Application of the constructivism approach to improve students' understanding of multiplication material

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Abstract. This research is motivated by the low ability of students' understanding of concepts in learning mathematics multiplication material. Mathematics learning requires a learning approach that can make students active and student-centered. If mathematics learning is not student-centered, it will lead to boredom which will ultimately make learning unattractive. Therefore, the researcher chose the constructivism approach to improve student learning activities and understanding students' concepts. This study uses classroom action research and was conducted at SDIT Altaftazani. The results of this study, it appears that student learning activities increase. Students become more active in learning, besides that formative test results also show a good level of student understanding of 35.7% is very good, 35.7% is good and 17.8% is sufficient and only 10.8% is still lacking.

1. Introduction
Mathematics is a compulsory subject that must be given from elementary school, junior high school, high school to college [1]. Mathematics subjects have many benefits for students in developing their thinking abilities. In the 2006 SBC curriculum which was later refined in the 2013 curriculum, it was explained that the objectives of mathematics learning were: 1) to understand mathematical concepts; 2) Using reason on patterns and attitudes; 3) Students can manipulate mathematics and generalize, present evidence, or explain mathematical ideas and statements; 4) Students can solve Mathematical problems; 5) communicating mathematical symbols; 6) has an appreciation of the usefulness of mathematics in the life of curiosity, attention, and interest in learning mathematics, such as resilience and confidence in problem solving. Mathematics learning aims to shape students to be human beings who: have high curiosity and have a tenacious attitude and have high self-confidence [1-3].

Learning mathematics basically can improve and develop students' understanding of mathematical concepts. Understanding concepts is an important part of learning problem solving in mathematics [4]. Without having a strong understanding of the concept, students will have difficulty doing the problem solving process. So, understanding mathematical concepts is an ability that must be developed first [5,6].

Understanding concepts in mathematics learning is not achieved. One of the benchmarks of success in learning is when a scientific concept is understood by students. Understanding is a situation when students already have knowledge about a concept and become new knowledge gained from the learning process [6-12]. Learning mathematics in students can be said to be successful when students have an understanding in solving problems in accordance with the questions asked [13]. Often students fail to solve problems according to the questions given by the teacher. Many things are behind this. One of them is learning mathematics which is considered less fun, boring and even terrible [14]. For this reason, a learning approach is needed that can change the view of mathematics that is not fun.
One learning approach that can be applied is the constructivist approach. Constructivism learning approach holds that children are creatures who are active in constructing knowledge through various interactions with their environment. Constructivism means the process of science formation. Every child must carry out this formation process himself. It is expected that students can actively think, develop various concepts and interpret various concepts that they learn themselves [15]. In this case, students must be really prepared mentally to actively build their knowledge. In the constructivism approach there are differences in the roles of teachers and students when compared to conventional learning. In this study the teacher's role is not too dominant, the teacher is only tasked with facilitating students so that students are active in building their knowledge. In this approach the teacher is expected not to do much explanation of the concept students must learn [16]. So that in the constructivism approach students will enjoy the ways or solutions they have found, so students will feel more enjoyable learning activities. The teacher must still provide direction so that no concept errors occur in students [16]. The constructivism approach in mathematics learning the role of the teacher is no longer the final answer to the students' questions, but rather as the student's director to shape and build mathematical knowledge so that a mathematical structure is obtained [17,18].

There are several stages of the constructivism approach in mathematics learning that we must understand, namely: 1) Perception Stage. At this stage, the teacher must be able to convey the initial concepts of learning and be able to motivate students to want to learn, and strengthen the drive to increase their potential. 2) Exploration Stage. At this stage design an activity that will give students the opportunity to search for and get a concept through the stages of data collection, organizing data, and interpreting data. This stage will arouse students' curiosity. 3) Discussion Stage (Explanation of Concepts). At this stage, direct students to analyze and interpret the results of their observations, to find explanations and answers to a problem. Next, a new understanding of a concept begins to be built by students. 4) Development Stage (Application Concept). At this stage, the teacher must be able to create a learning climate that can accommodate students to be able to apply their concept understanding [18].

2. Method

The study was conducted using the Classroom Action Research Method. Classroom action research aims to solve problems that occur in a school or more specifically in certain learning and in a particular class using scientific methods. the class action research model used is a research model developed by Kemmis and Mc.Taggat which consists of several cycles. Each cycle has 4 stages, namely: 1) planning (planning), 2) then action (action), 3) observation (observing) of the actions that have been done, 4) reflection (reflecting) [11,19]. The function of each of these stages is to elaborate on each other, because at each stage includes a process of improvement that must be carried out continuously so as to get the desired results. These stages must be carried out systematically. As for this study, the researchers planned two cycles which included one basic competency in mathematics in the 3rd grade elementary school. Schematically, the learning cycle that researchers carry out in this class action research is as in the following Figure 1.

![Figure 1. Research scheme](image-url)
The subjects of the study were 3rd grade students in SDIT Altaftazani. Located in Desa Gandasari, Kecamatan Katapang, Kabupaten Bandung, in one class with a total of 28 students, consisting of 10 male students and 18 female students. Data collection instruments used in this study were tests and observation guidelines.

3. Result and Discussion

3.1. Result

3.1.1. Implementation of the first cycle learning

To realize the learning action plan, the researcher draws up the Learning Implementation Plan (LIP). The lesson plan is made based on basic competencies, and adjusted to the learning approach that will be implemented, making student worksheets, making formative test sheets, making non-test data collection instruments and preparing manipulative objects in the form of beads.

