IGC: A Play-based Approach to Improve Concept and Operations on Integers

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Abstract *– This study aimed to determine the impact of Integer Game Card in increasing the performance of Grade 7 students in operations of integers. The research used the One Group Pretest-Posttest design. There were five Grade 7 sections with a total of 196 respondents (89 male and 107 female) who participated in the study. The data obtained were processed through Strata using the following statistical techniques: mean, weighted mean and dependent t-test. Results revealed that the students increased their performance in operations on integers through the use of game card called Integer Game Card Battle. It also implies that the game card has a significant impact in the performance of students in operations on integers. The study recommends that the Integer Game Card Battle should be implemented in Grade 7 students regularly until they master operations on integers especially how to determine the appropriate sign of the integers. Encourage Elementary Grade 6 Math Teacher to use Integer Game Card Battle in developing the skills of their pupils in the four fundamental operations on integers.*

Keywords – *Concepts, Integer, Integer Game Card, Operations and Performance*

INTRODUCTION

Mathematics is always required to be taken up in basic education and even in Higher Education. Many students would wish that Mathematics subject is an optional subject to be taken up or totally eliminated the subject in the Curriculum. This subject serves as hindrance in many students in completing their academic requirements and to graduate on time.

The subject of integers plays a vital part of the middle school mathematics curriculum as it symbolizes a move from concrete to abstract thinking (Lamb and Thanheiser, 2006). There are several methods or models invented to help assist students in learning and understanding the ideas or concept behind calculations involving integers. To name a few, money, number line, balloons and weights, and two-colour tiles (Cemen, 1993).

Many of the published studies, literature and experiences inside the classroom agree that many students have difficulty and struggle in the concept and principle of integers. Our country today is facing the low achievement or performance in the field of Mathematics. Lapid (2007) stated that the high school ability to manipulate and solve verbal problems is weak. One of the factors is low retention of the students in the past lessons particularly in integers. Integers serve as the pre-requisite to learn other concepts in Mathematics.

According to Cruz (2008) cited the report on Science, Mathematics, and Educational Panel on Congressional Commission on Science, Mathematics and Engineering (COMSTE) showed that the level of competitiveness of Filipino High School students in Mathematics was trimmed down from 47 in 2001 to 77 in 2007 out of 112 participating countries. The result served as an eye opener for every educator that Philippines is one of the countries having a poor performance in Mathematics.

The result of the performance showed low performance of students in Mathematics. Furthermore, the result of National Achievement Test (NAT) is also lower compared to the expected result. The Researcher observed how the students can solve complicated problem in Algebra, Trigonometry, Geometry and even in Calculus if the students are still struggling in the field of integers.

According to Novak and Gowin (2014), all classroom activities should be organized and implemented in such a way to guide students toward individual inventive learning, instead of rote learning. Therefore, it is important to use educational strategies that will enable the correct structuring of concepts so that meaningful learning can take place. The use of different approaches and teaching methods both broadens the contents of courses and enables students to overcome their prejudices thereby motivating them toward perceived difficult courses.

OBJECTIVES OF THE STUDY

This study determines the impact of Integer Game Card (IGC) to the performance of grade 7 in Mathematics performance on integers.

Specifically, it attempts to answer the following questions:

1. How may the academic performance in integers of the respondents be described?
2. Is there any significant effect the integer game card battles to the Mathematics performance on integers of the respondents?

MATERIALS AND METHODS

Methods

The study aims to find out the effectiveness of IGC as an instructional game material to improve the performance of Grade 7 students on operations in integers of Marciano Del Rosario National High School.

The experimental method and descriptive method of research is used. The result in window cards is the main tool in gathering data.

Experimental method is used to assign participants to an experimental treatment group and a control or comparison group (www.serve.org,20080).

Descriptive Research is the purposive process of gathering, classifying, analyzing and tabulating data about prevailing conditions, practices and cause and effect relationship and then making accurate interpretation about such data with the aid of statistical method. (J.F. Calderon 1993)

In addition, Jelineck (2007) defines descriptive method to describe a certain phenomenon. It is directed towards ascertaining the prevailing conditions and seeks to answer real facts with regards to the existence of a

phenomenon or condition. While experimental research, Joseph Luzzi, Ph.D. (2003) the investigator manipulates conditions for the purpose of determining their effect on behavior. Subjects should be unaware of their membership in an experimental group so that don't act differently (Hawthorne Effect). In the simplest experimental design, investigators administer a placebo to control group and a treatment to the experimental group. Experimental design vary in terms of subjects' assignments to different groups, whether subjects were pre-tested, whether different treatments were administered to different groups, and the number of variables being investigated.

