WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Learning Operation of Integers Using Strategic Intervention Material: Mathematics League of Integers

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A B S T R A C T

Students often have difficulty with the concept of integers which make them struggle when they solve algebraic equations. The purpose of this action research was to test the effect of Strategic Intervention Material in the students' performance in learning operation of Integers. It also aims to know if there is significant difference between using Strategic Intervention Material and Traditional Method of teaching in developing and improving their Mathematical skills. The experimental research design was used to investigate the effect of using Strategic Intervention Material in teaching the operation of Integers to grade 7 students of Sulivan National High School. There are 65 respondents used in this study. The instrument used in the study is standardized tests were the students answered the 40 items of same questions as their pre-test and post-test. A pre-test was given to both groups. The control group exposed the treatment of traditional method of teaching instruction, while the experimental group exposed the treatment of Strategic Intervention Material. Pre-test and post-test scores were used to compare gains in knowledge between the groups. The results assessed students' conceptual understanding, procedural skills and perception. It was found out that there is a significant difference between the two, and it proves that using the Strategic Intervention Material, the students get a higher score and a better result compare to the Traditional Method. The students become more interested in the discussion, it also found out that it is more effective than the old one, and the intervention is very useful.

Keywords: *Strategic Intervention Material, Traditional Method, Standardized test*

INTRODUCTION

Mathematics may be defined as the subject in which are never know what we are talking about, nor whether what we are saying is true. Even though everyone learns Mathematics at school, it is difficult to define what Mathematics is clearly numbers, shapes and equations formpart of it, but only a small part compared to the vast space of Mathematical concepts and ideas. One idea that appears everywhere in Mathematics is an abstraction. Instead of thinking about particular members, shapes, equations or any other objects, Mathematicians tend to think about their underlying structures and patterns.

The Learning Operation of Integers using Strategic Intervention Material is a study where the researcher used a differentiated approach in teaching and learning process. Because of the modernization and fast development of technology, the researcher focused on this study in using this material. This study will challenge the students to use the material and how they acquire knowledge by using it. The purposed of this study is to state what is the effect of using Strategic Intervention Material in learning, to show the performances of the students and find the benefits of this material.

Nowadays, Mathematics is one of the most hated subjects of some students. The poor performance of students in Integers of Grade 7 at Sulivan National High School has generated a heat on the educational system. It was in consideration of this issue that the motivation of this study aroused. The study focused on the learning operation of integers using Strategic Intervention Materials. This research will mostly benefit the learners.

Background of the Study

Integer is important subject material from the point of view that it brings together the reality of positive and negative numbers in real world context. It is commonly noted that some students experience difficulty when dealing with positive and negative numbers. This topic discussed within the group of researcher and there was difficulties encountered in teaching integers.

According to Sherman, Richardson, and Yard (2014), students fall below their expected level of Mathematics achievement for a variety of reasons. When asked why they were not as successful in learning Mathematics, many people respond that they "never understood Math" or "never liked it because it was too abstract and did not relate to them". These reasons and others can be categorized, in general, as environmental or personal, individualized factors.

The researcher also conducted an interview to the teacher on February 28, 2019 at Sulivan National High School. According to Teacher A and Teacher B of Grade 7 students, some students having difficulties in solving integers because they could hardly follow the rules of subtraction where it needs to

change the sign of the subtrahend and proceed to addition. In multiplying and dividing integers, the students having trouble when solving numbers with opposite sign. They also conclude that students having difficulties in other topics in division of polynomials because of this problem.

From this study carried out, there are many challenges in teaching Mathematics because everyone is a unique individual and have different ability to learn. But unfortunately, there are some students having difficulties in learning Mathematics for some reasons. Hence, the researchers use to develop and design a Strategic Intervention Material to further improve the students learning abilities and Mathematical skills. With the use of Strategic Intervention Material, it may help the students to easily learn the topic and having enjoyment while they are studying.

