Revisiting The Four Fundamental Operations to Bridge Mathemathicalarning Gaps of The Grade 6 Pupils of San Isidro Elementary School

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Abstract — As teachers usher a new generation of problem solvers, a challenge to overcome today relates to current math proficiency levels. When the Department of Education (DepEd) reopen in-person limited face-to-face classes, the researchers are alarm of the growing number of learners in San Isidro Elementary School who are behind in their math skills specifically in four fundamental operations. With that thought, the researchers decided to conduct a pre-test consisting of 40-item multiple choice test to assess the learning percentage of the learners. But due to time constraints, the researchers opted to use only the enrolled 17 Grade VI learners of the School Year 2021-2022 as respondents of this study in order to attain the research objectives within the allotted time. The intervention started on April 8, 2021 and ended on June 16, 2021. The same instrument was given the next day for post-testing to assess the learning percentage of the learners after the implementation of the intervention. The scores from 0 - 11 has the highest frequency of 8 or 47.06% of the respondents belong to the beginning level while the scores from 36 – 40 has the lowest frequency of 0 or none of the respondents belong to the advance level. The scores from 28-35 has the highest frequency of 6 or 35.29% of the respondents reached proficient stage after the implementation of the intervention while the scores from 36 – 40 and 0 - 11 has the lowest frequency of 2 or 11.76%. It reveals that two pupils already reached advanced level and only two remain at the beginning level compared to eight after the pre-test. The p-value obtained is less than the level of significance, 0.05 indicating that there is a significant difference before and after the implementation of the intervention hence, the decision is to reject the null hypothesis. Thus, this depict that the revisiting of four fundamental operations significantly bridge mathematical learning gaps of the Grade 6 Pupils of San Isidro Elementary School. The intervention turned out effective and can be implemented continuously.

Keywords — Four Fundamental Operations: Learning Gaps: Significant

I. Introduction

Mathematics is one subject that pervades life at any age and in any circumstance. Thus, its value goes beyond the classroom and the school. Mathematics as a school subject, therefore, must be learned comprehensively and with much depth. The twin goals of mathematics in the basic education levels, K-10, are Critical Thinking and Problem Solving (*K -12 Curriculum Guide in Mathematics).* Critical thinking, according to Scriven and Paul (1987) is the intellectually disciplined process of actively and skilfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection,

reasoning, or communication, as a guide to belief and action. On the other hand, according to Polya (1945 & 1962), mathematical problem solving is finding a way around a difficulty, around an obstacle, and finding a solution to a problem that is unknown.

In the 2018 tests, a report of the Program for International Student Assessment (PISA) of the Organization for Economic Co-operation and Development (OECD) states that the Philippines ranked second to the last (Dominican Republic) in math out of the 79 participating countries. In relation to this, DepEd issued a statement that they "recognize the urgency of addressing issues and gaps in attaining quality of basic education in the Philippines."

The aforementioned report is in consonance with the observed performance in Math of the learners of San Isidro Elementary School. When DepEd opens in-person limited face to face classes, the teachers observed that the pupils find it hard to solve even the four basic arithmetic operations. This problem already exist before but become worst when CoViD-19 pandemic hits the world.

Literature Review

In connection with the above-stated problem, the researchers feel the urgency that they need to respond to the lingering challenge they are facing in their school. This give way of implementing this action research study, revisiting the four fundamental operations to bridge the mathematical gaps of Grade 6 pupils of San Isidro Elementary School.

In order for the learners to excel in Mathematics, they must enhance their skills in four fundamental operations. According to Peter D'Alcantara Lisboa in his published book entitled "The Four Fundamental operations in the 'reasoned Arithmetica" in 1983, in his book, seek to encourage students' thinking showing an analytical method that accompanies the practical methods to perform addition, subtraction, multiplication and division with natural numbers.

Moreover, Julie Andrews told us in *The Sound of Music*, we should "start at the very beginning" because it's "a very good place to start." In math, we don't start with Do-Re-Mi, but we do build on the fundamentals known as arithmetic operations. Mastering arithmetic operations means setting a strong foundation for a lifetime of successful math learning. Arithmetic operations are the building blocks for all mathematical processes and methods. Those basics are addition, subtraction, multiplication, and division.

II. Methodology

A. Participants and/or Source of Data and Information

The participants of this research were all Grade VI pupils of San Isidro Elementary School, wherein seventeen (17) pupils were enrolled in Grade 6 class in the school year 2021-2022.

B. Research Instrument

The instrument used to gather the data in this study is the pre-test and post-test questionaires about the fundamental or basic operations in Mathematics that embodies the very foundation of learners' learning before they proceed to a more complex level of dealing numbers. The questions where taken from different references namely: 21st Century Mathematics for Grade 6, Mathematics for Everyday Life for Grade 6, Grade 6 worksheet on Four Fundamental Operations by Math-Only-Math.com and Four Operations Diagnostic Pre and Post Assessment Pack by Third Space Maths Hub.

