Improving understanding of addition and subtraction concept in first grader through utilization of flipped classroom

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Abstract. This class action research was conducted to see the effectiveness of the flipped classroom method on improving the concept of addition and subtraction. Flipped classroom method was chosen because it is in accordance with the current development of digital learning media that utilizes technology in learning. Flipped classroom performed by providing learning videos that can be viewed online by students at home then followed by problem solving activities through discussion activities in class with mentoring provided by the teacher. Based on this study an increase of 28.6% was obtained so that 83.3% of 42 students scored more than the minimum competencies criteria. The implications of this research can be utilized in other mathematical learning concepts.

1. Introduction
Teaching and learning are an art. Teachers while developing the art of word processing and class management also need to develop the art of managing differences that exist because of the diversity of students in the class. The differences that need to be managed so that each student gets the same understanding in the material being taught. This applies to all subjects including mathematics. Various methods have been used by researchers to improve the understanding of mathematical concepts, one of which is by flipped classroom.

Novak, et.al. in his study stated that there was increased engagement in the flipped lecture compared to the standard lectures on the understanding of mathematical concepts [1]. Flipped classroom can also be adapted to other STEM subjects Gökçe Akçayır, Murat Akçayır in a review of studies conducted showed that flipped classroom increases student understanding and motivation to learn [2]. Therefore, flipped classroom can be used to increase understanding of the concepts of addition and subtraction.

Chiu-Lin Lai and Gwo-Jen Wang in their study found that students who organize themselves well in learning the material provided shows improved learning outcomes [3]. Self-regulation in grade 1 children apart from being done independently by students is also obtained from the assistance provided by parents at home.

The aimed of this class action research is to improving the understanding concept of addition and subtraction on first grader. There is huge gap between student homework results and classroom performance that indicate student does not have firm understanding of mathematical concept. Existing gaps need to be overcome with methods that are appropriate to technological developments, namely flipped classrooms. This research conduct because the existing research does not specifically refer to the concept of addition and subtraction of grade 1 students.
2. Literature review
Mathematics at primary schools could be categorized over arithmetic, geometry, measurement, and statistics. On arithmetic students learn about computation involving addition and subtraction. Student should learn about addition and subtraction are connected [4]. Through the understanding of addition and subtraction connected, student learn about inverse concept which is solve substraction using addition and vice versa. Addition names the whole in terms of the parts and subtraction names a missing part. Addition and subtraction can be separated into structures based on kinds of relationships involved which is change problems (join and separate), part-part-whole, and compare problems [5].

Computation capabilities will be controlled if someone beforehand having number sense. McIntosh et al describe the number sense refers to a person's general understanding of number and operations along with the ability and inclination to use this understanding in flexible ways to make mathematical judgments and to develop useful strategies for handling numbers and operations [6]. Cobb in NCTM said that students will rely on their own computational strategies [7]. Students need to be taught a variety of problem-solving strategies before being given the opportunity to choose the right strategy for them. In other words, one of the roles of the teacher in teaching mathematics is to introduce ways of solving the problem. The strategies used by children can be recognized by those around them including teachers. Teacher can recognize it from the way students communicate ways of thinking when solving problems.

Flipped classroom is an innovation that utilizes technology in learning. Flipped classroom was introduced by J. Wesley Baker dan Lage M.K. et.al. According to Baker, flipped classroom is a change in learning from classroom through online delivery [8]. Changes in learning methods are made from the traditional way in the classroom to outside the classroom or vice versa [9]. Through flipped classroom, students gain new experiences in learning outside the classroom that utilizes technology, this learning experience will not be obtained if they learn by using other media.

Flipped classroom utilizing computer-based technology outside the classroom and then continue with the deepening of the material in the classroom [10]. Videos for flipped classroom provided online, watched by students at home then followed by the deepening of the material with the assistance of the teacher at the school [11].

