IMPROVING THE GRADE 7 STUDENTS' PROBLEM-SOLVING SKILLS IN PHYSICS THROUGH ReGiFoSoFi METHOD

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ABSTRACT

This action research aimed to find out if the use of the ReGiFoSoFi Method is effective in improving the problem-solving skills of the 30 students of Grade 7-Amethyst of Dr. Ricardo Gacula Memorial National High School during the Academic Year 2022-2023. This action research made use of the One Group Pre-Test Post-Test research design in determining the level of problem-solving skills of the respondents before and after the utilization of the ReGiFoSoFi Method. The data gathering instrument utilized in this action research was a 40-point teacher-made test which is composed of a 15-item multiple choice and a five-item problem solving with the use of a rubric in checking. For the analysis and interpretation of the results, the statistical tools frequency and percentage, mean, standard deviation, coefficient of variation, t-test, and gain ratio were used. Based on the findings, the researchers arrived at the following conclusions: (1) the level of problem-solving skills of Grade 7-Amethyst in Physics improved from Very Poor to Very Satisfactory, (2) ReGiFoSoFi Method is an effective strategy in improving the problem-solving skills of Grade 7-Amethyst in Physics, and (3) there is a good increase in the post-test scores of the students after the implementation of ReGiFoSoFi Method. Based on the conclusions, the following recommendations are set forth: (1) The school administrators may continue to encourage their teachers to attend training and workshops concerning strategies and methods in teaching Science, for them to formulate new strategies to improve the skills of the students like ReGiFoSoFi for problem-solving skills in physics, (2) the science Teachers may adopt ReGiFoSoFi Method in teaching physics-related problems, (3) the students may engage themselves on the proper and systematic way of solving a problem using ReGiFoSoFi Method, and (4) a further study may be concluded using ReGiFoSoFi Method in teaching other physics-related topics to a wider and different group of respondents.

Keywords: ReGiFoSoFi Method, Problem-Solving Skills, Physics

INTRODUCTION

Globalization entails technology, vast knowledge, experiences, and skills. It impels the educational system to provide better or quality human resources and innovations. One of its goals is to enhance the higher-order thinking skills of learners wherein Science contributes to this. It aims to intensify understanding, interpretation, and analysis. As one of its branches in Physics, it maximizes students to learn on the structure of matter, energy, and their interactions. However, it was popularly known to many as complex and challenging due to its numerous formulas and computations.

Physics is a subject that entails a lot of problem-solving. It includes problem sets that require mathematical analysis and solutions (Milbourne & Benneth, 2017). Understanding the universe through mathematical equations is what Physics is all about. This is the reason why Physics is perceived to be one of the most difficult subjects (Sarabi & Gafoor, 2018). Meaning, this subject requires students to be involved in solving a problem using the principles of physics which is usually represented by equations.

When the K-12 Basic Education reform in the Philippines was implemented in 2013, the science curriculum consisted of a 72-minute Physics class to be taken daily during the student's fourth year of secondary education. However, the country still noted having a performance of below international standards which is evident in the 2nd International Science Study (SISS) and 3rd International Mathematics and Science Study (TIMSS) rankings (Alonzo, & Mistades, 2021). With these, the problem of the poor performance of students in Physics remains unsolved.

There are two ways to make ourselves better Physics problem solver. First, one must know and understand the principles of Physics. Second, there must be a strategy for applying these principles to new situations in which Physics can be helpful. Unfortunately, problem-solving exists as an art with no universal approaches that a learner can use in solving word problems. One must explore a possible way to have the right path of the solution to get the correct outcome or answer.

Anent this, the researchers observed that many of the students have difficulties on how to solve problems systematically even if they were introduced to the principles. Students usually asked how to start, what steps should be followed, and how to get the correct answer and unit. Although the principles and concepts are being discussed and the formulas seem to be simple, the application of them is the primary concern among the students. This made the researchers decide and pursue the development of the ReGiFoSoFi Method as a contribution to the progress in the pursuit of globalization and world ranking. ReGiFoSoFi Method is a step-by-step process that stands for reading and Analyzing the problem, Finding the given values, Identifying the formula to be used derived from the Physics Principle or concept, Solving the equation, and lastly, determining the Final answer. This idea of using the ReGiFoSoFi Method in solving worded problems in Physics will help students to be more systematic and justify the nature of science as an organized body of knowledge.

