What can we learn from pupils’ dialogues? Second graders’ learning about division.

A S Maulida¹*, D Dasari², and E Mulyana²

¹Sekolah Pascasarjana, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No.229, Bandung 40154, Indonesia
²Departemen Pendidikan Matematika, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia

*ayashofiia@student.upi.edu

Abstract. Setting up lesson to introduce the concept of division by didactical situation for second graders’ student in one of private primary school in Bandung (March 2017). We set the lesson with the theme of ‘Let’s help Mrs Emma’. The lesson design was sharing four packs of chocolate for 5 persons. The situation, Mrs Emma got packages from her friends. The packs contain four packs of chocolate. The chocolates should be shared for her family’s member, such as father, Mrs Emma, little sister, little brother, and grandma. Then, Mrs Emma asked pupils to work in group and discuss about how to share the chocolates. The analysis was focused on group discussion, about phenomenology in the classroom then identifying pupils’ ethical orientations and decisions when dividing chocolates. We know that each pupil had their own tacit knowledge. It means that through this lesson design, pupils making dialogues for negotiating their argument to solve this problem. Moreover, pupils learned about collaborating and respecting each other’s tacit.

1. Introduction
Mathematics is the science of the logic of form, order, quantity and concepts relating to each other in large numbers [1]. The basic concepts of mathematics consist of arithmetic, algebra, geometry and analysis. These four basic concepts are mapped to the topics of school mathematics. The presence of mathematics in schools is as a tool to help students have good thinking skills in solving problems. For example to calculate the remaining shares in the case of sharing chocolate. In fact, the mathematical paradigm in society is a mathematical concept that is elusive. This paradigm as it is inherited down and down to at least affect the interest of some children to learn math. Actually, this paradigm can be started from the process of learning in the classroom, namely the lack of meaningful learning process. The meaningless process of learning mathematics [2] is caused by most teachers who deliver learning materials only to the extent pupils can count only. In addition, there are still some teachers in schools that teach aims to provide information where the creativity aspects of pupils can’t grow and the level of pupil thinking does not change. The use of inappropriate teaching materials is another cause of the incidence of meaninglessness of learning. The researcher’s chosen elucidation alternative is to create didactic design contained in DDR (Didactical Design Research). In didactic design, teachers are required to predict student responses from each didactic situation created and also to make anticipations. So that when the learning process takes place, all pupil responses that appear can be well anticipated by teachers and learning goes according to plan. Not only that, the researchers also do repersonalization and recontextualization before implementing the didactic design so
that it can expand the knowledge in designing the learning process in accordance with the thinking flow of pupils and what we will learn from pupils’ dialogue.

The quality of communication in the classroom affects the quality of mathematics learning. The quality of communication can be seen from the pattern of dialogue [3]. The word 'dialogue' has some descriptions but an important factor of the word that dialogue involves at least two parties in it [4]. The use of the first dialogue refers to the form of analysis, percentage of questions and familiarity. When entering into the use of dialogue at the familiar stage, the dialogue becomes relevant to the epistemology. The main idea in a dialogue is that the task of the teacher isn’t to give knowledge or information for the pupils but to the teacher's task of designing a learning situation where students will ask critical questions. These questions serve as a recollection of students' memory to support the construction of student knowledge. Dialogue is not only a multipurpose approach to pedagogy, but different forms of dialogue express a deeper assumption about the nature of knowledge, the nature of the inquiry, the nature of communication, the role of teachers and learners as well as the shared ethical obligations [5]. According to [6] dialogue has 4 levels of difference that are 1) there is a difference in fact as the condition of all learning; 2) there is a hierarchy of position identities that frame the context of the conversation; 3) hierarchy has an effect on the sense of predictability and responsibility in any case, hierarchy effect increasingly complex; 4) difference raises questions aimed at understanding, agreement, consensus, and community which is the typical goal of dialogue.

2. Methods
This Research applies Didactical Design Research method. Didactic design research has an orientation to build the attention, concern and life of the educator community on the development of learners that are used as the basic for determining professional decisions [7]. In the learning process there are three main components: educator, learner and material [8,9]. It through analysis three stages. The first stage about reflection for action that conducted before learning implementation. Reflection for action consists of re-personalization and re-contextualization of teaching materials underlying the didactic design hypothesis including teacher anticipation. The second stage about reflection in action that carried out during the learning process takes place by applying a meta-pedadidactic analysis. It includes unity, flexibility, and coherence. The third stage about the reflection of action that is done after learning implementation through retrospective analysis. It compares the didactic situation of the hypothesis by using meta-pedadidactic analysis.

The design research implemented in one of private primary school in Bandung, used one class (18 students), in March 2017 of academic year 2016/2017. Instrument in this research consist of test instrument and non-test instrument. The test instruments are structured for research in the form of an instrument of distribution to measure the skills, knowledge, and abilities of individuals or groups. The non-test instruments that will be prepared for this research are interview guides and documents. Interviews with students can reinforce the researchers' results in developing didactic designs. Interviews were conducted in relation to the pupils’ responses that emerged when in the situation got questions about the division and opinions of pupils about how to manage the way and the process of solving the problems they have experienced. In addition, in this study using non-test instruments in the form of documents that include video recordings and photos containing the recording during the entire process of research took place.

