Contextual Teaching and Learning Approach of Mathematics in Primary Schools

D Selvianiresa¹ and S Prabawanto²
¹Pendidikan Dasar, Sekolah Pascasarjana, Universitas Pendidikan Indonesia, Bandung, Indonesia
²Departemen Pendidikan Matematika, Universitas Pendidikan Indonesia, Bandung, Indonesia

*dessiselvianiresa92@student.upi.edu

Abstract. The Contextual Teaching and Learning (CTL) approach is an approach involving active students in the learning process to discover the concepts learned through to knowledge and experience of the students. Similar to Piaget's opinion that learning gives students an actives trying to do new things by relating their experiences and building their own minds. When students to connecting mathematics with real life, then students can looking between a conceptual to be learned with a concept that has been studied. So that, students can developing of mathematical connection ability. This research is quasi experiment with a primary school in the city of Kuningan. The result showed that CTL learning can be successful, when learning used a collaborative interaction with students, a high level of activity in the lesson, a connection to real-world contexts, and an integration of science content with other content and skill areas. Therefore, CTL learning can be applied by techer to mathematics learning in primary school.

1. Introduction
Mathematical concepts are interconnected between one material with other materials, making human thought evolved into a whole mathematical concept. Mathematics is hierarchical, structured, logical, and systematic concepts ranging from the simplest concept to the most complex concept [1]. In order to learn mathematics, the preceding concept which is the prerequisite must be completely mastered in order to understand the next concept. Simple concepts become the baseline of a person to be able to learn complex mathematical concepts. In fact, mathematics materials, especially at the primary school level is the foundation or develop the initial ability of students to be able to learn the material more widely in the higher level again. This is because mathematical ability are one of the most important primary targets in primary school education. If students have difficulty in learning mathematics, it can also affect the daily life and career of school in the future of children [2]. For example, students learning about fractions will be useful when faced with the problems students are asked by their mothers to cut the cake fairly in four sections. Children who have learned the concept of fractions, will certainly be helpful in solving this problem. That way, mathematics does not become a problem but becomes an important benchmark in solving problems in his life. If we understand mathematical material, then we will be able to solve everyday problems related to mathematics. It also relates also in students' skill in mathematical connections.
The mathematical connection ability is the ability to associate between mathematical concepts with other fields in other fields of study as well as with everyday life. The mathematical connection ability will make it easier for students to understand certain concepts because with the ability of connection can look for relevance or relationship concept that is being studied with the concept ever studied. Students with mathematical connection ability will be able to relate mathematics to their real life, and try to solve problems in their lives. For that reason, mathematical connection ability need to be possessed by students as early as their provision in real life [3].

However, seeing the importance of connection ability, it turns out the condition of students in the ability of mathematical connection is still low. For that, action needed to develop students' mathematical connection ability. Researchers want to test an approach that is by using Contextual Teaching and Learning (CTL) approach to the mathematical connections ability. Learning with the CTL approach, students are invited actively to be able to connect the content of the material to the context of daily life of the students, so as to bring the understanding and the meaning intact [4]. CTL approach is an approach involving active students in the learning process to find the concepts learned by linking the material with the knowledge possessed and the student experience in daily life. The mathematics that most students consider difficult, dizzy, even slow in digesting the concept, can be altered by learning that fits the context of the student according to one of the mathematics goals themselves. Students are expected after learning math to solve the problem especially the problem in real life, then the learning must be relevant to the life of the students. Students can like mathematics how well the lessons are presented in accordance with the students’ real life, where there are problems that they often encounter in real life [5]. On the basis of the above description of the problem of the still low mathematical ability of students, especially in grade IV primary school students, the researchers want to test a learning that is by using CTL approach to the mathematical connection ability of students. For that, researchers will conduct research with the title "Contextual Teaching and Learning (CTL) Approach of Mathematics in Primary Schools" and the research questions of this study are the following: What are the improvement of mathematical connection ability of students with CTL approach is higher than direct instruction?".

2. Literature Review

2.1. Characteristics mathematics in primary schools

Understanding for teachers in recognizing the characteristics of mathematics learning in elementary school is considered important as a benchmark in planning learning. As stated by Suwangsih and Tiurlina that learning mathematics in elementary school have some characteristic [1]. First, mathematics using spiral method that is learning where the material that will be taught always connected with material which has been student learn before. Understanding of the material he or she learns can be a prerequisite in learning the next material. Furthermore, learning uses an inductive method of learning that begins by giving a simple concept to a common concept. Mathematical learning embraces the consistency of truth means that learning mathematics has no conflict with each other. This means that any statement that is considered true is the result of a previously confirmed statement. Thus, although the elementary mathematics learning uses an inductive method, but the truth will be the same as the mathematical learning by the deductive method. Furthermore, mathematics learning should mean that learning in mathematics is an indirect concept, but there needs to be a process in reaching the concept. Students can learn with a variety of activities that are real often occur in student life.

