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Manipulatives in Learning Fraction for Improving First-Year Elementary Students' Understanding

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ABSTRACTS

This study was led to decide the effect of utilizing manipulatives in learning fraction. The examination demonstrated the effects of those manipulatives on learning fraction. The information was gathered from the sum number of 62 respondents, 31 students from the experimental group and 31 students from the control group, with the guide of the approved and validated test questionnaire. Information was investigated and translated utilizing the Average Weighted Mean and T-test as statistical tools. A pre-test and post-test were utilized to decide the results of utilizing manipulatives in the learning area. Data demonstrated that there was a significant difference in the utilization of Manipulatives for Learning Fraction among first-year elementary students. Some recommendations were also included in this study.

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1. INTRODUCTION

Mathematics instruction is critical in students learning (Gersten *et al*., 2009; Piccolo *et al*., 2008; Hiebert & Grouws, 2007). Mathematics skills are essential for functioning in today's world; mathematics abilities are necessary for school and daily life. There are many different approaches to teaching mathematics; we will focus on the use of manipulatives in mathematics education, specifically the common core.

On an international scale, the theory implies that a concrete model may be similar for some students to understand a symbolic model (Fosnot & Perry, 1996; Harrison & Treagust, 2000; Dori & Barak, 2001). Students who failed a symbolic algebra assessment scored 100% when using manipulatives. Additionally, the concrete nature of manipulatives typically requires users to exert physical actions on the manipulatives. Pouw *et al*. (2014) and Dandashi *et al*. (2015) noted that incorporating physical activities has been shown to enhance memory and understanding.

The National Council of Mathematics claims that learning in Grade 3 to Grade 5 should cultivate more than the students' abilities to make sense of mathematics; it should enhance their ability to solve problems (Schoenfeld, 2016; Stylianides, 2007). Memorizing facts without understanding underlying concepts makes it increasingly difficult for students to acquire new mathematical skills. Students need to be allowed to touch, manipulate, and construct their meaning and understanding. This can be achieved through the use of manipulative materials.

According to Carbonneau *et al*. (2013); Carr (2012) and Liggett (2017), simply incorporating manipulatives into math teaching may not be enough to increase achievement. It cannot be assumed that children will immediately see mathematical concepts or relationships by interacting with objects. Therefore, manipulatives mustn't be used as an "add-on" but are explicitly explained and modeled to ensure understanding.

This experimental research study aimed to examine how the use of manipulative in first grade will affect the students' experiences since during one of the field studies in the Peñaplata Central Elementary School; it was observed that one of the learners' weaknesses is the fractions in Mathematics, especially in grade one students. Learning the concepts of fractions can be one of the most challenging skills to master for elementary-level students. It is crucial to examine how effective these teaching tools can be regarding student achievement.

The hypotheses guided the study and tested at a 0.05 level of significance are:

(i) Ho_1: There is no significant difference in the pre-test mean scores of the students in the control and experimental groups.

(ii) Ho_2: There is no significant difference in the pre-test and post-test mean scores of the students in the control group.

(iii) Ho_3: There is no significant difference in the pre-test and post-test mean scores of the students in the experimental group.

(iv) Ho_4: There is no significant difference in the mean gain scores of students in the experimental group who used manipulative and the students in the control group who were exposed to the traditional approach.

2. METHODS

This study utilized an experimental method. In the experimental method, researchers identify and define key variables, formulate a hypothesis, manipulate the variables, and collect the results. Extraneous variables are carefully controlled to minimize a potential

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impact on the experiment's outcome. The researchers conducted a pre-test to test the student's prior knowledge of fractions and a post-test to identify the effect of Using Manipulatives in Learning Fraction in Grade I in Peñaplata Central Elementary School. The result of the pre-test and post-test served as the main instrument in gathering and collecting the needed data for the study.

This study was conducted at Peñaplata Central Elementary School, Island Garden City of Samal. This study considered two sections, the experimental and controlled groups. The experimental group consists of 30 students (11 male, 19 female), while the controlled group consists of 30 students (13 male, 17 female), a total of 60 respondents.

