DESIGN OF THE GREATEST COMMON DIVISOR (GCD) USING THE SHARING CONTEXT

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Abstract

This study aims to determine the role of sharing context in supporting the learning of the greatest common divisor (GCD) in class IV. The learning approach used is the Indonesian realistic mathematical approach (PMRI) which uses context. The use of context aims as a starting point in mathematics learning. The context used is sharing, in which students share candy and eggs with their classmates. It is hoped that using context relating to daily life can make learning more meaningful and students can build their own mathematical knowledge. The method used in this research is Design Research type Validation Study which includes preliminary design, teaching experiment, and retrospective analysis. The subjects consisted of 30 students of the IVD class and a mathematics teacher at SD Negeri 157 Palembang. Data collection techniques were obtained from video recordings, student activity sheets and interviews which were then analyzed qualitatively. A series of activities demonstrated that the context of sharing can help students understand the concept of the greatest common divisor (GCD) so as to guide students in solving problems related to the greatest common divisor (GCD).

1.INTRODUCTION

The Greatest Common Divisor (GCD) is one of the material that is felt difficult for most students. From the results of tests conducted on 20 students who were given problems about KPK and GCD, 60% of students still have errors in solving the problem [1]. Students have difficulty in resolving the related story of KPK and GCD, seen in the mistakes made in the process of solving the story [2]. Students experiencing difficulties and mistakes are caused by the teaching activities of teachers teaching GCD by providing materials in accordance with the package book, giving examples of problems and then giving practice questions, teachers do not do meaningful lessons with methods that are less varied, and seem boring [3].

The largest unity factor (Gcd) of two numbers is the largest positive integer that can divide the two numbers [4]. The fellowship factor is the same divisor that can divide two or more numbers [5]. [6] factor that divides into a whole number with a remainder of zero. To determine the GCD can be done by alliance factor, factor tree, and with table division [7]. In giving GCD lessons it should be linked to the daily problems of the students, as they would be much happier if what they learned relate to their experience or can be proven in reality [8]. Mathematics must be close to the daily life situation of the students because of mathematics as a human activity, so that students should be given the opportunity to learn to do the activity of each topic in learning mathematics[9].

A learning approach that links mathematics with everyday life is the realistic mathematics education of Indonesia (PMRI). PMRI is an adaptation of Realistic

Mathematics Education (RME) in which mathematics learning is a human and mathematical activity should be linked significantly to the context of the daily life of students as a source of development and as an application area through both horizontal and vertical mathematical processes [10]. [11] PMRI is a learning approach to mathematics that uses the real world as a first step for the development of ideas and concepts of mathematics where educators as learning facilitators, mediators, and evaluators. [12] Contexts can be related to student life in society. Based on the description of the problem that has been proposed, it can be formulated the main problems in this study are: (1) How the role of Sharing in supporting learning material GCD ?. (2) How is the learning path in learning GCD materials using the Sharing context? Then the purpose of this research are: (1) Mengatahui role Share in supporting learning material GCD. (2) Produce learning paths in GCD learning materials using the Sharing context. Mathematics learning with PMRI approach is derived from the context or "real" situations experienced by students who are the bridges to connect students from the real to the formal mathematical stage. This is in agreement with the RME philosophy developed based on Hans Freudenthal's ideas or views, namely: (1) mathematics must be connected to reality; and (2) mathematics as human activity "[10].

2.METHODOLOGY

The study was conducted in the odd semester of the academic year 2017-2018. The subjects of the study were the fourth graders of SD Negeri 157 Palembang and a teacher who taught in that class (model teacher). This research uses design research method which is one of the qualitative approach. There are 3 stages in the research design: preparing for the experiment, the design experiment and the retrospective analysis [13]. Three stages of the research design also conducted by researchers are described below:

2.1. Preparing for the experiment (Preliminary Design)

At this stage, the researcher discusses the literature on alms, PMRI approach, curriculum and research design method as the foundation for designing the learning path. The things undertaken in this phase are: (1) analyzing the learning objectives, (2) determining and defining the initial conditions of the research, (3) designing and discussing conjectures or developed HLTs, (4) determining class character and teacher roles. In addition, researchers conducted classroom observations, interviews with teachers to find out the state and initial ability of students who became the subject of research. Then the researcher discussed the schedule of research implementation.

2.2. Design experiment

At this stage, the activities undertaken are to implement the design of learning that has been designed in the first stage. There are 2 cycles at this stage ie pilot experiment as cycle 1 and teaching experiment as cycle 2. Cycle 1 aims to improve the quality of HLT that has been designed so as to obtain a better HLT to be applied in cycle 2.

