed with PMRI students are trained to argue and think critically. Besides the learning is interesting and makes students enthusiastic.

Based on the above description, the researcher is interested to make the reflection learning design for the students of class VII by using PMRI approach. Through this research is expected to produce learning design that can facilitate students to understand and learn the concept of mirroring.

Formulation of the problem

Based on the review mentioned above, it can be proposed problem formulation that is:

1. How does learning by using the reverse context of "AMBULANCE", through PMRI approaches help students represent the results of point reflection and flat rise in the Cartesian field?
2. How does the learning trajectory of Mirror with the context of "reversed" AMBULANCE, through PMRI approach in class VII?

Research purposes

Based on the above problem, the purpose of this research is to:

1. Building students' understanding of the context of the reversed "AMBULANCE" writing on learning reflection in class VII with PMRI Approach.
2. Design the learning path of Mirroring in class VII with the context of "reversed" AMBULANCE, through PMRI Approach.

Benefits of research

This research is expected to provide benefits:

1. For students, can increase motivation and train students in understanding the concept of reflection in the learning of mathematics so that students are more active learning because the learning process carried out interesting and meaningful.
2. For teachers, can be examples and information in the process of teaching and learning can especially help teachers in presenting reflection learning to students who are taught using different ways using PMRI approach.
3. For other researchers, it can be used as input to research and further study other mathematics learning subject by using PMRI approach.

Subject, Place and Time of Research

This study was conducted in the even semester of the academic year 2016/2017 at SMPN 10 Lahat, South Sumatra. The subjects of the study were the seventh grade students of junior high school. The number of subjects was 41 students, of whom 6 students participated in the experiment pilot and 35 students participated in the teaching experiment .. This study was conducted in the even semester of the academic year 2016/2017 at SMPN 10 Lahat, South Sumatra.

RESEARCH METHODS

This study aims to design an empirical learning pathway on the material of reflection in class VII and its contribution in support of the concept of reflection. Therefore, Design Research was chosen as the research approach because it is in line with the research objectives.

According to Gravemeijer & Coob (2006), design research consists of three stages. Explanation of the research stages are as follows:

1. Preparing for Experiment

a. Literature Review

b. Classroom Observations and Master Interviews

c. Designing Hypothetical Learning Trajectory (HLT)

2. Teaching Experiment

a. Cycle Learning 1 (Piloting Expriment)

Learning cycle 1 or Piloting Experiment was conducted on a small group of six students with high, medium, and low ability. The six students are from grade VII.2 students who are not experimental class. Cycle 1 is aimed to analyze and evaluate HLT that has been designed and know how the constraints of students in carrying out learning activities.

b. Lesson Cycle 2 (Teaching Experiment)

Teaching Experiment 2 was conducted in Grade VII.1 SMP Negeri 10 Lahat. Students involved in the learning activities consisted of 35 students and math teachers in the classroom acting as model teachers. Each group consists of 4 to 5 students.

3. Restrospective Analysis

In the restrospective analysis stage, the data obtained is then analyzed. The result of the analysis is used to develop the design on the next learning activity. HLT compared to what happens in learning. The purpose of retrospective analysis in general is to develop the Learning Path.

Data Collection Technique

During the course of the study, various data ranging from written data, student work, photographs, video recordings etc. were collected and analyzed to improve the designed HLT.

Data Analysis Technique

Design research is a qualitative research method, then the technique of data analysis in this study is conducted qualitatively with attention to the results of data collection has been done. Data analysis in this study is to analyze the results of students' written tests, and compare the observations during the learning process with HLT that has been designed.

RESULTS AND DISCUSSION

Cycle Learning 1 (Piloting Experiment)

This experimental study conducted by the researcher as a teacher, and the mother Suswati, S, Pd as observer. The experiments were conducted in sequence based on the HLT that had been made which consisted of four activities.

Revision of Hypothetical Learning Trajectory

Based on the learning in cycle 1 (pilot experiment) is required revision of HLT and student activity sheet so that later can be obtained optimal results in the learning phase of cycle 2 (teaching experiment). Revisions made related to the language and display used in the LAS. The HLT improvements are as follows:

1. The third question on activity 2 "Is the right side and left side of the image still different?" Replaced with "Are the right and left sides of the image still the same?"

2. Group discussion learning activities on discussion are reduced. From the two questions given to each group it was changed into several groups solving the first problem and the other group solving the second question.

