Effectiveness Of Game-Based Learning Strategy In Improving The Four Basic Fundamental Operations Of The Grade 5 Pupils In Mathematics

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Abstract — This study is conducted to determine effectiveness of game-based learning strategy to the performance of the Grade 5 learners. The findings of the study will be the bases for the proposed enhancement Plan. This study utilized Quasi-Experimental research design to determine the Effectiveness of game-based learning materials. The test of difference between the scores in the pre-test and post-test of Grade 5 pupils in Mathematics subject before and after the integration of game-based learning strategy in learning Mathematics. Aspects being measured (Grade 5 learners), test scores for the pre- and post-test, computed and critical T-values, decision based on comparison of computed and critical T-values, and interpretation of decision are all shown in the table. Table 3 above showed that the pre-test of Grade 5 pupils performance in Mathematics which is lower than the post-test. From the pre-test and post-test performance of Grade 6 pupils after the integration of the Game-based Learning Strategy which resulted to a computed t value which is higher than the critical t value under the level of significance and the hypothesis which states that there is no significant difference between the pretest and post test performance of Grade 5 pupils in mathematics before and after the integration of the game-based learning strategy is rejected.

Table 3 results about the test of difference between the scores in the pre-test and post-test of Grade 5 pupils in Mathematics subject before and after the integration of Game-based learning strategy in Mathematics implied that the aforementioned results are statistically significant considering that the scores were improved from the pretest to the posttest performance. This is due to the fact that the intervention is effective in improving the performance of the learners mathematical skills of learners. The rejection of the null hypothesis signifies that the teaching approaches shared by the teacher-researcher is successful, which means that it really serve its purpose which is to increase the mathematical skills of learners.

Keywords — Effectiveness Game-based Learning Strategy Grade 5 Learners Mathematics

I. Introduction

Mathematics is a difficult subject that most pupils hate. As a teacher, we need to find ways to cater to the needs of learners by implementing The Effectiveness of Game-based Learning Approach in Improving Four Basic Fundamental Combinations that would help them provide a better understanding of the learning in numeracy. Otherwise, they can't proceed to the next level of learning competencies if they don't master basic addition, subtraction, multiplication, and division.

A teacher, teaching grade V pupils for almost 7 years and 2 years in kinder. I have noticed that in all the learning areas most pupils have low grades in mathematics compared to other subjects. By implementing this kind of intervention, it would be a great help to the learners to be more motivated and interested to solve basic mathematical problems.

Mathematics is used throughout our lives - every day. As for many teachers in elementary, who were once a pupil, mathematics is often challenging for them with and without disabilities to master, as it requires thorough understanding and mastery of procedures. That is why considered one of the major subjects. Even teachers find it hard to provide effective ways to teach the subject in an easier and more understanding way. It is the very problem of most schools for learners who tend to just master the basic four operations and never care to elaborate their learning by having depth understanding of the matter because, for them, deeper learning of the subject is no longer needed. But mathematics does not just stop by simply familiarizing the four basic operations (addition, subtraction, multiplication, and division) since the curriculum requires more than that. And this is where real problems in teaching the subject emerged.

Because of the pandemic, pupils hardly solved basic operations in Math for they did not master them. In addition, learning material is limited and worse not available, it's hard on the part of the teacher but they say the best instructional materials for teaching is the teacher himself. The books being provided by the Department of Education are hard to understand that sometimes makes the subject more complicated for there are some clerical errors that they overlooked before they were published. In our area where the internet connection is not that good, finding resources other than the provided books and the presence of a teacher is one option and is therefore not giving the learners than chalk and talk. A very tiring strategy especially for slow learners.

The effectiveness of Game-based Learning Approach mastery of the four basic fundamental operations is very much appreciated and needed as learners will have an enjoyable way of learning. And this would only be possible if we have computers in our classroom since our learners cannot afford to have their laptops and tablets.

There are lot of problems encountered in teaching Mathematics such as lack of interest among the learners. This is one of the reasons why the researcher conducts this study to determine whether teacher-made contextualized Mathematical Materials improve the Mathematics performance of Grade 5 learners.

This study evaluated the effectiveness of Game-based learning strategy in improving the four basic fundamental operations of the Grade 5 Pupils in teaching Mathematics subject in Calbugos Elementary School in the Division of Leyte. The findings of the study were the bases for an Intervention Plan.