The pre-test and post-test were consisting of forty (40) items multiple choice test. Multiple choice items can be used to test a person's ability to incorporate information, to recognize a challenging idea, and provide test takers the oppurtunity to determine the correct answer from the wrong answer. It also requires less time to answer and easily scored and evaluated (Wells, et. Al, 2013).

C. Research Procedure

The researchers asked the approval of the school head and the permission of the respondents' parents/guardians to conduct the study. They give assurance to the parent's/guardians that confidentiality will be strictly observed within the course of the research study. Before administering the research instrument to the respondents, the researchers discussed the purpose of the conducted study in front of the respondents for them to understand. After the discussion, the researchers gave the set of test questionaires. They will have to encircle the best answer that corresponds to the question given with a specified time of 50 minutes. After the conduct of the pre-test, the researchers gathered and recorded the data. Diverse interventions were thoroughly conducted thereafter. Varied teaching techniques and strategies were adopted during the conduct of the intervention. On September 2022, post-test is conducted. The same survey questioners were given to the respondents with the same time limit. After the conduct of the pre-test and post-test, the researchers checked, tallied, summarized and then tabulated the responses. Data were analyzed and interpreted, presented in a tabular form through tables and analytical discussion or textual presentation. The test scores were also used to determine the significant difference before and after the implemtation of the intervention.

D. Data Gathering Methods

In a manner of getting data and information involved along the conduct of this research, the proposal shall be presented for approval this March 30, 2022 at the District Research Forum.

Based on the given situation, the researcher aims to bridge mathematical learning gaps of the four fundamental operations of Grade 6 pupils of San Isidro Elementary School of the school year 2021-2022.

Activities	Data to be Collected	Data Analysis/Statistical Treatment
Conduct Pre-Test	Result of researcher made Pre-test to be analysed and interpreted	Percentage
Conduct Formative Mathematical Test involving four fundamental operations.	Total number of pupil's passed the formative test.	Percentage
Administer Mathematical Post-Test parallel to Pre-Test	Comparative result of Pre-test and Post-test.	Percentage

E. Data Analysis Plan

This action research is a quantitative research wherein the researchers utilized the Mean Percentage Score (MPS) during the conduct of the test of Grade 6 pupils of San Isidro Elementary School of the school year 2021-2022.

This action research also uses table for easy interpretation of result.

Table 1. Levels of Proficiency (DO 31 s. 2012)

Scores	Descriptive Rating
36 – 40	Advanced
28 – 35	Proficient
20 – 27	Approaching Proficiency
12 – 19	Developing
0 – 11	Beginning

F. Treatment of Data

Utilization of frequency distribution and percentage are important in analysing the data. Specifically, the formula are as follows:

F.1 Percentage Method used in determining the percent or part of a variable

$$P = \frac{f}{n} \times 100$$

Where: ***P*** is the percentage

f is the frequency

n is the sample size

F.2 Descriptive Statistics (Total Weighted Mean)

$$\overline{x} = \frac{\sum fx}{n}$$

Where: $\overline{\boldsymbol{x}}$ is the mean

$\boldsymbol{f}$ is the frequency of each class

$\boldsymbol{x}$ is the mid-interval value of each class

$\boldsymbol{n}$ is the total frequency

$\sum \boldsymbol{fx}$ sum of the products of mid-interval values and their corresponding frequency

For the researchers to check if the data follows normal or not normal distribution, they use **Shapiro-Wilk** for normality testing of data and it leads them to use the Paired T-test as an appropriate statistical tool to use for this action research. The formula are as follows:

F.3 Shapiro-Wilk used in determining normal or not normal distribution

$$\boldsymbol{W} = \frac{(\sum_{i=1}^{n} a_i x_{(i)})^2}{\sum_{i=1}^{n}(x_i - \overline{x})^2}$$

Where: $\boldsymbol{x_{(i)}}$ is the *i*th order statistic

$\overline{\boldsymbol{x}}$ is the mean

At 0.05 level of significance. Note: *p-value > 0.05,* data is normally distributed: use parametric test, *p-value ≤ 0.05,* data is not normally distributed: use non-parametric test.

F.4 Paired Samples t-test used to test the significant difference before and after the implementation of the intervention

$$\boldsymbol{t} = \frac{\sum d}{\sqrt{\frac{n\left(\sum d^2\right) - (\sum d)^2}{n-1}}}$$

Where: $\boldsymbol{d}$ is the difference per paired value

$\boldsymbol{n}$ is the number of samples

At 0.05 level of significance. Note: *p-value > 0.05*, accept null hypothesis Ho, reject alternative hypothesis Ha, *p-value < 0.05*, reject null hypothesis, accept alternative hypothesis.

III. Results and Discussion

The following data answers the specific questions of the study.

1. What is the mathematical learning percentage of the Grade VI pupils of San Isidro Elementary School before the implementation of the intervention?