The data collection techniques are instrument test, observation, and documentation. Instruments of this research are test and non-test. Instruments test of the division problem and non-test instruments for interviews and documentation. Observations are made directly during the implementation of didactic design and as long as pupils do the test questions and non-tests. In addition, the researchers also observed the didactic situation of the recording video during the implementation of the didactic design of the class. Observation is done to find out pupil response and teacher anticipation during learning process so that can be obtained didactic design revision. Documentation done through written documentation, photos, and video during implementation.
This analytical technique is executed as it progresses and after completion of data collection. Based on Mile & Huberman [10], As for the following steps: First, reducing data means summarizing research data, choosing key points, focusing on important things and minimizing data and providing a clearer picture. Second, Presentation of data. Presentation of data in the form of a narrative text arrangement used to interpret. So that researchers easily understand and determine the steps to be implemented next. Third, conclusion or verification as the last step of the data analysis phase, the conclusion drawn is expected to clarify the condition of the findings of the researcher so that it can be understood and applied in further research.

3. Result and Discussion

The process of thinking of teachers according to [11] occurs in three phases, namely reflection for action, reflection in action, and reflection on action. These three thinking processes reflect the curriculum development framework at the level of practical implementation during the classroom learning process.

3.1 First Phase: Reflection for Action

At this stage questioned 'what material content should be taught?' And 'how should the content be taught?'. It aims to guide teachers when selecting material content and methods relating to pupil characteristics. The question develops into, what is the meaning of division for pupils? how to introduce the distribution to pupils in order to gain meaning? and how pupils respond to the learning situation we are designing? The question of how the content of the material should be taught is the most important thing because it guides and reinforces teachers’ belief that certain material content is more important and valuable to their pupils than others [12]. Based on deep enough discussion, we mean the division is not just about the division of numbers but also about the concept of division in the context of everyday life. Once we have established the meaning of sharing for ourselves, the next question is how to introduce the division to the pupils. The trick is diverse, in this study the students are given a problem situation with the theme 'Let's help Mr. Ema'. Mrs. Ema has four chocolates from her Japanese friend, named Kozue. It must be given to the five family members at her home: Grandma, Dad, Mrs. Ema, brother, and sister. Help Mrs. Ema to split chocolate and tell me the reason. The reason why choosing chocolate because chocolate is closely related to the pupils daily and the chocolate has the same shape, the same magnitude, and the same length. So, It won’t cause ambiguity. The didactic design builds up the meaning of the final division we decided by using chocolate, precisely chocolate kitkat. The design, teachers will invite students to think about how to divide 4 chocolates for five people. To know the possibilities of pupils' thinking, we tried to share the chocolate with some of the other teachers. The important point of this activity is that we can feel what pupils’ feel. If previously we think from the point of view of pupils, then this time we move as a pupil. The benefit is the teacher will be more confident with the election along with there is still time for improvement if there is less. Momentum like this can make the design more mature.

3.2 Second Phase: Reflection in Action

The purpose of today's learning is that pupils can interpret the divisions that are their foundation for learning in the next lesson. 1 group consists of 2 pupils. There are some findings that we get in class when implementation takes place. First, in group A, pupils are confused to share 4 chocolates with 5 family members. This is according to our expectations. Pupils are more confused when asked to give two ways. This confusion is the result of everyday pupils who are used to getting to know one answer. They are also unfamiliar with trying directly before being given an example. The anticipation of teachers when pupils are confused is to provide a simple guide, not an example. Finally, A group gives the first answer in the form of Mrs. Ema told to Kozue, please buy another one. Answer the second way, Mrs. Ema apologizes to Grandma because of only 4 chocolate.

The second finding occurred in B group. B group gave the first answer that Mrs. Ema had to divide the chocolate to her sister and then cut in half for her sister. Answer the second way, Mrs. Ema has to buy
another 1 chocolate for the sister. Another group of difficult pupils finally went to ask their friends. Teacher manages to play the rhythm of new life in class. Gradually, the atmosphere of fellow pupils’ collaboration in the class is formed gently. In the end, it was revealed that the learning objectives of the day actually teachers want their pupils can collaborate in the classroom, find the value of division in daily life, and built dialogue with friends when being difficult or not. He deliberately invites pupils who are difficult to ask other who have been able to make the habits in the class changed for the better. Pupils who know shouldn’t provide immediate answers but may only provide guiding questions. Here are some student answers that appear.

3.3 Third Phase: Reflection on Action
In reflection on action, pupils become our main focus. We share our findings of pupil activities in the classroom. Such findings are always be a big talk. Not all pupils are monitored at the same time by the teacher. There is something that may be overlooked by us as educators. This is where the function of reflection, to share and fill the void. As well as a finding we learned from one of the observers about the thinking of a child from A group. They said that Mrs. Ema has to apologize to her grandma because the chocolate is only 4. But unfortunately, their opinion can’t understood by their friends and was not anticipated before. In fact, that way greatly indicates the meaning of division in everyday contexts. Honestly, A group's thinking was not anticipated by us. It has become an important lesson for us that it is not okay for us as educators to justify pupils. From A group we learn that justice is about an agreement and
giving agreement to share the same happiness. That day we found that pupils who are considered 'less smart' turned out to show his unique mind-set, which is so unique to be unthinkable to us before.

4. Conclusion
The analysis was focus on group discussion, about phenomenology in the classroom then identifying pupils’ ethical orientations and decisions when dividing chocolates. We know that each pupils had their own tacit knowledge. It means that through this lesson design, pupils finding the value of division in daily life, making dialogues for negotiating their argument to solve this problem and building dialogue with friends when being difficult or not. Moreover, pupils learned about collaborating and respecting each other’s tacit. Another findings from pupils, we also learn that democracy is about an agreement and giving agreement to share the same happiness.

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6. References
[8] Suryadi D 2013 Didactical Design Research (DDR) to improve the teaching of mathematics Far East Journal of Mathematics Education 10 (1)