The purpose of this action research was to improve the problem-solving skills of Grade 7-Amethyst students at DRGMNHS with the use of the ReGiFoSoFi Method as a strategy in solving Physics worded problems.

OBJECTIVES OF THE STUDY

This study aimed to improve the Grade 7 Amethyst students' problem-solving skills in Physics at Dr. Ricardo Gacula Memorial National High School during the School Year 2022-2023.

Specifically, it sought to answer the following questions:

1. Determine the level of the Grade 7 students' problem-solving skills during the pre-test and post-test of the study.
2. Determine if there is a significant difference between the pre-test and post-test results obtained by the Grade 7 students along the level of problem-solving skills in Physics.

3. Determine if there is a significant difference between the pre-test and post-test results obtained by the Grade 7 students along the level of problem-solving skills in Physics.

METHODOLOGY

This chapter presents a discussion of the research design, sources of data, research instrument, research procedure, statistical consideration, and the statistical tools that were utilized in this study.

Research Design. This action research used a group Pre-test Post-test design to determine the effectiveness of the ReGiFoSoFi Method as a strategy for improving the problem-solving skills in Physics of the Grade 7 Students of DRGMNHS.

APA Dictionary of Psychology (2022) defined a group Pretest Posttest design as a research design in which the same assessment measures are given to participants both before and after they have received treatment or been exposed to a condition, with such measures used to determine if any changes could be attributed to the treatment or condition.

Sources of Data. The data were taken from the results of the pre-test and post-test administered to 30 Grade 7-Amethyst respondents, composed of 15 boys and 15 girls. Grade 7-Amethyst is one of the three sections of Grade 7 having heterogenous types of students at Dr. Ricardo Gacula Memorial National High School at Tamurong Primero, Candon City, Ilocos Sur during the School Year 2022-2023.

Scope and Delimitations. This action research aimed to determine the effectiveness of the ReGiFoSoFi Method in improving the problem-solving skills of Grade 7- Amethyst in Physics during the school year 2022-2023. The thirty (30) Grade 7 Amethyst students served as the respondents of this study. All the respondents were subjected to the implementation of the strategy to improve their problem-solving skills in physics consisting of 15 boys and 15 girls that summed the population. The topics discussed were distance and displacement, speed, velocity, and acceleration.

The researchers utilized a 40-point-test with 15-point multiple choice and 25-point solving worded problems. Seven (7) points were allocated to the topic of Distance and Displacement, nineteen (19) points for Speed, seven (7) points for Velocity, and seven (7) points for Acceleration which were presented in the Table of Specifications.

The study was conducted for ten days on February 13, 16, 17, 20, 21, 23, 27, and March 2, 3, 7, 2023.

Research Instrument. This research made use of a teacher-made test which is composed of 40 points with 15 items in multiple-choice and 5-item solving worded problems equivalent to a total of 25 points. The topics covered were distance and displacement, speed, velocity, and acceleration. A table of specifications was prepared beforehand consisting of Six (6) items allocated to the topic of Distance and Displacement, seven (7) items for Speed, four (4) items for Velocity, and three (3) items for Acceleration. The researchers used a scoring rubric in evaluating the second part of the test which is the solving of worded problems.

The instrument was validated and revised by three experts in the person of Mrs. Maila G. Castillo, a Science teacher in Grade 8 of DRGMNHS, Mrs. Maria Chelsie Rose B. Galangco, a Science teacher in Teodoro Hernaez National High School, and Mrs. Mary Lyn A. Gavina, a Science teacher in Teodoro Hernaez National High School which resulted to a validity index of 4.8, which is described as “Very High Validity”.

To describe the level of the problem-solving skills of the Grade 7-Amethyst students during the pre-test and post-test of the study, the range of scores below was used.

Data Gathering Procedure. The researchers were deployed in the different schools for their Field Study 1 observation. One of the researchers observed that the Grade 7 Amethyst students of DRGMNHS had struggles in problem-solving during their quizzes in their science subject. Mrs. Princess Izazane Gaspar, Grade 7 Science teacher confirmed the observations. Then, the other members of the team discussed this concern and came up with a study as approved during the proposal defense.

The researchers wrote a letter of permission to conduct research to Mrs. Jeaneleane G. Lomiteng, Principal of DRGMNHS. Upon approval of the request, the researchers prepared TOS, a teacher-made test, and the activity sheet.

The teacher-made test and activity sheet were checked and improved by Mrs. Maria Chelsie Rose B. Galangco, Mrs. Maila G. Castillo, Mrs.