Teacher shares learning material in the form of videos, web or YouTube links, or presentation slides that can be seen at home. Material that can be learned at home is very useful for students because there is an opportunity to repeat material that is poorly understood. In the class, students have the ability to absorb different material. There are students who are able to understand the teacher's explanation by only hearing the explanation from the teacher, but there are also students who need to listen to the teacher's explanation several times before he understands it. In addition to the ability to absorb different material, not all students who come to class have the readiness to participate in learning. There are students who are sick, sleepy, thoughts wandering everywhere also become a barrier in understanding the teacher's explanation. Flipped classroom helps overcome this through video material that can be seen repeatedly at home. Videos that can be watched at home without time limit provide opportunities for students who are absent from school due to illness, grief, family needs, etc. able to listen teacher's explanation of the material on that day. This makes students who are not present can still get the same material understanding as students who attend school.

Material learned at home gives parents the opportunity to provide explanations in a language understood by students. Teachers who teach with good grammar sometimes become a barrier for low grade students to understand because it is different from the language that is usually used in conversations at home. Parents who teach at home remove this barrier so that children can understand the material more quickly. Students learn the material with parents help to see the video or link provided, gives room for the interaction between parents and children.

Flipped classroom can create good interaction between learners and teachers in learning as well as the different learning needs of each student can be facilitated [12]. At school, teacher guides students to deepen the material in groups with their friends and individually. Through the deepening of the material in the classroom, the teacher can measure student understanding, provide clarification of inappropriate understanding and provide additional explanation when there are students who still do not understand
the material being studied. Teachers who actively monitor student activities provide opportunities for good interaction between teachers and students. Good learning activities is organized by seeking active engagement from students [13]. Students who are actively learning will have better understanding and can remember the material being learned. Flipped classroom effective on engaging students being an active learner and at the same time creating good interactions between students and students, also students and teachers in learning [14]. Discussions conducted between students provide an opportunity for students to actively understand the material as well as facilitate interaction between students with the presence of peer tutoring, namely students help colleagues who do not understand the material.

3. Methodology
The study was conducted on 1st grade students in Calvin Christian Primary School Jakarta. The number of students is 42 that divided on to class A and B. The study was conducted in second semester, of academic year 2018/2019.

The experiment was conducted using action research methods consists of two cycles. Each cycle contain of planning, implementation, observation, and reflection [13]. Each cycle consists of 3 meetings which is 2 meetings providing learning material through flipped classroom and 1 meeting for assessment. The duration of each meeting is 70 minutes.

There are 3 types of instruments used to collect data in this study: (a) observation data collected by checklist, (b) students learning outcomes collected by written test, (c) evaluation from parents collected by google form. The questionnaire for evaluation form uses a Likert scale with a scale of 1-5 and fill in form for asking parents input.

Analysis of this class action research was carried out by data triangulation. Data obtained from field observations, compared with student learning outcomes, and evaluations from parents. The data obtained from research processed using Microsoft Excel.

4. Results and discussion
Flipped classroom is a change on learning delivered in the classroom through online delivery. Teacher posts videos and work instructions. Video duration approximately 5 minutes, because the concentration range of the child is not long. Instructions given in the form of learning topics, learning objectives, duration of time needed to carry out activities, details of activities undertaken such as videos that need to be watched, what needs to be done, as well as forms of submission of learning evidence in the form of worksheets, videos, or photos. Learning material posted by teacher 2 days before it discussed in class so that children have enough time to study concept with the assistance of parents and to accommodate working parents that cannot immediately accompany their children. Changes in the delivery of material apparently have a positive impact on students in improving understanding of learning materials. It happens because parts that are not yet understood by students can be repeated in the video. Researchers through interviews with students get information that there are students who watch the video up to three times to understand the material taught by the teacher. Parents also have a big role on teaching concepts, because students can learn from their parents on the daily language using at home so they can have deepen understanding of the concepts. Based on this, flipped classroom helps students understand the material better than traditional learning.

Flipped classroom done by learning outside the classroom by utilizing computer-based technology and followed by deepening the material in the classroom. The learning video is watched by students at home online then is followed by the deepening of the material with the assistance of the teacher at the school. The deepening of the material at school is done through discussion activities which are also useful in creating good interactions between teachers and students and between students themselves. The discussion went well because students tried to be actively involved. The interaction that occurs between students and teachers is useful because teachers can make formative assessments of student understanding. Inadequate understanding such as the use of inverse operations that are wrong can be given input by the teacher. Good teacher and student interactions can be seen from children who dare to speak when asked, dare to tell about the mistakes they made.
Interaction between children going well, it can be seen from the discussion when children listen well when there are friends in the group who express their opinions. Students also seem patiently teach colleagues who do not understand how to do the task. Researchers who went around found that most of the students in the first cycle had grades below the minimum criteria score in the second cycle showing better. Students in the first cycle often ask the teacher about the truth of the answer in the second cycle has decreased in number.