3. The eighth question of activity 3, completing the reflection column table "line x = 5" is changed to "line x = c". Similarly, in the shadow coordinate columns "A '(5.2-x, ...)" is changed to "A' (c.2-x, ...)". Whereas "line y = 2" is also changed to "line y = c"

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Lesson Cycle 2 (Teaching Experiment)

The learning activities implemented in cycle 2 are almost identical to the revised one-cycle lesson. At the beginning of the lesson the teacher provided the motivation and introduction of learning about reflection with the ambulance ambulance context with the words "AMBULANCE" reversed as the starting point to apply the properties of reflection in solving the real problem. With group discussions, students discuss LAS 1, 2, 3 and 4 provided by the teacher and complete the stages of reflective learning.

Activity 1

In this activity students are asked to observe the "AMBULANCE" paper made upside down in a mirror and students are asked to answer questions available on LAS 1 in groups. The question question asks if the writing is as big as the reflection in the mirror. In the first question the whole group responded correctly and almost the same.

Figure 1. Student Observing "AMBULANCE"

The Inverted Inside A Mirror

The next question is about how many plots of tiles, the distance between the writing to the mirror and the distance between the shadow to the mirror. The second question of activity 1 has been answered by all groups. Although student answers vary, there are two plots, three plots and four plots.

The next question asks whether the height of the writing is equal to the height of its reflection in the mirror. The purpose of this question so that students understand the nature of reflection, height of objects and shadows in the mirror is always the same. The answer of each group is correct. Each group was able to answer correctly.

The next question is to direct to the fourth mirroring trait that the line connecting the dots on the object with the points in its shadow is always perpendicular.

The next question, from the answers of students above, students are asked to write down the properties of reflection that they have done. Answer group 1 for point number 4 is less precise. They replied, the line that connects the image to the object with the reflection in the mirror is always perpendicular. Should their answer, the line that connects the point on the object with the point of shadow the object is always perpendicular. Similarly, group 7 answers, they replied, objects and shadows perpendicular to the mirror.

Activity 2

The purpose of activity on activity 2 is so that students can determine the shadow of the letter on the word "AMBULANCE" is reversed on a plain paper. Discussion group of students is asked to cut one of the letters A, M or U contained in writing "AMBULANCE" is reversed. These letters are selected because they have vertical fold symmetry.

Students answer the questions given. Student answers to the first question, after seeing the shadow of the letter placed next to the mirror, whether the right side and the left side of the image are still the same. With the guidance of the teacher, each group is able to understand that if the letter is placed in front of the mirror then the shadow is also the same.

The next question asks students to copy the letters and draw their shadows on plain paper.

The third question on activity 2, the student is asked to cut one of the letters B, L, N, C or E contained in the word "AMBULANCE" is reversed. These letters are selected because they do not have vertical symmetry folding. Then students are also asked to put the letter next to the mirror and see the shadow. Questions asked, whether the right side and the left side of the shadow is still the same? Group 1 responds when the letter is placed next to the mirror then the shadow of the letter, the right and left sides are the same. From the group 1 responses, the students looked hesitant because at first they answered differently. While group 6 and group 7 answerannnya is correct. They replied that the right and left sides of the letter's image were different or different. One student confused to determine the right and left sides of the letter, whether the same or different then the other students argue that the right and left sides of the left are different but misleading the right and left sides.

The fourth question or the last question on activity 2, the students are also asked to copy the letter, then draw the shadow on the paper plain. Each group of students, plagiarized with different letters, as shown in the student answers above. All answers from each group, students can draw the shadow of the letters on plain paper correctly.

Activity 3

Activity 3 is given at the second meeting. The first question, by calculating the plot, the student is asked to determine the result of the point reflection on the Cartesian plane that is reflected against the x axis. From the student's answer, students at first confused determine the point A shadow by reflecting on the x axis. But with the teacher's guidance that if the x-axis is like a mirror, finally the whole group is able to determine the coordinates of the point's shadow. Student responses are in line with the designed HLT.

The next question about how to determine the shadow of point A by mirroring the y-axis. Group 4 in determining the shadow of point A against the y-axis is less than one plot to the left. The teacher asks the students to recalculate many plots.

Next is the question of determining the shadow of point A by mirroring the line x = y. The teacher asks the students to be more careful in calculating the plot. The group that responds exactly according to the HLT is group 5. Group 5 has been able to determine the shadow of point A by mirroring the x = y line. Group 2 has written the coordinates of point A 'correctly but is misplaced. While group 7 wrong write down the coordinates and also misplaced the location of the shadow.

The fourth question, how to determine the shadow of point A against the line y = -x. From the students' answers above, all groups have been able to understand how to determine the shadow of point A by reflecting the y = x line.

The next question about determining the shadow of point A by mirroring the line x = c. The teacher explains that the line x = 5 is determined by parallel to the y-axis at the point of the abscissa 5. The student's answer to this fifth question, all groups have been able to answer correctly.

