The Fourth Grade Student's Achievement in Mental Computation

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Abstract: *The aim of this study is to find the students' achievement comparison between mental computation and non-mental computation approach on subtraction topic at the fourth grade students SD Negeri 8 Peusangan. This study use quantitative approach with pre-test and post-test experimental design. The data were analyzed using statistics of t-test to test the hypothesis. The population of this study were two parallel classrooms where one classroom as the experimental group and the other as the control group. Due to the number of the population are not so big, all of them used as the sample. The number f sample for both experimental and control group are 14 students. The results show that students' achievements taught by mental computation approach are better than that of non-mental computation approach. Students' responses towards mental computation approach are very good and they look like more creative in solving subtraction problems.*
Keywords: *Achievement comparison, mental computation, and non-mental computation*

I. Introduction

In line with the effort to improve the quality of life as a nation in the world, the efforts to improve the quality of education are continually performed both in administration and in administration sector and in instructional sector. In teacher sector, the program of teachers' professional development is always encouraged to gain a better teacher performance at the school level. On the other hand, students' achievement are also still far from expectation as an effect of individual difference in constructing their new knowledge. These phenomena also appear in the topic of subtraction between two numbers. [1]stated that learning can be described as a condition when people can do something they cannot do before. Furthermore,[2]define learning as a process undertaken by an individual to change his behavior to a new behavior as a result of experiencing with environment. In the case of learning subtraction, the students did not show any changes before and after learning. This case requires any consideration for us to spot the cause of the problem such as inappropriate methods of teaching, misleading approach, etc.

One of the problems that usually happen in mathematics teaching and learning is the non-meaningfulness of the learning process experienced by students. Students' inability to digest the presented learning materials is a sign of a big problem in the learning activities. [3]stated that learning is a meaningful process. He expressed that learning mathematics must be a process of meaningful activities with a good understanding. The learning process will come out in vain when there is no in-depth understanding as a result of learning.

Therefore, whoever the teachers who teach mathematics they need to consider all conditions that make learning succeed. Teachers need consider and adjust all kinds of aspects relating to the teaching and learning process such as the allocated time, the appropriateness of methods in relation to materials and students, understanding the taught materials, and understanding the way the students learn and being able to predict students' ability to understand certain concepts[4].

In case of learning subtraction of two numbers, many students experienced the difficulties when they work with subtraction problems. Learning approach is an important part of learning as a whole. Therefore, choosing the right approach to deliver subtraction topic smoothly and successfully also needs a thorough consideration and try a new way if one approach does not work well. It is very often that the students fail to understand subtraction between two numbers due to the unclear explanation from the teachers or it simply due to the way the teachers teach. Students may need other approaches that may connect well with the way they can understand. The more the teaching variation the teachers provide the higher the possibilities all students can understand the material. This is due to the individual difference in term of learning, particularly in mathematics learning.

Providing students with a variety of approaches to solve two-digit subtraction problems may strengthen their ability in solving various kinds of problem. [5]Stated that mathematical process mayincreasestudents'

thinking pattern become a pattern that is mathematical, systematic, logical, critical precisely. In mental computation, the flexibility process expected from students requires the teachers' role to introduce the flexibility idea of mental computation, particularly in subtraction. Teachers' direction on how to develop curiosity from students is crucial due to the students need role models. For this purpose, teachers need a number of instructional approaches that may be implemented in certain materials. That why the meaningful processes of teaching and learning require teachers with a wide range of experiences. Teachers are expected to continually enhance the capability through various kind of activity and resources such as improving their capabilities by adopting the newest result finding in mathematics teaching and learning. For example, less professional teachers will rigidly apply standard procedure to solve subtraction problem likes 62 -17. Usually they will perform subtraction by arranging the number in two line and process it following the place value (62 -17). The unit 2 is subtracted by 7 and the tens 6 is subtracted by 1. 2 cannot be subtracted by 7 due to 2 is less than 7, therefore 2 need to borrow 10 from 60's for 2 to be 12. Then the process will be 12 − 7 that is equal to 5. The next process is to subtracted 1 ten from 5 tens (the remaining from 6 after 1 is borrowed). 5 − 1 will be 4, that is 4 tens, which will give the final result 45. The process performed here is the procedural processes. This kind of rote learning in mathematics is the common type of mathematics teaching that require students to remember the procedure they do not understand. This type of teaching makes mathematics so tough for majority students. The effect of this procedural approach without understanding often makes students misunderstand the procedure. For the subtraction 62 − 47, students simply subtract the bigger number with the smaller. In this case they subtract 12 by 7 (the result is 5) because they borrow 10 from 60 and then they subtract 60 by 10 which give the results 50. This process will give the final result 55. This is one of the portraits of the mathematics teaching and learning in most schools caused by the effect of procedural misunderstanding.