2.2. Contextual Teaching and Learning (CTL)

Contextual Teaching and Learning approach anchors teaching and learning in students’ diverse life contexts and prepares students for learning in the complex environments they will encounter in their
future careers [6]. Contextual teaching and learning approach in teaching can apply seven components to create an effective teaching and learning process. First, constructivism is a philosophical thinking of contextual teaching and learning. Second, component that questioning. Questioning is the primary strategy of teaching and learning based on contextual approach. Third, Inquiry is the core of teaching and learning activity using contextual teaching and learning approach. The knowledge and skills got by the students are not only the result of remembering a set of facts, but it is a result of their own discovering. Fourth, learning community suggests the result of teaching and learning got from cooperation with other. Fifth, modeling was imitated by student is better in teaching the skill and learning the certain knowledge. The model gives the great chance for teacher to give the examples how something works before the students do the duty. Sixth, reflection is a way of thinking about what something is newly studied, thinking to the back about what we had been done on studying in the past. Seventh, authentic assessment. The assessment is the process of collecting data, which can gives a description of the students’ learning.

2.3. Mathematical connection ability

In mathematical connection ability, students are required (a) connection between topics in mathematics that connect one material and other materials in mathematics, (c) connection between mathematics materials and other science, (d) connection between mathematics and everyday life which can be found by students [3]. If students can connect mathematics idea, their mathematics understanding will be deeper and longer because similar with connectivity theorem according to Brunner express that there is a strong connection between one concept with other concept, not only the contain but also the formula that used. Mathematical connections, students can build a new understanding of prior knowledge, so that mathematical material can be seen relatedness [7, 8]. A material can be a prerequisite for other materials, or a certain concept is needed to explain other concept. Therefore, mathematical connection ability is needed to be trained in the school.

3. Experimental Method

The method used in this research is the method quasi experiment and research design is the nonequivalent control group design. The subjects of the research were 22 students experimental class and 20 students control class from one of primary school in the city of Kuningan. The experimental class consists of 8 female students and 14 male students, while the control class consists of 10 female and 10 male students. In general, the characteristics of students in both classes are very active and vibrant when given concrete objects.

This study was conducted during six meetings with data collection techniques in this research are test pretest and postest, observation sheets enforce ability of the model. Implementation of this research begins with a pretest to know the initial connection mathematic ability of the students. After that, the learning process is carried out using Contextual Teaching and Learning (CTL). Then, the posttest to determine the end of the connection mathematic ability of the students. Pretest and posttest analysis using n-gain data with normality, homogeneity, and mean differences test with SPSS.

4. Result and Discussion

4.1. Increased mathematical connection ability test

Based the results of analysis of the ability of a mathematical connection before showing that pretest the students who obtain CTL approach is lower than the mean ability of the students with the direct instruction. After the learning process is done, students who obtain CTL approach mean ability in mathematical connection is higher than the mean mathematical connection ability of the students who mathematical connection with the direct instruction. After examining the pretest and postest results of mathematical connection capability in both classes, further analysis of pretest and postest data in the
experiment class and control class was performed. In analyzing the data, previous pretest and posttest data are made in N-gain. N-gain data is what will be done the test is the normality test, homogeneity test, and two-averaged test to answer the problem formulation. These N-gain data to be tested are normality test, homogeneity test, and two-averaged test to answer the problem formulation. Normality test is conducted to find out whether the two research data taken are in the normal distributed population or not.

Based on the result of N-gain that is not abnormal distribution, then further test the difference of two averages by using non-parametric test. Here is the hypothesis used is as follows.

“The improvement of mathematical connection ability of students who gain learning by using CTL approach is higher than students who using direct instruction”.

The data of the average difference test results using the non-parametric test can be seen in Table 1.

| Table 1. Statistics of average differences test results on both classes |
|-------------------|-----------------|-----------------|
|                  | Mann-Whitney U  | Wilcoxon W      | Asymp. Sig. (2-tailed) |
| gain_connection   | 98.500          | 308.500         | .002                      |
| Z                 | -3.079          |                 |                            |

Based on table 1, the average difference of N-gain data of mathematical connection ability in experiment class and control class obtained by P-value (Sig.) is 0.002. Because the one-way test, then 0.002 divided by two, so the value of P-value (Sig 1-tailed) = 0.001. This means that the value obtained is less than α is 0.05, so H₁ is accepted and H₀ is rejected. These data indicate that there is a difference of N-gain data of mathematical connection capability in the experiment class and control class. Thus, it can be concluded that the improvement of mathematical connection ability of students who obtain learning CTL is higher than students who get direct instruction.

Improvement of mathematical connection ability in experiment class can be seen from result of student’s answer. Result of the posttest in the experimental class can be seen in Figure 1 and 2.