Based on the results of observations, preliminary activities have been carried out well starting from activities motivating students and conditioning the learning situation to deal with learning to be given. Similarly, the preparation of manipulative objects as props has been well prepared. The core activities in the learning process carried out by the teacher are in accordance with the learning implementation plan that has been prepared previously. Core activities begin with the formation of study groups based on the heterogeneous state of students with reference to the analysis of daily activities of students. Based on these criteria, 7 groups were formed with each group consisting of 4 students. This grouping of students aims to enable students to interact, exchange ideas and be able to construct their knowledge through collaboration in groups as well as a bridge for students to think and construct knowledge from within themselves so as to produce a new understanding of the concepts being studied.

In the group discussion activities the responses of some students who were categorized as having sufficient understanding of mathematics provided many inputs in solving the questions. However, some students who are categorized as having poor and poor mathematical understanding are seen to be silent and joking so that they look smart and have good mathematical understanding, dominating in discussions and working on worksheets. After the discussion process is complete, the teacher carries out a formative test to measure the level of student understanding in learning mathematics multiplication material. The formative test results are as follows Figure 2.

![Formative Test of The First Cycle](image)

Figure 2. Formative Test of The First Cycle

Formative test results show that there are 8 students (28.5%) students categorized as reaching a very good level of understanding of mathematics, 6 students (21.5%) Students categorized as reaching a level of understanding of good mathematics, 6 students (21.5%) are categorized as reaching the level of understanding of mathematics sufficient, there are 8 students or a small portion (28.5%) of students categorized as reaching the level of understanding of mathematics is less.
From the results of the analysis of the implementation of learning in the first cycle shows that learning mathematics using the constructivism learning approach is still lacking, because there are still 8 students (28%) who do not understand the learning material. The results of the first cycle of reflection can be concluded that the implementation of learning by using constructivism learning approach to improve understanding of the concept of multiplication, students in general have understood the concept of multiplication, but there are still some students who are less active in learning activities, in addition there are still 28.5% who still do not understand the concept of multiplication, so that the second cycle still needs to be carried out.

3.1.2. Second cycle learning implementation
This second cycle begins by reflecting on the results of the first cycle through analysis of the amount of data that has been obtained. Based on the results of this activity, further improvements were made to the overall learning process to improve it in the second cycle. Furthermore, a second cycle learning implementation plan is prepared with different indicators but it is still a development of the indicators in the first cycle. The lesson plan is completed with Student Worksheets (SW), formative tests and observation formats.

The core activity begins with conditioning students to sit in groups according to their respective groups that were formed at the meeting last week. The next activity is to explore, the teacher presents questions in the form of Student Worksheets (SW) that must be done by students in groups with nuances of constructivism. Students are given the opportunity to recognize the problem, investigate and analyze it and collect a variety of possible answers to solving the problem, determine one of the possible answers which are seen as the easiest and apply in solving the next problems.

While working on the worksheet the teacher’s activity is to observe the activities of the students in the group, guiding if there is a group that is having difficulty and directing it so that the students' thinking activities in the group are more active. After the discussion process is complete, the teacher carries out a formative test to measure the level of student understanding in learning mathematics multiplication material. The formative test results are as follows Figure 3.

![Formative Test of The Second Cycle](image)

**Figure 3.** Formative Test of The Second Cycle

Formative test results show that there are 10 students (35.7%) students categorized as reaching very good levels of understanding of mathematics, 10 students (35.7%) students categorized as reaching good levels of understanding of mathematics, 5 students (17.8%) categorized as reaching the level of understanding of mathematics sufficient, there are 3 students or a small portion (10.8%) of students categorized reaching level of understanding of mathematics as less.

The results of the second cycle of reflection can be concluded that the implementation of learning using the constructivism learning approach to improve understanding of the concept of multiplication, students in general have understood the concept of multiplication, it appears that only 3 students (10.8%)
still lack understanding. From these results the research is considered sufficient until the second cycle and will not proceed to the third cycle.

3.2. Discussion
Based on the results of research on students, the level of understanding of students with constructivism learning approaches from the first cycle and the second cycle showed an increase in the number of students whose understanding was very good showed a significant increase, so did the categories of other levels of understanding which increased. This means that the constructivism learning approach can increase students' understanding of multiplication. The results of observations of students' activities during learning take place that students generally give a positive impression. This can be seen from the activities of students in discussions in groups to try to understand the problem of building knowledge multiplication from the first cycle shows an increase in the second cycle. This shows the approach of learning mathematics with the learning approach constructivism able to increase the activities of students in expressing opinions in the group.

From the results of the study it was seen that the activities and understanding of students increased in mathematics learning using the constructivism approach. Because learning facilitates students to be active in the learning process. According to Jatisunda, In the constructivism approach students will love the ways or solutions they have found, so students will feel more enjoyable learning activities. But of course the teacher must still provide direction so that no concept errors occur in students [16]. This is consistent with the results of research from Azhari and Somakin which states that the constructivism approach can motivate students to actively develop students' knowledge and skills in learning mathematics. The constructivism approach can also be an alternative for teachers in choosing innovative learning approaches [17].

4. Conclusion
Based on the description of the results of research, analysis and discussion of mathematics learning with a constructivism approach to increasing the understanding of concepts in multiplication learning material in grade 3 SDIT Altaftazani, Bandung Regency it can be concluded that the implementation of the constructivism learning approach can improve the ability to understand the concept of multiplication learning material in class 3. Completeness student learning can be achieved well after using the constructivist learning approach. This can be seen in the results of the last cycle formative test scores. Finally, students' activities during the process of learning mathematics with constructivism learning approaches can provide new experiences, construct their own knowledge with the knowledge they have. This can be seen from the more active students in group discussion during the learning process.

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