2.3. Retrospective analysis

At this stage, all data obtained during the teaching experiment were analyzed. HLT serves as the main reference to determine what matters are the focus of the analysis. The HLT is compared to the real state of the student, in this case, the strategies and thinking processes of students that actually occur during the learning.

3.RESULT AND DISCUSSION

In the process of learning, done several stages of the preparatory stage for research (preparing for the experiment), design experiment (the design experiment). In the preliminary design stage, the researcher studied the literature in the form of content standard based on KTSP and KD understood the GCD concept, then did the HLT (Hypothetical Learning Trajectory) design and from the HLT obtained Student Activity Sheet (LAS) which will be used by the students in the learning process. The HLT has been designed by researchers to be discussed with the model teacher. After the first cycle, there are several sections in the revised activities based on the findings, the observations and the results of the student's answer analysis in cycle 1. The revisions are made to obtain optimal results in the next cycle. The revisions are related in the form of activity and in terms of the language used in the activity sheet or in the matter of pre-test and post-test.

After making improvements to HLT 1 that resulted in HLT 2, the researchers then conducted a teaching experiment in cycle 2 (teaching experiment) involving 30 students. In the second cycle, the teacher of SDN 157 Palembang elementary school was involved and acted as a teacher for the whole learning process.

3.1. Pre Test

As is the case with cycle 1, in the second cycle there is also a pre-test to see how far students' understanding of the Greatest Common Divisor (GCD) material and what strategies are commonly used by students. Based on the results of the pre-test shows that most students still have difficulty in determining the settlement of the largest partnership factor presented in the form of a story.

3.2. Activity 1: Sharing Candy

Before the learning activity begins first the teacher gives apersepsi to students about multiplication and division of numbers. Then the teacher convey the purpose of learning and learning outcomes that are expected to be achieved students After that the teacher distributes student activity sheet 1 (LAS 1) and 6 candy to be discussed with his group friend. After the students get the LAS, the teacher gives the students time to read the instructions on the LAS. In this activity the students do activities of sharing 6 candy with their group friends, then write down the results of their activities in the table that has been provided.

For problems in LAS 1, each group solves the problem well. Here are the results of several group answers on activity sheet 1 with the aim of determining the factor of a number.
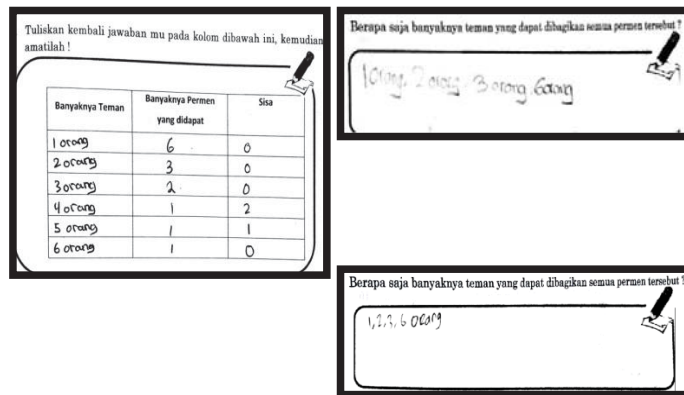

Figure 1. Student's answer to activity 1

After all students solve the problem on activity 1 learning followed by concluding learning activity by the teacher with student. The quote of the dialog when drawing a conclusion can be seen in the excerpt of dialog 2

Teacher: "Each of you has already made a conclusion, some have concluded

that the member is good, there is a conclusion that in order to understand the number factor, there is

also a conclusion this activity can add knowledge to understand about the factor of numbers. so what

is the number factor? ".

Student: (Answer simultaneously)

Teacher: "Try one person".

Student 1: "All numbers that can divide that number".