II. Literature Reviews

Mental computation can be considered as an alternative way to solve subtraction problems and to enrich students' mathematical insight. Mental computation may train students to reason properly on any mathematics at both lower grade and higher grade at primary school[6].

Mental computation is expected to make students find a comfortable feeling towards arithmetic operations, particularly in subtraction. While subtraction for children is more difficult than addition[7], this is intended students will experience more ejoyable in learning.

There are many types of mental computation. In this study focus on the techniques suggested by[8].They are compatible numbers, subtitutions, and equal differences. Compatible numbers mean that the process of computation is performed by finding the easy number to add or subtract. For example, $54 − 17 + 16$ can be soved by adding 54 and 16 first then subtracting it by 17 ($54 + 16 − 17$). The final subtraction expression will be $70 − 17$. Substitutions mean to substitute another number to change the expression without changing the essence of the problem. For exanple, the subtraction 52 -17 can be change to be $52 − (2 + 15) = 52 − 2 -15 = 50 − 15$.

III. Methods

This study use quantitative approach with experimental design. The sample of the study is two classes of fourth grade students at SekolahDasarNegeri 8 Peusangan, Bireuen regency, Aceh Province, Indonesia.

For the purpose of data collection, the two parallel classes were chosen for treatment and control classes. The two classes that participated in this study are the class IV/A and class IV/B. The class IV/A is assigned as experimental group and class IV/B as control group. The number of students participated in this study for both experimental and control class is 14 students. Based the evaluation by the classroom teacher, the ability and performance of the two classes are relatively equal. The following table shows the composition of students according classrooms and gender in experimental group and control group.

Table1: Students composition based on groups and genders

Groups	Gender		Total
	Boys	Girls	
Experimental	8	6	14
Control	7	7	14

1. Instruments

The instrument for data collection in this study is the 5-item subtraction problems. The same problems were assigned for both experimental and control groups and for both pre-test and post-test. In doing the test, the students are encouraged to freely choose to solve the easier problem first. At the post-test, the experimental group is required to solve the problem in mental computation approaches while the control group is advised to solve as they usually do.

The same instructional materials are provided for both experimental and control group, the teaching approaches are the same (demonstration and discussion). The different is when the students solve the subtraction problem in experimental class. The students in experimental class are instructed to perform the subtraction in flexible ways with mental computation. The process of teaching and learning was performed by researchers with the help by the teachers.

2. **Data collection**

Before the instructional process started, both groups are given pre-test as a comparison for the post-test that will be held at the end of the instructional process.

The pre-test result will be used as an initial reflection and as a guideline for preparing instructional materials. Both groups are expected to actively participate in the teaching and learning processes. This study was conducted under the same teachers and methods but with different approach on solving the material problems.

3. **Data analysis**

The main data for this study is collected from the result of pretest and posttest of experimental and control group. The mean of N-gain the score were then calculated. The complete result can be seen in table 2 as follow.

Table 2: N-gain mean of students' achievement of mental computation and non-mental computation approaches

Approaches	Level	Mean	SD	N
Non-mental Computation Approach	High	-.4750	1.79884	4
	Middle	.1000	.46904	6
	Low	.5750	.22174	4
	Total	.0714	1.00646	14
Mental Computation Approach	High	1.0000	.00000	4
	Middle	.8050	.30684	6
	Low	.5625	.18679	4
	Total	.7914	.27177	14
Total	High	.2625	1.41718	8
	Middle	.4525	.52759	12
	Low	.5688	.18992	8
	Total	.4314	.81098	28

From the table 2 above, it can be drawn several points relating to the students' achievement of mental computation approach and non-mental computation approach. They are as the following:
a. N-gain mean of students' achievement with mental computation approach is bigger than those of with non-mental computation approach (0.7914 > 0.0714).
b. N-gain mean of higher-level students' achievement with mental computation is bigger than those of with non-mental computation approach (1.000 > -0.4750).
c. N-gain mean of middle-level students' achievement with mental computation is bigger than those of with non-mental computation approach (0.8050 > 0.1000).
d. N-gain mean of lower-level students' achievement with mental computation is smaller than those of with non-mental computation approach (0.5625 < 0.5750).

From several results above, it can be drawn a statement that the students' achievement with mental computation are than that of with non-mental computation, particularly from higher-level students and middle-level students. The following are the achievement improvement made students of SD Negeri 8 Peusangan using t-test.

Table 3: t-test students' achievement of SD Negeri 8 Peusangan

Instructional approaches	Me	t	Sig.	Ho
Mental computation * Non-mental computation	88.5714 > 55.0000	-4.015	.000	Rejected

Table 3 shows that the mean of students' achievement with mental computation approach is bigger the mean of those with non-mental computation approach (88.5714 > 55.000) with significant value 0.000. Due to the significant value 0.000 is smaller than 0.05, the research hypothesis "there is a significant difference between mental computation and non-mental computation approach in subtraction" is accepted. This means that

the students taught by mental computation approach reach a better achievement compared to the students taught by non-mental computation approach.