According to Rodrigo (2015), Strategic Intervention Materials are conceptualized and designed to aid the teacher to provide the pupils the needed support to make progress in studies. These will increase and deepen the skills, knowledge and understanding of the child in various subject areas not only in Science and Math but also including various learning areas in the curriculum.

All these prompted the researcher to create Strategic Intervention Materials in learning operation of integers. The respondents will take the pre-test and post-test before and after the intervention of Grade 7 students in Sulivan National High School, area of Baliwag, Bulacan.

Statement of the Problem

The research study aims to determine the learning operation of integers using Strategic Intervention Materials in Sulivan National High School as a basis for better teaching strategies on the secondary students.

This research study sought to answers the following questions:

1. How may the performance of the Grade 7 students in Mathematics be described?
2. Is there a significant different between the performance in pre-test and post-test of the students using:

a. Traditional Method

b. Strategic Intervention Material

3. Is there a significant different between the performance in post-test of the students using Strategic Intervention Material and Traditional Method?
4. How may the Strategic Intervention Material be evaluated in terms of the following:

4.1. Guide Card

4.2. Activity Card

4.3. Assessment Card

4.4. Enrichment Card

4.5. Reference Card

4.6. Strategic Intervention Material

Conceptual Framework of the Study

The conceptual framework is the study of our research which is “Learning Operation of Integers Using Strategic Intervention Materials”. In this research study, the method we used is the IPO Model.

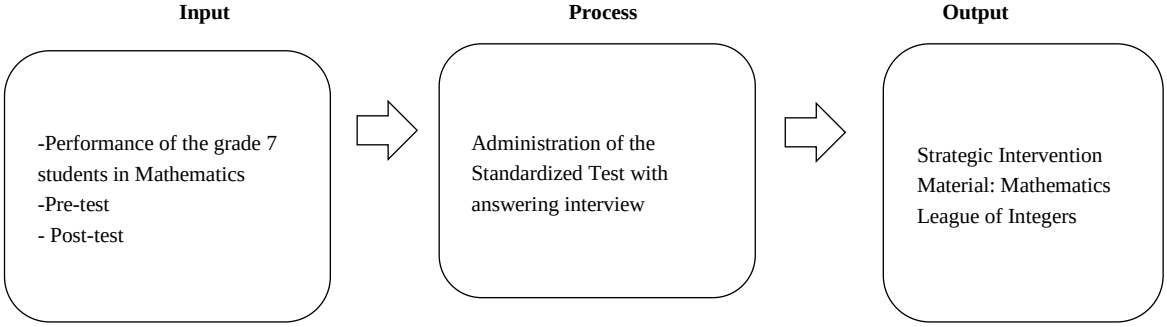


Figure1. Paradigm

The Paradigm is a set of assumptions, concepts, values, and practices that constitutes a way of viewing reality. It is the graphical representation of all the factors that make up a process.

The Input-Process-Output diagram includes all of the materials and information required for the process itself.

The Input is the information gathered from the study. These are the performance of students in Mathematics. The process deals with how data will be gathered or collected in order to interpret the statement of the problem. This consists of using standardized test as the pre-test and the post-test of the students. The Output is the Strategic Intervention Material that may be used to further improve the performance of the students in learning integers.

Significance of the Study

The significance of this study is to elicit useful information that could be learning operation of integers using Strategic Intervention Material in grade 7 students in secondary school. The result of this study will merit the following:

- **Future Researcher**. This will serve as a basis for further study on learning Mathematics using Strategic Intervention Material.
- **Parents**. The result of this research will help the parents who are concerned with the education of their children considering school performance in different discipline.
- **Researcher**. This will serve as a guide for the researcher on what will be the intervention and approaches is better to use.
- **School Administrator**. They encourage the teachers to make different methods of teaching and use Strategic Intervention Material because the students have different ability in terms of learning.
- **Students**. The result of this research will help students concerned to appreciate the subject Mathematics, expose the importance of Mathematics, having enjoyment while learning, encouraging them to put in more effort and to remove every negative sentiment and fear students have towards the study of Mathematics.
- **Teachers**. This will serve as a basis for the teacher to used Strategic Intervention Material in teaching to improve the performance of the students and having enjoyment while they are learning.