Dialog 1

Student answers related to the conclusions of learning activities can be seen in Figure 2
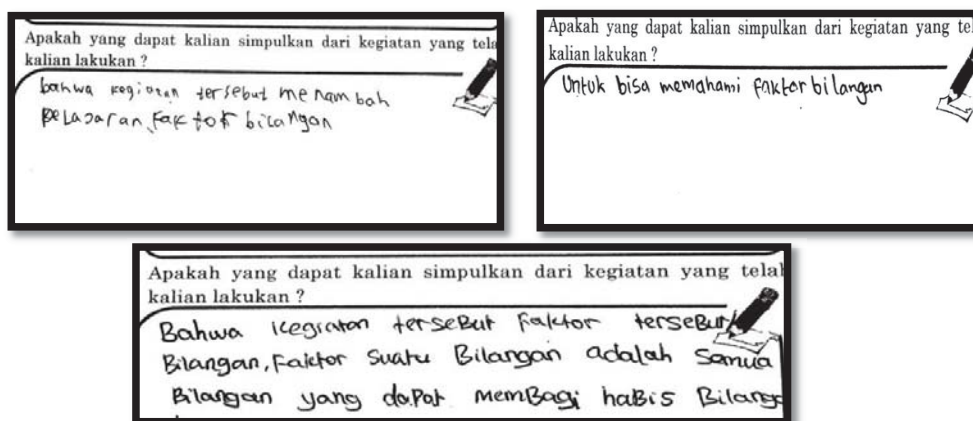
Figure 2. Answers to student conclusions

After a series of issues on the first activity is completed, the teacher asks the students to do the second activity.

3.3. Retrospective Analysis Activity 1

As in the first activity in the first cycle, this activity aims to enable students to determine the factor of a number by sharing activities of 6 candies to a group of friends. In the first activity, there is no significant problem, only at the beginning of learning some students feel less understanding of activities - activities undertaken on the activity sheet. Figure 1 on the results of the distribution of the 6 sweets done by the students shows that the students are able to determine the factor of a number through the sharing activity that has been done.

In Figure 2 on the answers of students in drawing conclusions from the learning process that has been done, It appears the answers of various students. From the answer, there is a group that concluded the number factor and there are also groups that concluded about the learning activities that have been done. At the end of the learning, the teacher invites students to draw conclusions about the factors of a number so that students better understand the factor of a number because this knowledge is very useful for the completion of the activity - the next activity.

3.4. Activity 2: Sharing Candies and Eggs

In the next lesson after the first activity is completed, the student performs the second activity. In the second activity, the students were given 6 candies, 8 eggs and activity sheet 2 with problems that did not very much in cycle I. Students read the LAS that has been given by teachers in groups and then experiment directly to share eggs and candy to their friends. During the learning process, the teacher and researchers go around to help the students if they find it difficult. In addition, teachers also motivate students to work together in one group. Here is a dialogue between researchers and students in the learning process that shows when some students have difficulty in distributing candy.

Here is the dialogue between teachers and students in solving the initial problems in the LAS 2.
Teacher : "The problem where?".

Student 1: "In candy".

Teacher: "How many times is there, how many candies are there?"

Student 1: "Six".

Teacher: "There are six, how many people are there?".

Student 1: "There are eight".

Teacher: "It's asked to divide the 6 eggs to 8 friends, meaning if the candy is 6 in for the 8 people candy?". Student 1   : "Less"

Teacher: "How much does her candy?".

Student 1   : "Two".

Teacher: "Yes, can not be shared fairly?".

Student 1   : (Cock your head)

Teacher   : "Can not ya? can not be divided fairly because the candy is less 2, if the eggs can be divided   equally? "

Student 1   : "Can".

Dialog 2

Because the students still look confused when the teacher membibing solve the problem, then the teacher re-affirmed the same thing in front of the class. Here's the dialogue quote.

Teacher   : "There are 8 eggs divided into 8 people, can it be fair not?".

All students   : "Fair".

Teacher   : "How much can the candy be?".

All students   : "One".

Teacher   : "One but there are 2 friends who can not, about - fair is not?".

All students   : "No".

Teacher   : "Rather than being unfair, do you think it's better to share or not?"

All students   : "No".

Teacher   : "Not shared".

Dialog 3

        Students' answers on activity sheet 2 with the aim of determining the two-digit fellowship factor can be seen in Figure 3.

Figure 3. The sample of student's answer to activity 2

After all students solve the problem of activity 2 learning continued by concluding learning activity by teacher with student. Quotes of dialogue when drawing conclusions can be seen in the excerpt of dialog 5.

Teacher : "We have learned the factors of fellowship now, now you try to conclude what is meant by the two-number partnership factor".
Student 1   : "The same number".
Student 2   : "I miss, what is miss?".
Teacher : "The alliance factor of two numbers?".
Student 2   : "The two-number partnership factor is the same divisor."

