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MATH DRILL TO IMPROVE THE COMPUTATIONAL FLUENCY OF GRADE 9 STUDENTS IN ADDITION AND SUBTRACTION OF INTEGERS NUMBERS

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ABSTRACT

The purpose of the study was to determine the impact of the Olympic Integer intervention on the computational fluency of students in adding and subtracting integers. Hence, the purpose of this study was to determine the significant difference between the pretest and post-test scores of the students. A pre-experimental research design was utilized to measure the effect of the intervention. Data were gather from 30 Grade 9 students at Doña Carmen Soriano National High School, selected through purposive sampling. Data collection was done through pretest and post-test administration. Findings revealed a substantial difference in the scores before and after the intervention. The mean pretest score was 9.90 (Moderate), while the mean post-test score was 17.70 (Very High). The paired t-test results indicated a significant improvement in students' scores from the pretest to the post-test, with t (29) = -15.144, p < .001. This substantial difference suggests a strong effect of the intervention on students' ability to add and subtract integers, indicating a highly significant and positive impact on their computational fluency.

KEYWORDS: *Intervention, Computational Fluency, Olympic Integers, Pre-experimental Design, Integer Operation, Philippines*

INTRODUCTION

Computational fluency denotes the proficiency in employing strategies to rapidly and effectively deduce mathematical facts. A student endowed with computational fluency possesses the capacity to adeptly integrate strategies with existing factual knowledge to solve more intricate mathematical problems. Computational fluency is a vital skill for mathematical success. It involves the ability to quickly and accurately perform basic arithmetic operations, such as addition, subtraction,

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multiplication, and division. Integers constitute one of the basic math topics in secondary education. Understanding integers is important for laying the foundation of various other topics to be covered in the future like algebra. However, basic concepts and operations involving integers are among the math concepts that are most difficult to understand in secondary education. Although integers are a math topic, they are frequently used to represent many real-world situations, such as temperature, profits and losses of money and location.

In Recep Tayyip Erdoğan University, in Rize Turkey students do not understand addition and subtraction at a conceptual level especially due to the intensive use of operational approaches. One of the reasons for having difficulty is that students proceed to addition and subtraction operations without learning integers and their characteristics at the conceptual levels. Strong computational fluency in integers tallows students to solve problems more efficiently, develop a deeper understanding of mathematical concepts, and prepare for more advanced mathematical skills (Ipek, 2020).

In Philippines, specifically in Manila, students often have difficulty with the concept of integers which makes them struggle when they algebraic solve equations. Performing operations on integers involves signs of the numbers and the signs of required operation. This makes students get confused and struggle when asked to perform operations on integers. Mathematics teachers have identified that the students' low mastery level in mathematics is not solely attributable to a deficit in skill acquisition but is also influenced by the students' sluggish pace in solving mathematical problems. Many standardized tests and entrance exams for higher education institutions place a significant emphasis on computational skills, making it essential for students to develop the speed and accuracy necessary to excel in these assessments. Their lack of speed and accuracy in performing calculations can hinder their overall performance and prevent them from demonstrating higher levels of proficiency (Rubin, 2019).

In the Division of Davao del Norte, particularly in Doña Carmen Soriano National High School it was reported by Maria Laica Lumbay, a teacher of the said school states that there are number of students struggle with the computation of addition and subtraction of integers numbers. This deficiency hinders their ability to solve mathematical problems efficiently and accurately, ultimately affecting their overall mathematical proficiency. While students may possess a basic understanding of these concepts, their lack of computational fluency prevents them from applying their knowledge effectively.

Our inquest on this study arose since this dilemma is existing. As a student teacher it is very important to improve student's computational fluency in addition and subtraction of integers numbers. Computational fluency is a cornerstone of mathematical proficiency, enabling students to solve problems efficiently and accurately. Without strong computational skills, students struggle to grasp higher-level mathematical concepts and face significant challenges in problem-solving, ultimately hindering their overall academic achievement.

Research Objectives/Questions

In this study, it was emphasized what would happen to the pretest and post-test of the study. The following were the set of objectives:

1. To determine the level of computational fluency among students during the pre-test.
2. To determine the level of computational fluency among students during the post-test.
3. To determine if there was a significant relationship between the pre-test and post-test score of the students.

Methodology

This study presents the methodology that will be employed in this study. This includes the research design, research participants, and data gathering. The research design chosen for this study is Quasi-Experimental, providing a structured and systematic approach to investigating the two groups, the control group and the experimental group.

RESULTS

This chapter presents the findings and results of Integer Olympic as a strategy for enhancing the computational fluency among Grade 9 student of Doña Carmen Soriano National High School. Analyses and interpretations of data were done parallel to the research objectives.

Presented in Table 1 are the results of the pretest, showing the performance levels of 30 students in the experimental group in computing addition and subtraction of integers. The overall mean score was 9.90, indicating moderate performance by the students in the pretest. The highest score achieved was 13, while the lowest score was 3. The most frequent score was 10, obtained by 7 students.