Scope and Delimitation of the Study

This study will cover the Grade 7 students of Sulivan National High School, area of Baliwag Bulacan. This will cover in the fourth grading period of the Academic Year 2018-2019. The instrument to be used in this study is the standardized test taken from Integer Operation Review.

METHODOLOGY

This chapter presents the research design, respondents of the study, research instrument and data gathering procedure, and data processing and statistical treatment.

Research Design

This study focused on the learning Operation of Integers using Strategic Intervention Materials on Grade 7 students at Sulivan National High School. The experimental – research design method was used in this study.

The experimental research design is utilizes to test the cause and effect relationships under conditions controlled by the researcher. Experimental research is considered to be successful only when the researcher confirms that a change in the dependent variable is solely due to manipulation of the independent variable. The purpose of this study is to know the effect and performance of the students using Strategic Intervention Material in learning Operation of Integers.

The researcher also used the mixed method of studies were both quantitative and qualitative method use in a single study. The qualitative method is the observation of the researcher and the interview and survey to the students. The quantitative method is the number of result on pre-test and post-test of the students.

Respondents of the Study

The respondents in this study were the 2 sections of Grade 7 in Sulivan National High School with the total number of 65 students Academic Year 2017-2018. One section consist of 32 students and used as the controlled group of the study and the other section consist of 33 number of students and presented as the experimental group of the study.

Research Instrument

In obtaining the pertinent data of this study, standardized test was used during the conduct of chapter test using the same questions. The questions consist of 40 items. Each question was analysed and interpreted comprehensively. The pre-test were given before the intervention and the post-test given after the intervention. The intervention used from this study is the Traditional Method of teaching and using Strategic Intervention Material. The result of the test will served as a basis of effects in the intervention.

The researcher also used a rubric for the evaluation of the Strategic Intervention Material. The rubric consisted of the different parts of the SIM.

Data Gathering Procedure

Permit to conduct research and study was secured by requesting permission in the Area Chair of College of Education and to the Dean of Bulacan State University. The researchers also prepared a letter addressed to the Principal of Sulivan National High School where is the study will be conducted.

The researchers identified the least mastered topic in Grade 7 students by asking them to rank the list of the topics in Mathematics and by interviewing some Mathematics teacher in Grade 7. Afterwards, the researchers administered a pre-test before proceeding to Traditional Method of teaching. Then, after discussing post-test were given to them.

After using the Traditional Method, we proceed to use Strategic Intervention Material in other section. Like to the other section, before we exposed the instrument that we are going to used they answer the pre-test. Then after using the Strategic Intervention Material to the students, post-test were given to them.

The purpose of this is to know if there's a significant between the performances in pre-test and post-test of the students using Traditional Method and Strategic Intervention Material.

Data Processing and Statistical Treatment

The data were processed and analysed by using the statistical tool. The t-test used to compare two means, the means of two independent samples or two independent groups and the means of correlated samples before and after treatment. The formula used to find the t-computed value is:

$$t=\frac{x_1-x_2}{\sqrt{\left[\frac{SS_1+SS_2}{n_1+n_2-2}\right]\left[\frac{1}{n_1}+\frac{1}{n_2}\right]}}$$

Where:

t = the t test

X_1 = the mean of group 1

X_2 = the mean of group 2

SS_1 = the sum of squares of group 1

SS_2 = the sum of squares of group 2

n_1 = the number of observation in group 1

n_2 = the number of observation in group

The frequency distribution used to get the percentage of the students who have difficulties in different topics in Mathematics. The formula used to find the frequency distribution is:

$$P=\frac{n_1}{N}$$

Where:

P= percentage

n_1= number of respondents

N= total number of respondents

The researcher used the inferential statistical treatment to make judgement of the probability that an observed difference between is dependable one or that might have happened by chance in this study. Simplest inferential test is used because researchers want to compare the average performance of two groups on a single measure to see if there is a difference. To compare the average performance between two groups, researchers consider the t-test for differences between groups.