Table 2. Mathematical learning percentage of the Grade VI pupils of San Isidro Elementary School before the implementation of the intervention

Scores	Frequency	Percentage	Descriptive Rating
36 - 40	0	0.00	Advanced
28 - 35	3	17.65	Proficient
20 – 27	2	11.76	Approaching Proficiency
12 – 19	4	23.53	Developing
0 - 11	8	47.06	Beginning
Mean		13.8	Developing

Table 2 indicates the frequency and percentage distribution of the pupils' academic performance before the implementation of the intervention. Findings show that the scores from 0-11 has the highest frequency of 8. This implies that 47.06% of the respondents belong to the beginning level while the scores from 36 – 40 has the lowest frequency of 0 or none of the respondents belong to the advance level. With a mean of 13.8, it is interpreted that the level of proficiency of Grade VI learners in solving the four fundamental operations during the pre-test falls on **Developing Stage**.

2. What is the mathematical learning percentage of the Grade VI pupils of San Isidro Elementary School after the implementation of the intervention?

Table 3. Mathematical learning percentage of the Grade VI pupils of San Isidro Elementary School after the implementation of the intervention

Scores	Frequency	Percentage	Descriptive Rating
36 - 40	2	11.76	Advanced
28 - 35	6	35.29	Proficient
20 – 27	4	23.53	Approaching Proficiency
12 – 19	3	17.65	Developing
0 - 11	2	11.76	Beginning
Mean		24.9	Approaching Proficiency

Table 2 depicts the frequency and percentage distribution of the pupils academic performance after the implementation of the intervention. Finding reveals that the scores from 28-35 has the highest frequency of 6 or 35.29% of the respondents reached proficient stage after the implementation of the intervention while the scores from 0 – 11 and 36 – 40 has the lowest frequency of 2 or 11.76%. It also reveals that two pupils already reached advanced level after the intervention. This shows that after the implementation of the intervention only 11.76% remains at the beginning level and 11.76% has reached the advanced level. With a mean of 24.9, it is interpreted that the level of proficiency of Grade VI learners in solving the four fundamental operations after the post-test falls on **Approaching Proficiency Stage**. Study shows that the academic performance of the respondents in four fundamental operations was improved after the implementation of the intervention.

3. Is there a significant difference before and after the implementation of the intervention?

Table 4. Test of Normality Using Shapiro-Wilk

Variable	N	Mean	Median	SD	Minimum	Maximum	Skewness	Kurtosis	W	P
Pre-test	17	13.8	12	9.95	1	31	0.565	-1.04	0.91	0.1
Post-test	17	24.9	26	9.09	8	40	-0.271	-0.648	0.974	0.879

Since the p-value of the pre-test (0.1) and post-test (0.879) in the Shapiro-Wilk test of normality is > 0.05, thus we use the parametric test specifically **paired sample t-test**. Two sets of data of the same subject are compared to know if there is a significant difference before and after the implementation of the intervention.

Table 5. Paired Samples T-Test: Paired Sample t-Test: Comparison between the Pre – Test and Post test Result of the Respondents

Test	N	Mean	SD	MD	t	p	Decision	Analysis
Pre-test	17	13.8	9.95	-11.1	-10.6	< .001	Reject Ho	Significant
Post-test	17	24.9	9.09					

Note: If p value is less than the level of significance which is 0.05 reject the null hypothesis otherwise accept.

Table 5 reveals the comparison between the pre-test and post-test result of the respondents using paired sample t-test at 0.05 level of significance. The p-value obtained is less than the level of significance, 0.05 indicating that there is a significant difference before and after the implementation of the intervention hence the decision is to reject the null hypothesis. Results shows that the Grade VI learners performed better in the post-test compared to their pre-test as evidently shown in their mean scores.

This suggests that learners exposed with the varied teaching strategies learned and performed better. The present study supports the findings of Perse (2017) who stated that traditional techniques used repetition and memorization of information to educate students, it meant that they were not developing their critical thinking, problem-solving and decision-making skills. Furthermore, modern learning encourages students to collaborate and therefore be more productive.

The performance of Grade VI learners disclosed that there was a significant difference after the application of the different teaching strategies. This implies that varied teaching strategies have significant impact of the current norms of teaching. The present study is in consonance with the findings of Wright (2017) who stated that modern teaching method is effective in today's education. New, emerging and innovative educational teaching approaches are vital in today's new era of education.

There is an increase of pupils test results through the regular conduct of the intervention. The result is conformed to the study of John Dewey, "Learning is a lifelong process. Learning is at best when you experience it." Thus, Constant Practice Makes Perfect. In this case, there must be a regular follow up and conduct of the Intervention to the pupils to help them perform better in school. A strong collaboration between parents is encouraged to work hand in hand on the remediation of the pupils to maintain their progress.

IV. Conclusion

To answer the first research question, the mean is 13.8, it is interpreted that the level of proficiency of Grade VI learners in solving the four fundamental operations during the pre-test falls on **Developing Stage**. Meanwhile, for the second research question, the mean is 24.9, it is

interpreted that the level of proficiency of Grade VI learners in solving the four fundamental operations after the post-test falls on **Approaching Proficiency Stage**. Therefore, for question number 3, it is concluded that there is a significant difference before and after the implementation of the intervention. The post-test mean is significantly higher than the pre-test mean. Thus, this action research depicts that the intervention turned out to be effective and can be implemented continuously.

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