Dialog 4
Student answers related to the conclusion of learning activities can be seen in figure 4
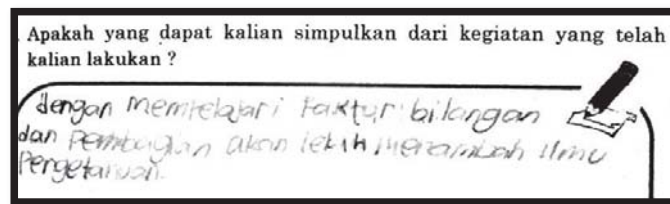

Figure 4. Answers to student conclusions

3.5. Retrospective Analysis Activity 2

Not much different from the activities in the first cycle, this activity aims to make students able to determine the factors of two numbers. In the excerpt of dialogue 4, teachers guide the students in solving problems that students understand the gap. Because the students seem confused with the explanation given by the teacher then the teacher re-affirmed his explanation in front of the class seen in dialog 4. After being given an explanation by the teacher It appears that students understand if there are any remaining either less or more in the division then the division is unfair and can not do. In Figure 5 is the student's answer to the conclusion of the learning activity that has been done. Students do not conclude about the particular partnership factor. This is where the role of teachers to guide students about the factors of two-number fellowship at the end of the learning seen in dialog 5. Conclusions by students with teacher guidance can be a reflection for students to better understand the two-number partnership factor is very important in determining the GCD.

3.6. Activity 3: Observing the Candy and Egg

Distribution Results As has been done in cycle I, the third activity begins with the teacher giving LAS 2 where the problem is related to the distribution of candies and eggs to the previous activity. Furthermore, from the results of the students are asked to observe and determine the number of friends at most who get the candy and eggs. These problems will stimulate students in determining the greatest partnership factor.

In the initial lesson of activity three, the teacher gives two conflicts before leading to the ruler. Here is a discussion quote between the student and the researcher and the conflict-related Figure at the beginning of the activity problem 3.

Teacher : "Can all be?"
All students : "Already miss"
Teacher : "if it is done please"
Student 1 : "This is the same way as yesterday yes miss?"
Teacher : "yes same"
Student 2 : "Why not have a table miss?"
Teacher : "no, this activity please do it your way. If you want to use the table as yesterday also may "

Dialog 5

To find out the form of student answers in dialog 6 above, it can be seen in figure 6 based on one of the student's answer images on the problems of number 1, 2 and 3.
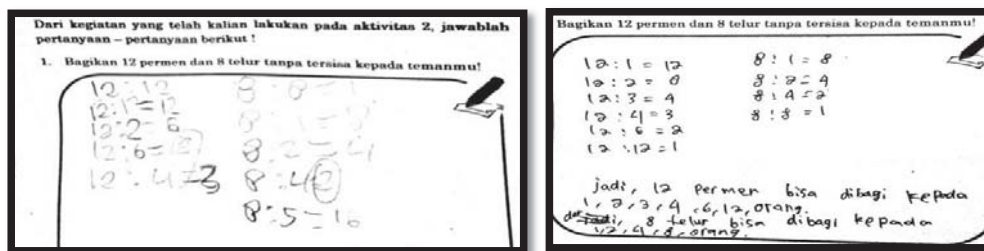

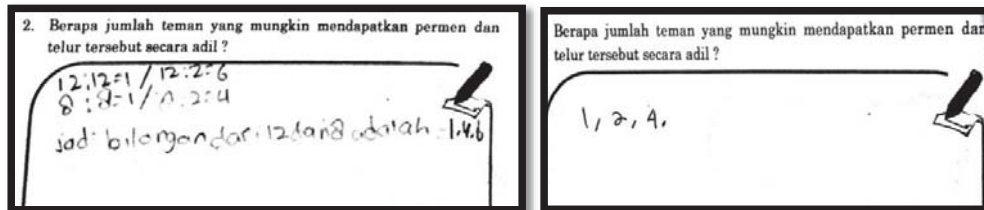Figure 5. Student's answer on problem number 1

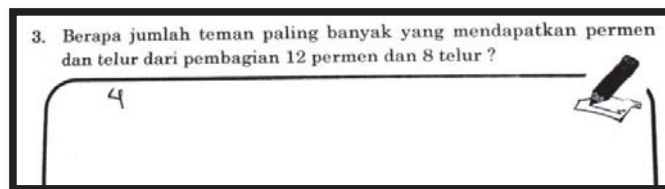Figure 6. Student's answer on problem number 2

Figure 7. Student's answer on problem number 3

3.7. Retrospective Analysis Activity 3

On the second day of the teaching experiment, the students have focused on understanding the Greatest Common Divisor (GCD). Previous activity is an important

early knowledge for students in conceptualizing to determine the Greatest Common Divisor (GCD). In the dialog 5 teachers give freedom to the students to determine their own chosen strategy to solve problems on the activity 3. Based on the sample answers of students on the first problem in activity 3 that can be seen in Figure 5 seen the students do not have difficulty in determining the factor of a number, it's just some students determine the factor of a number no longer using a division table or a factor tree but directly share it with other numbers. This happens because of the activity 1 student understands that in sharing must be done fairly and without rest.