Specifically, it sought to answer the following questions:

1. What is the performance of the Grade 5 pupils in Mathematics before the integration of Game-based learning approach ?
2. What is the performance of the Grade 5 pupils in Mathematics after the integration of Game-based learning approach?
3. Is there any significant difference on the performances of the Grade 5 pupils in Mathematics before and after the integration of Game-based learning approach?
4. What improvement plan can be proposed based on the findings of the study?

Null Hypothesis:

HO: There is no significant difference in the performances of the Grade 5 pupils in Mathematics before and after the integration of Game-based learning approach.

II. Methodology

Design. The study utilized the Quasi Experimental type of research Design to evaluate the Effectiveness of Game-based learning approach in improving the four basic fundamental operations of the Grade 5 Pupils in teaching Mathematics based on the different most essential learning competencies for the 1st grading period which were delivered by the teacher of In Calbugos Elementary School. The findings of the study were the bases for an Intervention Plan. The researcher utilized Universal Sampling in identifying the respondents of the study. Quantitative analysis was used to determine the significant difference between the pre-test and post-test mean scores in Calbugos Elementary School in the Division of Leyte based from the different most essential learning competencies in first grading period delivered in Mathematics subject which purely focused on the different competencies. The main local of the study is in Calbugos Elementary School which is located under the in the Villaba District in the Division of Leyte. Based from the aforementioned locale, the main respondents that were chosen by the teacher-researcher was the Grade 5 learners which was identified based on their test performances prior to the integration of Game-based Learning Approach in the delivery of the different learning competencies. The assessment given to the respondents was carefully validated by the teacher-researcher himself which are the pretest and posttest test performances of the Grade 5 learners, the different steps in conducting the identified approach were undertaken in order to validate their performances before and after the implementation of Game-based Learning Approach to the

respondents. This study is mainly focus on the results of the different test validation to gather data: The pretest scores performance of the Grade 5 learners before the implementation of the Game-based Learning Approach in identifying the performance of the respondents, The Posttest scores performance of the Grade 5 learners after the implementation of the Game-based Learning Approach as well as the significant difference of the pretest and posttest performances before and after the implementation of the Game-based Learning Approach in the delivery of the most essential learning competencies in teaching mathematics for the first gradiing Period. In the Quasi-experimental research design, the researcher prepared the different materials which integrating Game-based Learning Approach. The focus of this study was the Grade 5 learners and those readers who are in the fair and good level of performance in order to improve their performance those on the average level of performance as well as those learners who were independent learners as well as facilitating in the giving of pretest and posttest to the identified respondents in order to gather necessary data that will be significant in the study; The proposed Intervention Plan was taken based on the findings of the study.

Sampling. There are 19 respondents who are included in the study. There are 8 Male and 11Females with a 19 total number of respondents. The respondents or the grade 5 learners were being identified based on the performance of learners, and the primary means of reach is during the actual conduct of the study as well as during the gathering of data in the school where the study was conducted.. Another way of contacting them are through cell phones of their respective parents.

Research Procedure. The researcher prepared the research design which is the quasi-experimental research design and tools which are the different learning materials embedding the Game-based Learning Approach based from the numeracy test given to the respondents . The researcher formulated the following steps or procedures to be guided during the gathering of data. The steps are the following:

The researcher sent a letter to the Schools Division Superintendent of Leyte Division for approval in conducting the study to the said school, After which, the approved letter coming from the Schools Division Office was given to the Public School District Supervisor (PSDS) for his awareness.

The researcher conducted the pretest before the integration of Game-based Learning Approach in teaching Mathematics After conducting the pretest, the researcher now integrating the Game-based Learning Approach to the different most essential learning competencies (MELCs) in English for 4 weeks. After 4 weeks of integrating the Game-based Learning Approach to the lesson, the posttest was conducted to validate the learning of the Grade 5 learners..