Mary Lyn A. Gavina, and Mr. Cliff Owen Q. Pascua, who served as validators. The teacher-made test gained a validation index of 4.8 which is described as "Very Highly Valid". The activity sheet gained a validation index of 4.79 which is described as "Very Highly Valid".

From January 21, 2023, to February 10, 2023, the lesson plans and other instructional materials were prepared and evaluated by the Research Adviser and their Science subject teacher, Mrs. Princess Izazane Gaspar.

On January 31, 2023, the researchers administered the reliability test among Grade 8 Waterlily of the same school for an hour. After the said test, the researchers did an Item Analysis which was later submitted and treated statistically by the statistician and got a result of 0.828 interpreted as "Good/Very High".

On February 12, 2023, the researchers administered the pre-test among the respondents for one hour.

On February 16-17, 2023, the lesson on *Distance and Displacement* was conducted by Mr. Asuela. For day 1, the researchers used the PowerPoint Presentation, tarpapel, chalk, and board during lesson discussion, while the students jotted down notes. The student-teacher even wrote assessment questions on the board and respondents would answer on the paper. On day 2, the researcher performed a group activity consisting of problems guided by the ReGiFoSoFi Method with the use of the activity sheet. The winner of the said activity would be granted a reward.

On February 20-21, 2023, the lesson on *Speed* was conducted by Miss Diana Rose G. Cudiamat who also used the ReGiFoSoFi Method in the teaching-learning process. The process of the strategies was also the same as the previous class including the reward system and differentiated instruction.

On February 22, 2023, a review session was conducted by the researchers through the form of assessment covering their lesson in distance displacement, and speed. This aimed to make the respondents gain mastery in the previous lessons with the use of the ReGiFoSoFi Method. On February 23 & 27, 2023, the lesson on *Velocity* was conducted by Miss Shaira Joy L. Galloniga taught velocity incorporating the said method. The process of the strategies was also the same as in previous meetings.

On March 1-2, Mr. Adrian Paul E. Mangay-ayam taught the lesson on acceleration and the same process was done.

On March 7, 2023, the post-test was administered. Then, the results of the pre-test and post-test were tabulated by researchers and were statistically treated and interpreted using SPSS with the help of their statistician, Asst. Prof. Jazmin S. Alabaso.

Statistical Tools. The data gathered were subjected to analysis and interpretation. The following tools were used:

1. Frequency and Percentage
2. Mean
3. Standard deviation
4. Coefficient of Variation
5. t-test
6. Gain ratio

Ethical Considerations. To ensure that ethics were observed in conducting this research, the following information were strictly observed:

The school authorities and respondents were informed about the purpose and the data-gathering procedure of this study. Their consent and permission were ensured before utilizing the data.

Any type of communication about the research was done with honesty and transparency.

Proper citations were observed in the integration of different literature and studies in this research manuscript.

The researchers took part in work that coheres with the accepted ethical standards that they were competent to perform.

RESULTS AND DISCUSSION

This chapter deals with the presentation, analysis, and interpretation of the results of the pre-test and post-test conducted on respondents.

1. Level of the Grade 7 students' problem-solving skills during the pre-test and post-test of the study

Table 1 presents the level of problem-solving skills in Physics of Grade 7-Amethyst during the pre-test and post-test.

Table 1
Level of Problem-Solving Skills in Physics of Grade 7-Amethyst during the Pre-Test and Post-Test

Indicators		Grade 7-Amethyst			
		Pre-Test		Post Test	
Number of students		30		30	
Number of Points		40		40	
Highest Score		10		39	
Lowest Score		3		22	
Mean		5.53		30.43	
Descriptive Level		Very Poor		Very Satisfactory	
Ranges of Scores	Descriptive Levels	f	%	f	%
32.01-40.00	Outstanding	0	0	11	36.67
24.01-32.00	Very Satisfactory	0	0	17	56.67
16.02-24.00	Satisfactory	0	0	2	6.67
8.01-16.00	Poor	3	10	0	0
0.00-8.00	Very Poor	27	90	0	0
Standard Deviation		1.81		4.37	
Coefficient Variation		32.79%		14.35%	

Table 1 shows that 30 respondents took the 40-point test. The set of respondents has the highest score of 10 on the pre-test and 39 on the post-test. The lowest score of the respondents during the pre-test is three while 22 in the post-test.