In one sample of students' answers (figure 6), the student experienced an error in determining the number of numerical factors. Students incorrectly answered number 6 is a partnership factor of 8 and 12. In one of the students' answers in Figure 6, the student was able to answer correctly from the problem without experiencing difficulties. In the problem number 3 students answer by choosing the greatest partnership factor.

To know the extent to which students 'understanding of the students' ability to solve the problems of the greatest partnership (GCD) then the learning is continued into activity four.

3.8. Activity 4: Resolving issues related to GCD

The fourth activity which is the last activity carried out at the second meeting. At the time of carrying out this activity, students are still sitting in the same group as in previous meetings. In the fourth activity are given two real-world problems related to the greatest partnership factor.

At the time the learning activities take place, researchers and teachers walk around to help students if they find difficulties or things that are not understood by students on the activity sheet. Teachers provide motivation to students to keep working together in one group like the previous activity.

After the students solve the problem on the activity sheet, the researcher asks a student to explain the strategy used in solving the problem. Here's a quote of the student's work dialogue on the issue in the LAS.

Teacher: "Naira is over?
Student 1   : "Already"
Teacher: "Number one, the answer is like that from where?
Student 1   : "Wanted first factor, lots of boxes may be made 1, 2 and 6"
Teacher: "Why is that?"
Student 1   : "in the box there is a shirt and pants, must be selected the same number
Teacher: "Continue?"
Student 1   : "The largest cardboard is six".

Dialog 6

To see how the form of student completion strategy in problem-solving on activity 4 can be seen in figure 8.
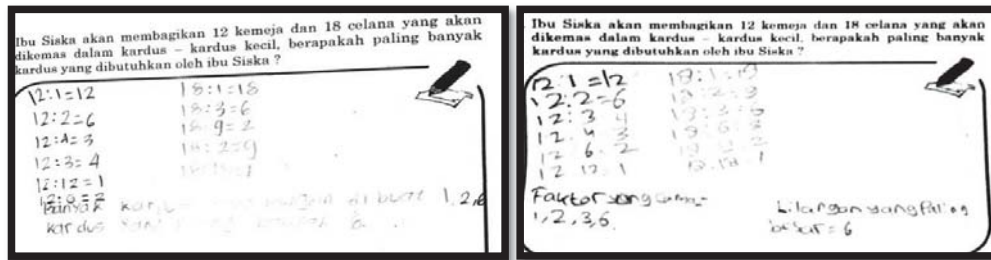
Figure 8. Student problem solving strategy

3.9. Retrospective Analysis Activity 4

In the previous activity, students have shared activities to determine the Greatest Common Divisor (GCD), but not necessarily guarantee whether the student has been able to best use the concept of Greatest Common Divisor (GCD) or not. Therefore, the fourth activity aims to find out how far students understanding in solving problems related to the Greatest Common Divisor (GCD). Can be seen based on dialog 6 that one student is able to explain the strategy used in solving the problem. The answer from the explanation of the chosen strategy can be seen in Figure 8. The student determines the amount of cardboard that may be required by selecting the same number of number factors. Furthermore, to determine the GCD which in the question is the number of cardboard most students determine by choosing the greatest partnership factor. After completing the final activity, students are given a post-test to find out how the students understand in receiving the material matter of the Greatest Common Divisor (GCD) at the teaching experiment stage.

3.10.Post Test

The test results indicate the development of students in the learning of the subset material. This appears in the completion of students in answering questions. Thus the learning that has been given gives a positive effect on the students. In the learning process, students are very enthusiastic in completing the given LAS. This is because students are interested in the problems that are faced ie with respect to the real life of students. This is consistent with the notion that mathematics is a form of human activity and must be linked to the context of everyday life [10]. [11] pleasant atmosphere can support the achievement of effective learning objectives.

4. CONCLUSION

Based on the results and discussions that have been described in the previous chapter than from this study concluded that: The sharing context used in the study plays an opportunity for students to build their own knowledge of the Greatest Common Divisor (GCD) through the sharing of sweets and eggs. The class discussion forums in the lessons provide students with opportunities to test their ideas and gain a comparison from their peers' opinions so as to strengthen and expand their understanding of the Greatest

Common Divisor (GCD). then teacher reinforcement will be a strong foundation for students expanding their understanding of GCD.

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