Question:
Jumlah siswa kelas 4 dan 5 adalah \( \frac{3}{4} \) dari jumlah siswa kelas 4, 5, dan 6. Banyaknya siswa kelas 4 sama dengan banyaknya siswa kelas 5. Jika jumlah siswa kelas 4, 5, 6 adalah 80 orang. Tentukan banyaknya siswa kelas 4, 5, dan 6! (Urutkan dari nilai yang terkecil hingga terbesar)
Based on figure 1 and 2, it can be seen that the result of the answer given by the students in the experimental class is complete and clear according to the question given. The answers given by the students show students can recognize and link the various problems presented, and answer them in a structured and clear in the provision of information answers. While the results of students’ control class answers are still not complete. Whereas in the first step, students have done the right way. Only, in the final answer is incomplete, the students have not sorted according to what is asked in the matter. In the ability of student connections have not been maximized, because in learning students are accustomed to just follow the steps that the teacher explain. Students memorized steps of workmanship, but students have not been able to relate the various problems that exist in the matter. The results obtained from the students in the experimental class closely related to the learning given is the learning with CTL approach. In learning CTL, students are asked to be active in finding, searching for themselves through activities that do. The learning of CTL emphasizes that the students are active in working and experiencing, until the inquiry process is done by the students, making the students more independent and learning more meaningful for the students. This is because students will try to describe how something they learn is tailored to the life of their students [9]. That way, learning will be quickly understood and more meaningful. On the other hand, on direct learning is more teacher-centered to provide an explanation in the given material. Students in learning more to listen, record, question and answer if the material is not understood, and do the exercise questions to see how far students understand the material. Direct learning should not be applied since it only requires students to memorize their lessons. In the learning process, the teacher should focus on the discovery oriented technical strategy which matches the student’s thinking ability [10].

Presentation of problem on CTL learning at the beginning of learning makes the students challenged to solve problems beyond their usual problems. This is in line with Piaget’s opinion that when learning emphasizes active students trying new things by relating their experiences, helping their students in building their own minds, rather than being passive recipients of information [11]. Learning by using CTL, students are invited to actively involve themselves to be able to find their own meaning based on the experience they have, so as to facilitate students in solving the problem. That way, learning will be more meaningful for the students. As Ausubel points out that learning can be meaningful when students learn to understand what they have acquired, then be linked and developed into a complete knowledge [11]. Students connect the knowledge and experience they have, so that it becomes a new knowledge that is understandable and meaningful for the students.

In addition, formal education is not simply to ensure that students are taught but to ensure that they learn. This simple shift—from a focus on teaching to a focus on learning has profound implications for schools [12]. The existence of community learning activities in the form of group activities, making students eager to learn together with his friends. Group activities create awareness for their students to help each other, students who understand the material teaches to students who have not understood the material. While in direct learning, students are more to self-study and work individually. Students who more quickly understand the material certainly superior to the friends who are in the group as well as asor.

The different treatment of the two classes, it certainly produces different mathematical connection capabilities as well. The results of the answers given by the students in the experiment class are complete and clear according to the questions given. The answers given by the students show students can recognize and link the various problems presented, and answer them in a structured and clear in the provision of information answers. The results obtained from the students in the experiment class closely related to the learning given is the learning with CTL approach. Contextual learning allows students to connect the content of the material to the context of everyday life to find meaning [5]. The learning process of CTL, students are invited to actively involve themselves to be able to find the meaning of the material that is learned by linking the material with their daily life, so that when the student is in the daily environment he can apply the subject matter he has learned before. Learning will be more effective if the teacher can link the material by linking the student experience. Students build their knowledge through experience, using new situations, thus generating new knowledge for students.
[13]. In addition, the modeling activities carried out are very useful for students. The modeling does what the teacher wants, as a tool for student learning. In learning CTL, modeling can not only be done by teachers, but can also involve students. Students learn through active experience deliberately done by teachers to direct students' perceptions and concerns [14]. That way, students in the experiment class are more enthusiastic in learning.

Whereas in the control class students, the result of the postes answer of the students has been able to relate the material of the given problem, but not yet in relating the problem one with the other problem. The results of the answers given by one of the control class students are still not complete. Whereas in the first step, students have done the right way. Only, in the final answer is incomplete, the students have not sorted according to what is asked in the matter. In the ability of student connections have not been maximized, because in learning students are accustomed to just follow the steps that the teacher explain. Students memorized steps of workmanship, but students have not been able to relate the various problems that exist in the matter. With the ability of mathematical connections of students who have not developed optimally, it will also affect the results of student learning [15]. While in the experiment class almost in every activity students actively seek to conclude, so students learn more independently. In addition, students in the experiment class were given more opportunities to see the linkages, since the primary goal of suppressing mathematical connections in the classroom was that students were not teachers [16].

Based on the result of postes of students in both classes, it is proven that there are differences in the ability of mathematical connections of students who get learning with CTL approach and students who gain direct learning. The difference can be seen from the average score of the students of both classes that prove that the average of the students' grade of the experiment class is greater than that of the control class students. This means that learning with a CTL approach is better than direct learning.

5. Conclusion
Based on the results of research and discussion presented, it can be concluded that the Contextual Teaching and Learning can improving of mathematical connection ability. Contextual Teaching and Learning (CTL) approach giving to active students in their knowledge and experience, can be to learn independently, develops their mathematical competence, and gives an idea that mathematics really can be applied and beneficial to student life.

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