The study utilized a total of 50% of the total population of Grade 7 students or 5 out of 10 sections from Marciano Del Rosario National High School in Cabanatuan City, during the second grading period, school year 2016-2017. Fifty (50) percent from the curriculum level are drawn by systematic random sampling where five even number sections from the list of sections is the respondent.

Materials

In gathering the data for this study, the researcher employs the I-Card as a tool to determine the improvement of the students from Pre-test to Post-test and the test is answered properly and honestly by the respondents.

A letter of request to conduct the study was sent to the Office of the School Division Superintendent of the Division of Cabanatuan City, Department of Education through the Principal of Marciano del Rosario Memorial National High School.

The researchers personally explained and discussed how to administer I-Card test and procedure of IGC. The researchers also implemented game card one week to the identified respondents. The said intervention was done once a week for one month. When the result of I-Card in Pre-test and Post-test were collected, the researchers tallied and analyzed.

The data of the study used descriptive analysis and statistical tools like mean/average, weighted means, percentages, and frequencies to describe the performance of Grade 7 students in integers.

T-test is used to test for the significant impact of Integer Game Card (IGC) to the performance in operation on integers.

$$t = \frac{(\overline{X}_1 - \overline{X}_2)}{\sqrt{\sigma_p^2\left[\frac{1}{N_1} + \frac{1}{N_2}\right]}}$$

Analysis was conducted using Statistical Package for Social Sciences (SPSS). The level of significance was set at 0.05 of significance.

RESULTS AND DISCUSSION

Ayinde (2014), assessed the impact of Instructional Object Based Game (IOBG) on the mathematics performance of the students. The study revealed that the use of IOBG had significant effect in the performance of the students. His finding supported Balbuena et.al; finding (2014) they found out that using gameplay such as card game in teaching instructional method had a significant effect in facilitating students learning of grade 7.

Similarly, Rubin et.al (2014), found that the activity-based teaching such as target integer, integer chips, Damath and online gaming had a significant effect on student performance in integers. In additon, Malvecino and Ventayen (2020), stated that some of the Mathematics teachers were utilized game apps in the teaching process of the subject. The most highly used are the Sudoku and Math riddles and puzzles.

However, Ferguso (2014), revealed that the Digital Game-Based Learning (DGBL) had no significant impact in the academic achieve in mathematics. Bragg (2012), supported the study of Ferguso. His study showed that games and activities did not help student to understand the concept in mathematics. He explained that the game and activity should be appropriate to mathematical concept before employing the games.

Researches revealed that online gaming had a positive impact in the academic performance in mathematics. Mavrotheris (2012), found that the online gaming had a significant effect as an instructional tool to teach mathematics concept.

Similarly, Kebritch (2008), examined the effect of computer games on mathematics achievement and student motivation and found out that computer games had a significant effect on mathematics achievement of the students.

Level of Performance of Control and Experimental Group Before the Use of Integer Game Card (IGC)

The table shows the mean score of each section, control and experimental group, before the use of integer game card. It also shows the weighted mean of 48.29 for control group and 49.13 for experimental group, it was revealed that the average score of the respondents are lower than the half of the 100-item test.

Table 1. Description on the Level of Performance of Control and Experimental Group before the use of IGC

Level of Performance of Control and Experimental Group After the Use of Integer Game Card (IGC)

The table shows the mean score of each section, control group and experimental group, after the used of integer game card. It also shows the weighted mean of 50.88 for control group and 60.12 for experimental group, it revealed that the average score of the student respondents are now greater than the half of the 100-item test.