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Table 1 Pretest Result

PRETEST SCORES	FREQUENCY	PERCENTAGE
3	1	3.33%
5	1	3.33%
6	1	3.33%
7	1	3.33%
8	2	6.67%
9	5	16.67%
10	7	23.33%
11	4	13.33%
12	3	10.00%
13	5	16.67%
TOTAL	30	100.00%
MEAN PERCENTAGE SCORE		9.90
DESCRIPTION		MODERATE

Presented in Table 2 are the results of the post-test, showing the performance levels of 30 students in the experimental group in computing addition and subtraction of integers. The overall mean score was 17.70, indicating very high performance by the students in the post-test. The highest score achieved was 20, while the lowest score was 14. The scores 18 and 19 were both obtained by 8 students each, making them the most frequent scores.

Table 2 Post-test Result

POST-TEST SCORES	FREQUENCY	PERCENTAGE
14	1	3.33%
15	4	13.33%
16	1	3.33%
17	5	16.67%
18	8	26.67%
19	8	26.67%
20	3	10.00%
TOTAL	65	100.00%
MEAN PERCENTAGE SCORE		17.70
DESCRIPTION		VERY HIGH

Presented in Table 4 are the results of the significant difference between the pretest and post-test scores, indicating the performance levels of 30 students in the experimental group computing addition and subtraction of integers, $t(29) = -15.144$, $p < .001$. Since the probability value ($p < .001$) is less than the level of significance ($\alpha = 0.05$), the null hypothesis is rejected. This means that there is a significant difference between the pretest and post-test scores.

In terms of the mean scores, the pretest showed a mean of 9.90, with a standard deviation (SD) of 2.44, while the post-test showed a mean of 17.70, with a standard deviation of 1.64. This indicates a notable increase in performance from the pretest to the post-test among the experimental group

Type of Test	N	df	Mean	SD	t-value	P-value	Decision $\alpha = 0.05$
Pre-Test	30	29	9.90	2.44	-15.144	< .001	Significant
Post-Test	30		17.70	1.64			

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CONCLUSION

The study revealed a significant improvement in students' computational fluency in addition and subtraction of integers numbers, demonstrated by the marked difference between pretest and post-test scores. This improvement highlights the effectiveness of the INTEGER OLYMPIC intervention. Initially, students' computational fluency was moderate, but after the intervention, their performance was rated as very high.

The INTEGER OLYMPIC proved to be a valuable tool in mathematics education, specifically for teaching integers. The drill helped students enhance their skills in adding and subtracting integers. Over a one-month period, students showed significant progress in adding and subtracting integers with different sign.

The findings align with previous research, such as the study by Rau et al., (2019), which supports the idea that effective instructional strategies for cultivating computational fluency positively influences the students learning in mathematics. The importance of Integer Olympic on computational strategies and procedures, coupled with opportunities for practice and feedback. The use of adaptive, personalized practice activities that adjust to individual student needs and progress. Similarly, Hemmati (2018), found the potential of computational tools to visualize mathematical concepts. These tools can create interactive representations of mathematical ideas, making them more engaging and easier to grasp for students. This increased engagement can lead to a deeper understanding of mathematical concepts and a more positive attitude towards math learning.

Moreover, educational drill like INTEGER OLYMPIC not only make learning enjoyable but also foster critical thinking and analytical skills. By integrating academic content into an interactive format, these drills enhance students' cognitive abilities and creativity.

Furthermore, the INTEGER OLYMPIC drill is an effective educational tool that significantly improves students' computational fluency. It provides a practical, engaging, and enjoyable method for students to enhance their mathematical skills, resulting in improved academic performance and a deeper grasp of complex mathematical concepts.

RECOMMENDATION

Based on the findings of this study, several recommendations can be made to further to enhance the learning experience and effectiveness of teaching addition and subtraction of integers. It is highly recommended that teachers incorporate the Integer Olympics into their mathematics classes. This approach has proven to significantly improve students' abilities in solving addition and subtraction of integers, making the learning process both engaging and effective.

Additionally, conducting further action research to evaluate the effectiveness of Integer Olympics in other mathematical topics, such as trigonometry, statistics, and calculus, is essential. This research can determine whether the positive outcomes observed in solving addition and subtraction of integers can be replicated across different areas of mathematics. Furthermore, exploring the potential of this game-based intervention in other subjects beyond mathematics could provide insights into its broader educational benefits and versatility.

Moreover, educational institutions should consider providing professional development for teachers on how to effectively implement learning strategies like Integer Olympics. This training can equip the teachers with the necessary skills and knowledge to utilize these innovative methods to enhance student learning outcomes. Additionally, further studies should be encouraged to explore and document the long-term impacts of such interventions on student performance and engagement in mathematics and other subjects.

Furthermore, fostering a collaborative learning environment where students can engage in peer-to-peer learning while using Integer Olympics can also be beneficial. This approach can promote individuality and teamwork, communication, and collaborative problem-solving skills, which are valuable beyond the classroom.

Lastly, given the successful implementation of the Integer Olympics in teaching adding and subtracting integers, it suggests its potential as a valuable educational tool. Expanding its use and conducting further research can contribute to a more effective and enjoyable learning experience for students across various subjects and educational levels.

The recommendations based on this study emphasize the importance of integrating innovative game-based learning approaches into mathematics education, conducting rigorous research across different mathematical topics, providing adequate professional development for teachers, and fostering collaborative learning environments. These efforts aim to enhance student engagement, improve learning outcomes, and explore the broader educational benefits of such interventions.

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