The instrument that the researchers used in the data gathering processes in the study were a validated questionnaire to identify the Effect of Using Manipulatives in Learning Fraction of Grade I. The first instrument used in this study is a questionnaire for the pre-test that consists of 30 items. The same questionnaire was given to the respondents for the post-test to identify their overall knowledge further. Data were analyzed using Average Weighted Mean and t-test. Shown in **Table 1** below is the descriptive interpretation of the score interval.

Table 1. Descriptive Interpretation of the Score Interval.

Range of Test Scores	Descriptive Equivalent	Interpretation
16.80-20.00	Outstanding	The respondents display extremely high performance in the learning process in manipulative.
15.20-16.79	Very Satisfactory	The respondents display high performance in the learning process in manipulative.
13.60-15.19	Satisfactory	The respondents display satisfactory performance learning procedural process on manipulative.
12.00-13.59	Fairly Satisfactory	The respondents display unsatisfactory performance in learning procedural processes on manipulative.
0.00-11.59	Did Not Meet Expectations	The respondents display a need for improvement in their performance in learning procedural processes on manipulative.

3. RESULTS AND DISCUSSION

3.1. The pre-test means scores of the experimental and control group

Table 2 displays the pretest mean score of the Experimental and Control groups in the teaching fraction. Thirty-one (30) respondents in the experimental group, the pretest mean score is 6.97 and has a descriptive equivalence of did not meet the expectation. This shows that the respondents display a need for improvement in the performance in the learning procedural process on manipulative and the pre-test mean score of the controlled group had gained 4.65 which also has a descriptive equivalence of did not meet the expectation during the test. The pretest mean scores of the experimental and control group signify their level of knowledge about fractions. The result shows that the students do not have any prior knowledge about fractions.

Table 2. Pre-test mean scores of the experimental and control groups.

Groups	N	Mean	Descriptive Equivalent
Experimental	31	6.97	Did Not Meet Expectations
Control	31	4.65	Did Not Meet Expectations

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3.2. The post-test mean scores of the experimental and control groups

Table 3 shows the post-test mean score of the experimental and controlled group in the fraction test after having delivered the instruction and actual discussion. The post-test mean score of the experimental group is 15.19. It has a descriptive equivalent of satisfactory, which means that respondents display satisfactory performance learning procedural processes on manipulatives. The post-test mean score of the control group is 8.42 and has a descriptive equivalent of did not meet expectation, which explains why the control group needs an improvement in learning fractions.

Table 3. Post-test mean scores of the experimental and control groups.

Groups	N	Mean	Descriptive Equivalent
Experimental	31	15.19	Satisfactory
Control	31	8.42	Did Not Meet Expectations

3.3. Significant difference in the pre-test mean scores of the experimental and control groups

Table 4 below shows the significance of the difference between the pretest mean scores of the experimental and control groups that gain the mean difference. The experimental group had a pretest mean of 6.97, while the control group obtained 4.65. The computed t-value of both groups is 3.30. This shows that the null hypothesis was rejected since the p-value was less than the α = 0.05 level. It means that there is a significant difference between the pretest of experimental and control groups.

Table 4. Significance of the difference in the pretest mean scores of the experimental and the control groups.

Pretest Mean Scores		Mean Difference	t-value	p-value	Remark
Experimental	Control				
6.97	4.65	2.32	3.30	0.002	Significant

3.4 Significant difference in the pretest and the post-test mean scores of the control group

Table 5 shows the significance of the difference in the control group's pretest and posttest mean scores. The control group gained a mean score of 4.65 on the pretest, and the posttest was 8.42. The mean difference of the control group is 3.77 and the p-value is .000. This shows that the hypothesis is rejected and implies a significant difference in the pretest and posttest of the control groups.

Table 5. Significance of the difference in the pre-test and the post-test mean scores of the control group.

Mean Scores of Control Group		Mean Difference	t-value	p-value	Remark
Pretest	Posttest				
4.65	8.42	3.77	5.35	0.000	Significant

3.5. Significant difference in the pre-test and the post-test mean scores of the experimental group

Table 6 below shows the significance of the difference in the pretest and the posttest in the experimental group. The experimental group gained a mean score of 6.97 in the pretest, and the posttest was 15.19. The experiment gained a mean difference of 8.22, and a p-value

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of 0.000. This implies that the hypothesis is rejected. It shows that there was a significant increase in scores after using manipulatives in the class.