The mean score of Grade 7-Amethyst during their pre-test is 5.53 which is described as "Very Poor", while its mean during the post-test is 30.43 which is described as "Very Satisfactory". This implies that the problem-solving skills of the respondents in Physics improved during the Post-test.

The standard deviation of the respondents in the post-test is 4.37 which is higher than the standard deviation of the pre-test which is 1.81. This shows that the scores in the post-test are more varied than that of the scores in the pre-test.

The coefficient of variation of the respondents in the pre-test is 32.79 percent which is greater than the post-test which is 14.35 percent. This means that the variability of scores during the post-test is more consistent than the variability of scores in the pre-test.

2. Significant difference in the level of problem-solving skills in Physics between the pre-test and post-test results obtained by the Grade 7 students

Table 2 presents the significant difference in the level of problem-solving skills in Physics between the pre-test and post-test results obtained by the Grade 7 Students.

Table 2
Significant Difference in the Level of Problem-solving Skills in Physics between the scores in Pre-test and Post-test of Grade 7-Amethyst

	Mean	Mean Difference	Computed t-test value	*p value*	df	Decision
Post-test	30.433	24.9	32.44	0.000	29	Reject (H_0)
Pre-test	5.5333					

Level of Significance a= .05

The table shows that the mean difference in the scores of Grade 7-Amethyst in the pre-test and post-test is 24.9. The computed t-test of the respondents is 32.44 at 0.05 level of significance, with a p-value < .05 level with 29 degrees of freedom. Therefore, the null hypotheses (H_0) are rejected, thus there is a significant difference between the pre-test and post-test scores of the respondents and this further shows that the ReGiFoSoFi Method is effective in improving the problem-solving skills in Physics of the respondents.

3. Average gain ratio obtained by the Grade 7 students from the results of the pre-test and post-test of the study

Table 3 presents the average gain ratio obtained by the Grade 7 students from the results of the pre-test and post-test of the study.

Table 3 shows the gain ratio of the scores obtained by Grade 7-Amethyst from the pre-test and post-test of the study. The highest individual gain ratio by the respondents is 97.14 percent. On the other hand, the lowest individual gain ratio of the respondents is 47.06 percent. Overall, the average gain ratio is 72.37 percent.

This further shows that there is an improvement in the respondents' problem-solving

skills in Physics as compared to their pre-test results and post-test. This implies that the ReGiFoSoFi Method is effective in improving the problem-solving skills in Physics of Grade 7 learners.

Table 3

Average Gain Ratio of Grade 7- Amethyst obtained from the results of the Pre-test and Post-test of the Study

Respondents	Pre-test	Post-test	Gain Ratio
1	10	34	80.00
2	9	37	90.32
3	9	33	77.42
4	7	34	81.82
5	7	28	63.64
6	7	37	90.91
7	7	33	78.79
8	6	26	58.82
9	6	31	73.53
10	6	32	76.47
11	6	22	47.06
12	6	30	70.59
13	6	25	55.88
14	6	32	76.47
15	5	22	48.57
16	5	28	65.71
17	5	30	71.43
18	5	29	68.57
19	5	26	60.00
20	5	39	97.14
21	5	37	91.43
22	5	25	57.14
23	5	29	68.57
24	4	30	72.22
25	4	33	80.56
26	4	33	80.56
27	3	30	72.97
28	3	30	72.97
29	3	33	81.08
30	2	25	60.53
	Average Gain Ratio		**72.37**

CONCLUSIONS

Based on the findings, the following conclusions were made:

1. The level of problem-solving skills of the Grade 7 Amethyst from the pre-test and post-test indicated an improvement from “Very Poor” to “Very Satisfactory”.
2. There is a significant difference between the mean scores of the respondents in the pre-test and post-test which indicated that there is an improvement in the problem-solving skills of the Grade 7 Amethyst students.
3. There is an improvement in the post-test scores of the respondents after using the ReGiFoSoFi method.

RECOMMENDATIONS

Based on the conclusions, the following recommendations were formulated:

1. The school administrators may continue to encourage their teachers to attend trainings and workshops concerning strategies and methods in teaching Science for them to formulate new strategies to improve the skills of the students like ReGiFoSoFi for physics problem-solving skills.
2. The Science teachers may adopt the ReGiFoSoFi Method in teaching physics-related problems.
3. The students may engage themselves properly and systematically in solving a problem using the ReGiFoSoFi Method.
4. A further study may be conducted using the ReGiFoSoFi Method in teaching other physics-related topics to a wider and different group of respondents.

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