RESULT AND DISCUSSION

In this section, the data gathered were carefully discussed, analysed and interpreted using appropriate statistical tool whose main objective is to know the effect and performance of the students in learning Operation Of Integers using Strategic Intervention Material at Sulivan National High School area of Baliwag, Bulacan.

Figure 1: Percentage of Grade 7 students according to their Mathematics difficulty.

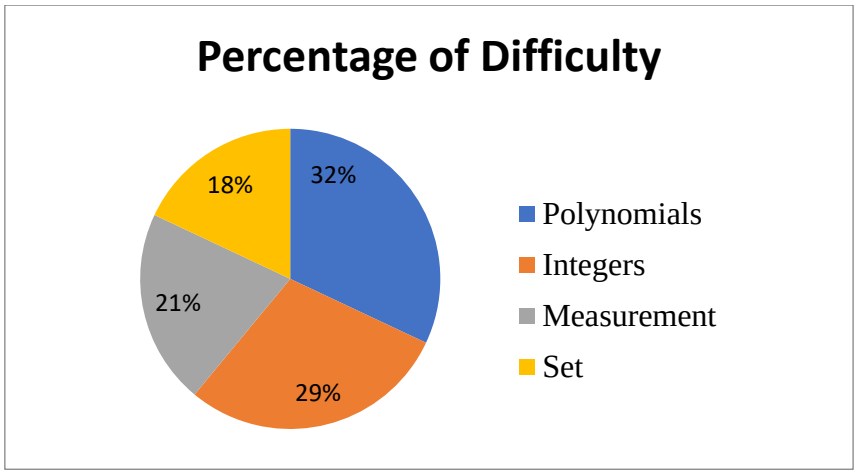
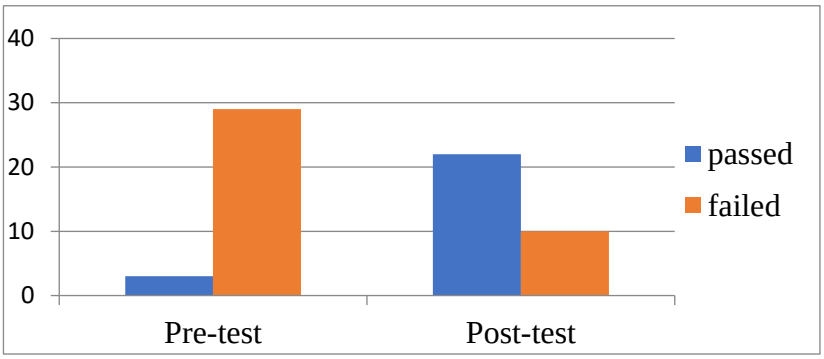


Figure 1 revealed a total of 65 respondents, 21 or 32% of the respondents says that they are having difficulties in learning Polynomials while the 19 or 29% of them are having difficulties in learning Integers. The 14 or 21% of the respondents revealed that they are having difficulties in learning Measurement and the remaining 11 or 18% is of the participants are having problems in learning Sets.

Even though Polynomials have the greatest percentage of difficulties in learning of the students, the researchers proceed to study the Integers, second to the highest percentage because Integers is the basic foundation in solving Polynomials. You need to learn first the basic rules on how to add, subtract, multiply and divide numbers before proceeding to complex solving. You cannot answer a difficult problem, if you do not know how to apply the basic or the simplest method. Although, Integers is basic, there's still a students who are having their difficulties in solving unlike sign. That's why, the researchers wants to prioritize the students' difficulties.