Table 6. Significance of the difference in the pretest and the posttest mean scores of the experimental group.

Mean Scores of Experimental Group		Mean Difference	t-value	p-value	Remark
Pre-test	Post-test				
6.97	15.19	8.22	11.26	0.000	Significant

3.6. Significant difference between the mean gain scores of the experimental and the control groups

Table 7 below shows the significance of the difference between the mean gain scores of the experimental and control groups. The mean gain score of the experimental is 8.62 and the control group is 1.00 with a mean difference of 7.62 with a p-value of .000. Therefore, the null hypothesis was rejected, and there was a significant difference in the mean scores of the experimental and control groups. This result shows that using manipulatives can increase and improve students' achievement in learning fractions.

Table 7. Significance of the difference between the mean gain scores of the experimental and the control groups.

Mean Gain Scores		Mean Difference	t-value	p-value	Remark
Experimental	*Control*				
8.23	4.00	4.92	9.86	0.000	Significant

This study aimed to determine the effect of using manipulatives in learning fraction to Grade-1 students in Peñaplata Central Elementary School, District II IGACOS. Based on the results, it was found that the pretest means scores of the control and experimental groups have a descriptive equivalent of did not meet expectations, respectively. More specifically, it is at the primary level. Many of these learners lacked experience and background knowledge, which led to misconceptions about understanding the concepts of fractions. Moreover, Rittle stated that learning basic fractions is not easy; it has many methods and operations to be used and followed. Fractions for young learners also are challenging to understand, which can cause low esteem and fall their minds to confusion.

In addition, the post-test means scores of the control group have a descriptive equivalent of did not meet expectations while the experimental group has a descriptive equivalence of satisfactory. As shown by Stein and Bovalino, (2001), manipulatives can be important tools in helping students to think and reason in more meaningful ways. By giving students concrete ways to compare and operate on quantities, such manipulatives as pattern blocks, tiles, and cubes can contribute to the development of well-grounded, interconnected understandings of mathematical ideas. Suh and Moyer-Packenham (2007) stated that using manipulative skills can develop primary spatial skills. The study through block building activities can improve the learners' mental performance compared to special skills like visualization. Golafshani (2013) mentioned in their research that using tools or handed materials can be symbols through the concrete object that comes from the learning using these manipulatives; it serves as motivation and a guiding practice all over learning opportunities.

Further, there is a significant difference between the pretest of experimental and control groups. Individual differences in students are personal differences specific to each student. Individual differences include variables such as physical characteristics (height, weight),

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intelligence, interest, perception, gender, ability, learning styles, and personality traits. Moreover, there is also a significant difference in the pre-test and post-test of the control groups. End observation, sufficient pacing, and classroom management just as clearness of introduction, all-around organized exercises, and educational and empowering criticism had been found in direct guidance with traditional encouraging techniques have appeared to positively affect students' accomplishment. Similarly, there is a significant difference between the pre-test and the post-test in the experimental group. Shin and Bryant (2015) cited that manipulatives are materials that serve as a guide and specific example. Therefore manipulation is a useful motivational tool to strengthen their prior knowledge. Initially, concrete materials are also an easy way to acquire knowledge, and it helps them build a strong foundation of ideas. Besides, this kind of learning method can make your entire class lively, and learners are having fun while manipulating things.

Lastly, it was found that there is a significant difference between the mean gain scores of the experimental and control groups. As stated by Jimenez and Stanger (2017), using concrete manipulatives in teaching mathematics, fractions especially can make the lessons more understandable and reduce the dissatisfaction of teachers and students' understanding. This kind of method in teaching is active; learners can manipulate things/objects to discover new ideas and give them fun while manipulating things.

4. CONCLUSION

The purpose of this study was to determine the impact of using manipulatives when teaching fractions. The test showed how those manipulatives affected students' learning of fractions. The information was acquired using a total of 62 respondents, including 31 students from the experimental group and 31 students from the control group, under the direction of a test questionnaire that had been approved and validated. The Average Weighted Mean and T-test statistical techniques were used to analyze and translate data. To evaluate the effectiveness of using manipulatives in the learning environment, pre- and post-tests were used. Data showed that there was a substantial difference in how first-year primary kids used manipulatives to learn fractions. This research also gave some recommendations.

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6. AUTHORS' NOTE

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