The next question relates to determining the shadow of point A by mirroring the line y = c. At this point also, the teacher explains that the line y = 2 is determined parallel to the x axis at the ordinate point 2. From the student's answer, it appears that all groups have been able to answer this sixth question correctly. This means that the student is able to understand how to determine the shadow of point A by mirroring the line y = 2.

The next question, completing the table determines the shadow coordinates of the result of point A to the x-axis, y-axis, line x = y, line y = -x, line x = c and line y = c. In the seventh question, it still asks the shadow coordinates of point A (3.4). In this LAS 2, the question of the shadow coordinates of the result of point A (3.4) to the line x = 5 is directed to find the formula for how to determine the abscissa. Similarly, the shadow coordinates of the result of point A (3.4) to line y = 2 are directed to find the formula for how to determine the ordinate. From the answers of each group, the students are right in completing the table. This may be because students can copy from previous activity results.

The next question, still completing the table determines the shadow coordinates of the result of point A to the x-axis, y-axis, line x = y, line y = -x, line x = c and line y = c. However point A (3.4) is given by point A (x, y). The students' answers from each

group to answer this eighth question are correct, except group 7. They have a slight error in determining the coordinates of the shadows of point A (x, y) by reflecting the line y = -x. They answer A '(- x, -y) when it should be A' (y, x).

Activity 4

The purpose of Activity 4 is to determine the result of a flat wake reflection on the Cartesian plane using printable paper. Students are expected to understand that to determine the result of flat wake reflection by determining the result of reflecting the points on the wake of the flat and then connecting it. Here's the student's answer to the first question of activity 4, determining the result of reflecting the build up of ABCD by mirroring the x-axis. The students' answers from each group are correct. All groups responded appropriately to the designed HLT.

The second question, how to determine the shadow of the triangle PQR by reflection on the y axis. Student answers to the second question of each group are also correct.

Next, the student is asked to determine the flat-wave ABCD image by reflection of the line x = -4, where the flat ABCD waves cut the line x = -4.

Student answers to the third question of activity 4 are:

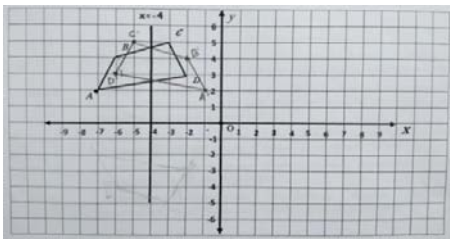

Figure 2. Sample of Student's Answer to Activity 4

In general, the trajectory of learning reflection with the ambulance car context can be seen in the picture below:

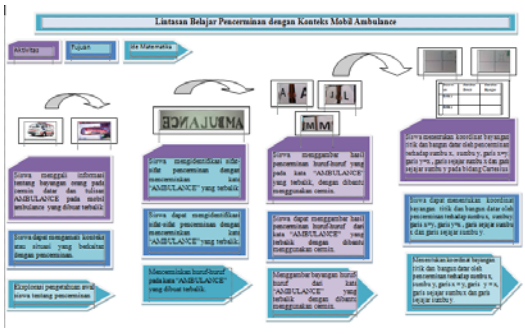

Figure 3. Trajectory Learning Path

Discussion

Based on the research objective of designing the learning trajectory of reflection with the "AMBULANCE" writing context reversed in the PMRI approach has been able to build students' understanding in performing four stages of learning reflecting material. And it can be said that the learning trajectory (HLT) that has been designed in accordance with the design can run well. What appears in the classroom learning according to the learning path designed by the researcher.

CONCLUSION

Based on the results and discussions that have been described can be drawn the conclusion that:

The reflective learning activity with the four stages of the activity is able to build students' understanding and give the students a chance to understand their own knowledge of the ambulance car context, identify the reflecting properties, draw the reflected letters in the reversed AMBULANCE the results of the reflection and the coordinates of the point and wake shadows toward the x-axis, y-axis, line x = y, line y = x, line x = c and line y = c.

The learning path of reflection in the form of the learning process path or the learning experience passed by the students is organized into four learning activities starting from (1) digging up information about the inverse AMBULANCE writing, (2) identifying reflecting properties by reflecting the reversed "AMBULANCE" , (3) drawing the letters reflected in the reversed "AMBULANCE", (4) determining the point and wake shadow coordinates by reflecting the x-axis, y-axis, x = y, line y = x, line x = c and line y = c.

Suggestion

For teachers, to optimize the understanding of the material in depth to the students with interesting learning that cultivate the spirit of curiosity build student creativity and utilize all sources of learning as with PMRI approach.