Figure 2.1: Result of the pre-test and post-test using Traditional Method of Teaching.



As observed in figure 2.1, it is very obvious that there are 3 grade 7 students who got a score of 21 and above, while there are 29 respondents got a score of 20 and below in the pre-test, the mean score is 9.88. In the post-test, 22 students got a score of 21 and above, and 10 students got a score of 20 and below, the mean score is 20.94.

This means that after the students were exposed to Traditional Method of teaching Mathematics it affects their performance while answering the standardized test; they got a higher score than before.

Table 1: Significant Difference using T-test between the Pre-Test and Post-test Results of Using Traditional Method.

Variable	**Mean score**	**t-value**		**Interpretation**	**Decision**
		Computed	**t-tabular Value at 0.05**		
Pre-test	**9.88**	**6.62**	**2.00**	**Significant**	**Reject H_0**
Post-test	**20.94**				

Since the t-computed value of 6.62 is greater than t-tabular value of 2.00 at .05 level of significance with 62 degrees of freedom, the null hypothesis is rejected in favor of the research hypothesis. This means that there is a significant difference between the performances of the students using traditional method.

Figure 2.2: Result of the students in pre-test and post-test using Strategic Intervention Material.

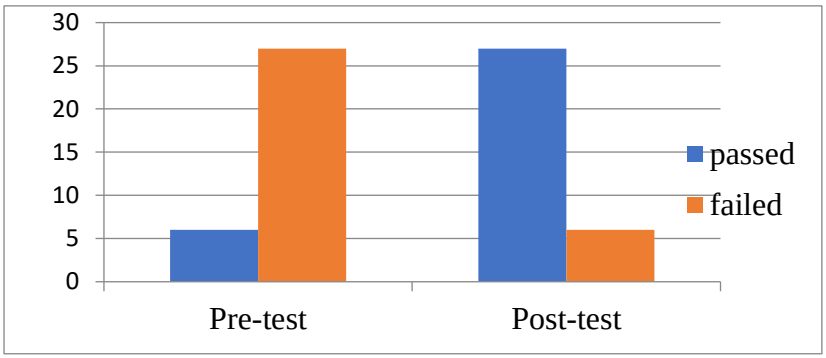


Figure 2.1 B revealed the result of pre-test, 6 students passed the pre-test with a score of 21 and above and 27 students failed with a score of 20 and below, the mean score is 10.18. While in the post-test which was given after the students were exposed to the Mathematics League of Integers, a proposed Strategic Intervention Material, 27 students passed and 7 students failed, the mean score is 26.52.

This means that after the students were exposed to Strategic Intervention Material it affects their performance while answering the standardized test; they got a higher score than before. It also helps the students to improve their Mathematics skills.

Table 2: Significant Difference using T-test between the Pre-Test and Post-test Results of Using Strategic Intervention Material.

Variable	**Mean score**	**t-value**		**Interpretation**	**Decision**
		Computed	**t-tabular Value at 0.05**		
Pre-test	**10.18**	**8.55**	**2.00**	**Significant**	**Reject H_0**
Post-test	**26.52**				

Since the t-computed value of 8.55 is greater than t-tabular value of 2.00 at .05 level of significance with 64 degrees of freedom, the null hypothesis is rejected in favor of the research hypothesis. This means that there is a significant difference between the performances of the students using strategic intervention material. It implies that the students perform better when using strategic intervention material.

Figure 3.1: Mean value of score according to post-test of the students using Strategic Intervention Material and Traditional Method.