Discussions also create active student involvement which ultimately increases student understanding as suggested by Piaget. Students who find themselves solving problems will be better able to remember the strategies well. This problem-solving strategy will be better mastered when peer tutoring occurs in group discussions. This study considered successful if there had been an increase in the student ability on addition and subtraction through the use of flipped classroom. Indicators that depict increasing child's ability on addition and subtraction are shown by the child's ability to solve addition and subtraction problems with a structure of join-separate, part-part-whole, and compare of unknown results, modifiers, or initially. This ability is also shown by students being able to work on the problem even though the same sign is on the left. Students can demonstrate counting fluency by being able to show how to count as a form of communication of ideas, calculate addition and subtraction with correct results, and flexibly use methods in problem solving.

Flipped classroom result in the first cycle are not satisfying because a lot of students got score below minimum criteria. Students begin to be able to do addition and subtraction that requires re-grouping like $35 - 16 = 19$. Even so, only $54.7\%$ of the total 42 students who scored more than minimum criteria (KBM), this means that almost half of the class still has difficulty in adding and subtracting. Students seem to still have difficulty solving problems whose modifiers are unknown $35 - \ldots = 19$ or initially unknown like $\ldots - 26 = 16$. When facing problem $42 - \ldots = 18$ there are students who work with $42 + 18$ after tracing through interviews with children, it is found that children remember the pattern taught by parents and tutors, namely the inverse concept, but because they do not understand the concept of adding the subtracting well, the thing to remember is that the reduction is done by addition and vice versa. This finding indicates that students do not yet have a good understanding that addition and subtraction are related. Therefore, in the second cycle the researcher emphasized increasing problem solving of initial and modifier unknown.

Students who have good calculation skills are demonstrated through their ability to use appropriate strategies in solving problems. Students in the first cycle were found to forget the principle that the equal sign indicates the number to the left of the sign equal to the number to the right of the sign. This is seen from the majority of children having difficulty doing problem when the same sign is moved to the left as $33 = \ldots - 16$. Many children who work with $33-16$. The difficulty of recognizing the equal sign indicates that students do not have useful strategies for handling numbers and operations. This deficiency of course very detrimental for students because it will prevent in calculating therefore in the second stage the researcher emphasizes giving practice questions by changing the position of the equal sign on the left. The given problem begins with the sum problem of reducing the number to 20 to make it easier for students to recall the facts. Based on the researcher's observations, on the second cycle students communicate ideas better, this can be seen from their work on problem solving, some children also dare to try different ways in each number of questions worked on. Also, many children can remember the fact that the sign equal to signify the amount to the left of the sign equal to the number to the right of the sign. It can be seen on student giving right answer for problem that equal sign place on the left side.

The researchers' strategy in the second cycle was successful as indicated by an increase in children's assessment results by 28.6% from the previous cycle. There are 35 children or 83.3% whose grades are more than minimum criteria (KBM) and the score average increased to 73.

Data triangulation done by analyzing the results of observation notes, written tests of students, with evaluations from parents. Based on the evaluation form collected by parents telling that (a) students get better understanding on the material being taught because they can repeat the video given by teacher,
(b) children more enthusiastic about learning mathematics because there is a video to be watched and can hold iPad or laptop to learn, (c) there is a better interaction between parents and children compared to the previous cycle, (d) parents are also happy because they can better understand the concepts and learning objectives provided by teachers in mathematics that are not normally studied by them, (e) feel satisfied with learning that utilizes different methods to enrich children, (f) concern with children which must interact with the gadget.

From parents’ evaluation can be confirmed that there was an increase in understanding the concepts of addition and subtraction as had been found through observation notes and student learning outcomes. Thus, it can be concluded that the flipped classroom method has succeeded in increasing students’ grade 1’s understanding of the concepts of addition and subtraction.

5. Conclusion
Based on the explanation and data above, it can be concluded that flipped classroom method can increase the understanding of the concept of addition and subtraction of first grader.

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