To see the relationship between instructional approach and the level of students' ability (high, middle, and low) toward students' achievement, the analysis processes use two-way ANOVA.

Table 4: Two-way ANOVA of instructionalapproaches and students' ability

Variable	F	Sig.	Ho
Instructional	6.723	.017	rejected
Category	.367	.697	accepted
Instructional* Category	2.112	.145	accepted

H_0 = There is no interaction between instructional approaches and students' ability

From the table 4 above it can be seen that the F value for interaction between instructional and students' ability is 2.112 with significant value 0.145. This significant value (0.145) is greater than 0.05, therefore the research hipothesis that state that there are an interaction between instructional factor and the students' ability level (high, middle, and low) is rejected and can be concluded that there no interaction between instructional factor and students; ability level.

The interaction between instructional factor and students' ability level can be seen as in the Figure 1.
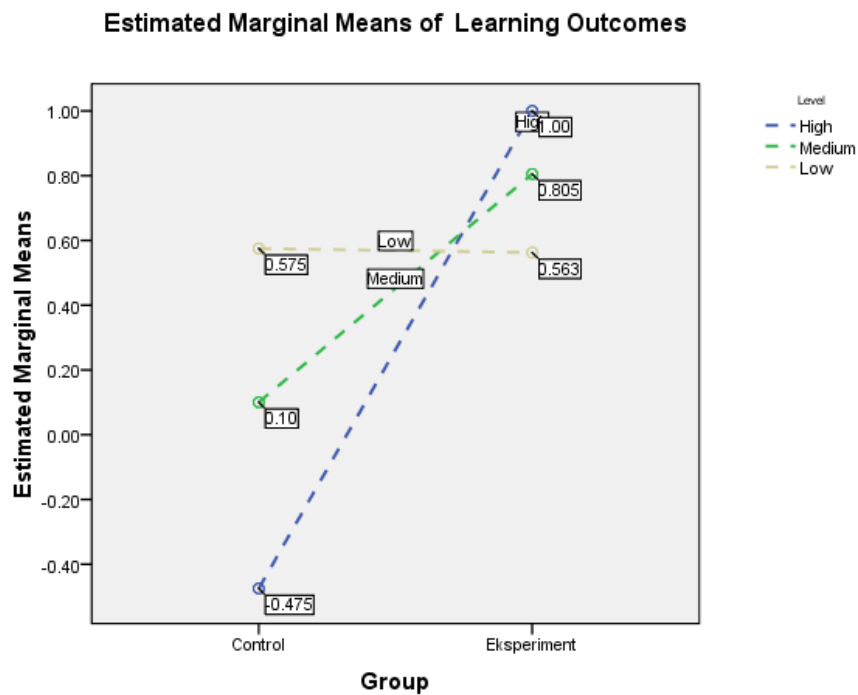

Figure 1. Interaction of instructional factor and performanve level toward students' achievement

IV. Results and Discussion

Based on the figure 1 above the instructional with mental computation approach is best performed by high and middle level students. This can be seen in the average of N-gain of students' achievement in mental computation approach is greater than the non-mental computation approach.

The following figure is an answer on the post-test answer sheet of a student in experimental group.
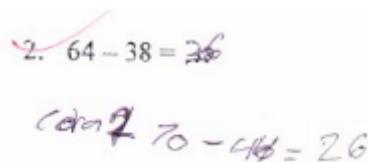

Figure 2. Sample answer of student (AD)

The student tried to anwer the subtraction problem using mental computation with equal differences approach. The student had a little miunderstanding of equal difference, he should chane the problem to be 66 – 40 to be able to easily get the result.

The following figure is an answer from student in experimental group. This students also used the mental computation strategy.

Figure 3. Sample answer of student (MK)

The following figure is a sample answer using mental computation strategy with different approach

Figure 4. Sample answer of student (SR)

The fourth student had the same way in mental computation with another approach.

Figure 5. Sample answer of student (SH)

All the above students solved the subtraction problem (no. 2) with different approach but they arrived at the same answers.

The answers given by students above in solving two-digit subtraction problems for problem no. 2 is in performed by using mental computation approaches.

V. Conclusion

The findings in this study shows that instructional on subtraction using mental computation approaches is an alternative apparoach for the students who have difficulties in two-digit subtraction materials. Students will find by themselves the suitable approaches when solving the problem. It looks like the students will find mental computation approach as the easy way to perform computations. The use of mental computation may also have effect on students' mindset toward mathematics, particularly on subtraction of two-digit numbers.

Before students are introduced to mental computation, the only way they had to solve subtraction problem is by following the standard procedure (algorithm). Introducing this way of doing subtraction give them a rich, flexible methods to solve the problem concerning subtraction.

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