Table 2. Description on the Level of Performance of Control and Experimental Group after the use of IGC

	Control	**Experimental**
SECTION	**MEAN**	**MEAN**
7-Maayos	44.32	47.78
7-Matatag	45.03	52.85
7-Mabait	46.06	58.75
7-STE	73.12	82.53
7-Matulungin	45.87	58.70
Weighted Mean	**50.88**	**60.12**

Comparison on the Level of Performance of Control and Experimental Group Before and After the Use of Integer Game Card (IGC)

The table 3 and table 4 show that the mean during pretest for control and experimental group has no significant difference since the probability (0.300) is greater than 0.05. It also shows that the mean during the posttest for control and experimental group has a significant difference since the probability (0.006) is less than 0.05. The study revealed that the t-value (5.33) in posttest is higher than the critical value of 2.13 with the probability of 0.006.

Table 3. Comparison of the mean value on the Level of Performance of Control and Experimental Group before and after the use of IGC

	Control	**Experimental**
SECTION	**MEAN**	**MEAN**
7-Maayos	40.12	38.95
7-Matatag	40.34	42.48
7-Mabait	47.12	49.50
7-STE	69.12	68.69
7-Matulungin	44.76	46.02
Weighted Mean	**48.29**	**49.13**

	MEAN	
	Control	**Experimental**
Pretest	48.29	49.13
Posttest	50.88	60.12

Table 4. Comparison of the t-value on the Level of Performance of Control and Experimental Group before and after the use of IGC

	t-value	**Probability**	**Decision**
Pretest	1.19	0.300	Accept
Posttest	5.33	0.006	Reject

The null hypothesis “Game card has no significant impact in the Mathematics performance in integers of Grade 7 student respondents” was rejected. It also implies that the game card is effective to improve the performance of the students in operations on integers.

The result was supported by the study of Rubin RJ. Et al (2014), they found out that the activity base teaching like games such as target integer, chips Damath and online game number cruncher had a significant effect in the performance of the students in operations on integers.

CONCLUSIONS AND RECOMMENDATIONS

Based on the result of the study, the following conclusions were drawn:

4. Majority of the student respondents increase their performance on operation in Mathematics. The mean score of the experimental respondents 49.13 before implementing the IGC was increased to 60.12 after implementing the IGC;
5. The study revealed that the integer game card had a significant impact in the performance of grade 7 students in operations on integers.;

Based on these conclusions, the following recommendations are provided in this study:

11. Teachers, administrators and parents should find ways in improving the performance of students in operations of integer. Several studies revealed the influence of factors such as low family income, study habits, etc. to the performance of students in school. Furthermore, patience and new techniques in teaching can help them to appreciate the beauty of mathematics and learn efficiently and effectively.
12. Similar studies are recommended using other subject areas and add more respondents from the different schools in Cabanatuan City to determine how effectives the tools in improving the academic performance of the students.

REFERENCES

[1] Balbuena S.E. et al (2014) *Mnemonics and Gaming*: Scaffolding Learning of Integers. Retrieved from www.apjeas.apjmr.com

[2] Vygotsky L. (1962) Social Learning Theories. Retrieved from Theorisehttps://jan.vcc.nac.udu//sh/educator/Learningtheorieswebsite/vgotsky. Html

[3] Rubin R.J. et al (2014) *Effects of Game-Based Learning on Students' Mathematics Achievement: A Meta-Analysis* http://education.fsu.edu/wp-content/uploads/2015/06/Umit-Tokac.pdf

[4] Ferguson TLK. (2014) *Mathematics Achievement with Digital Game-Based Learning in High School Algebra 1 Classes* http://digitalcommons.liberty.edu/cgi/viewcontent.cgi?article=1839&context=doctoral

[5] Kebritchi M. (2008) Effects Of A Computer Game On Mathematics Achievement And Class Motivation: An Experimental Study http://etd.fcla.edu/CF/CFE0002066/Kebritchi_Mansureh_200805_PhD.pdf

[6] Ayinde, O.M.(2014) *Impact of Instructional Object Based Card Game on Learning Mathematics: Instructional Design Nettle* http://www.majersite.org/issue8/1_olatoye.pdf

[7] Malvecino, L. C., & Ventayen, R. J. M. (2020). Utilization of Multi-Media Games as a Pedagogical Approach. *ASEAN Multidisciplinary Research Journal*, *4*(1), 57-67. Retrieved from https://paressu.org/online/index.php/aseanmrj/article/view/213