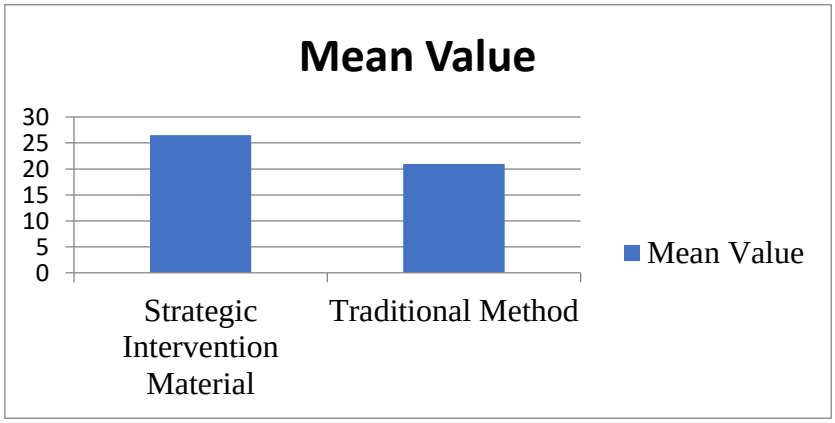


Figure 3.1 presents the mean scores of post-test using Strategic Intervention Material and Traditional Method. For Strategic Intervention Material's post-test, the mean score is 26.52, while the mean score of Traditional Method is 20.94.

Table 3: Significant Difference using T-test between the Post-test Results of Using Strategic Intervention Material and Traditional Method.

Post- Test	**Mean score**	**t-value**		**Interpretation**	**Decision**
		Computed	**t-tabular Value at 0.01**		
Strategic Intervention Material	**26.52**	**3.30**	**2.660**	**Significant**	**Reject H_0**
Traditional Method	**20.94**				

Since the t-computed value of 3.30 is greater than t-tabular value of 2.660 at .01 level of significance with 63 degrees of freedom, the null hypothesis is rejected in favour of the research hypothesis. This means that there is a significant difference between the performances of the students using Strategic Intervention Material and Traditional Method. It implies that the students perform better when using Strategic Intervention Material than Traditional Method.

Table 4: Evaluation of Strategic Intervention Material.

Focus Area	**Mean Score**	**Interpretation**
Guide Card	**4.15**	Very Good
Activity Card	**4.10**	Very Good
Assessment Card	**4.33**	Excellent
Enrichment Card	**4.34**	Excellent
Reference Card	**4.25**	Excellent
SIM	**4.14**	Very Good

The Guide Card, Activity Card and the Strategic Intervention Material has the same interpretation and it is all Very Good with the mean score of 4.15, 4.10 and 4.14. The Assessment Card with the mean score of 4.33 and Enrichment Card with the mean score of 4.34 has the same interpretation and it is Excellent. It is proved that with the use of this intervention, it can help and it will challenge the students to learn using this kind of material. This intervention is very useful since that the students will enjoy playing the activities and at the same time, they are all enjoying.

Conclusion

Based on the result and discussion, the researcher concludes the following:

1. The performance of the Grade 7 students improved student motivation, increase student academic achievement and foster positive student attitudes in Mathematics subject when using Strategic Intervention Material compare to Traditional Method of teaching.
2. There is a significant different between the performance in pre-test and post-test after exposing to traditional method of teaching, the result of post-test improved compared to the result of the pre-test.
3. The use of Strategic Intervention Material has a significant positive effect on student academic achievement. It implies that the scores on post-test are better than the scores on pre-test.
4. Most of the students adopted the deep learner's approach after the exposure to the Strategic Intervention Material. It has the capability of influencing the learning approach of the students in Mathematics.

5. The study also concluded that Strategic Intervention Material have more motivation to learn Mathematics in class compared to Traditional Method.
6. The use of Strategic Intervention Material is effective and can be use by the teachers to improve student's performance in Mathematics.

Recommendations

1. Encourage Mathematics teachers to make Strategic Intervention Material to enhance the performance of the students.
2. Mathematics teachers can use the Strategic Intervention Material made by the researcher to re-teach the concepts and skills and help the students master the competency-based skill.
3. Seminars should be conducted in the division level regarding development and implementation of the Strategic Intervention Material in the classroom.
4. Use Strategic Intervention Material to enhance the achievement of the learners.

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