The results were analyzed and interpreted in order to find out if there were increased on the performance level from the pretest to the posttest. Then after the posttest and pretest were analyzed, the posttest result was treated statistically using the test for mean difference. The

Approval and recommendation from the Office of the Schools Division Superintendent, as well as to the Assistant Schools Division Superintendent being the Chairman of the Schools Division Research Committee through the Senior Education Program Specialist in Planning and Research. After the Approval of the Schools Division Research Committee, the Approved or endorsement letter from the body together with the approved letter of intent were forwarded to the Office of the Public School District Supervisor as well as to the office of the School principal in order to get full support on the conduct of the study as well as to get also approval from their end. The proposed title and design was submitted to the School Division Office for approval. Upon approval, the Division released endorsement to the District Office where the school is located. When the research was approved by the Schools Division Office and District Office, the researcher began the process of data gathering. Validation of the instruments through Experts such as the Master Teacher and in coordination with the school head and lastly to the Education Program Supervisor in Learning Resource was sought. Orientation of the participants was done. Answering and retrieval of the research tool followed. Tallying of results and treatment of data. Analysis and Interpretation of Data. Making of Proposed Enhancement Plan.

Ethical Issues. The right to conduct the study was strictly adhered through the approval of the principal, approval of the Superintendent of the Division. Orientation of the respondents both the learners and the teachers including the School Principal was done.

Treatment of Data. The following statistical formulas were used in this study:

The quantitative responses were tallied and tabulated. The data was treated statistically using the following statistical tool.

Weighted Mean. This was utilized to assess the performance of the Grade 5 pupils in Mathematics.

T-Test For Mean Difference- This tool was used to calculate the significant difference of the pretest and posttest performances of the Grade 5 pupils in Mathematics.

III. Results and Discussion

Table 1
PRE-TEST PERFORMANCE OF THE GRADE 5 LEARNERS IN MATH

Score Range	Description	PRETEST	
		Frequency	%
21-25	Excellent	0	0
16-20	Very Good	4	21
11-15	Good	7	37
6-10	Fair	3	16
1-5	Poor	5	26
Total		19	100
Weighted Mean		**11.42**	**Fair**

Table 1 shows the pre-test performance of Grade 5 learners in Mathematics before the integration of game-based learning strategy in improving the four basic fundamental operations of the respondents in the delivery of the most essential learning competencies (MELC) in Mathematics. The table 1 shows the result of pre-test on the performance of Grade 5 pupils in Mathematics before implementing of the game-based learning strategy. We all know that having games while learning is an exciting part in the giving the different topics in Mathematics. Even teachers really love to have games while learning different things in life how much more if those different types of educational games will be applied in the teaching and learning process were learners are really involved. From the table 1, it was found out that in the in the excellent level of performance having considered as the highest level of performance based on the categories, based on the results, there were no learners or having a zero percent having the scores ranging from 33-40 under the descriptive performance which is excellent performance level. For the scores ranging to 16-20 under the category of very good level, there were 4 out 21 learners or 11 percent out of the 19 total number of learners being validated who got this very good level of performance. Under the very good level performance, with the scores ranging from 11-15, it was found out that there were 7 total of learners which has an equivalent percentage of 37 percent. In this level of performance, it is said to be dominant compared to other categories of level of performance. On the other hand, there were 3 respondents out of 19 total of respondents belong in the fair level performance having the scores ranging from 6 to 10. Lastly, in the poor level of performance with the scores ranging from 1-5. It was found out that there are 5 respondents out of the 19 respondents validated in the pre-assessment in Mathematics. The Grade 5 students' pre-test math performance is shown in Able 1, which is divided into different score ranges from Excellent to Poor. All of the students received below-average grades. The majority of students (37%) and (26%), respectively,

fell into the Good and Poor categories. Additionally, a sizable percentage of students received Very Good (21%) and Fair (16%) grades.

Results in table 1 which presented the pre-test performance of Grade 5 pupils in Mathematics before the game-based learning strategy in the delivery of the most essential learning competencies or to deliver the identified least learned skills in Mathematics based on the diagnostic conducted by the teacher-researcher. Based on the pretest result, it was implied that the there was a varied or multiple distribution of scores on the different identified categories which composed of 5 level of categories that was based on the different learning performances of learners in learning Mathematics. Since the results are varied in which some of the learners are distributed in the poor level of performances others are in the good and even very good level of performance, it was suggested that the teachers should conduct different learning activities which could help the learners gained trust and confidence to learn those difficult topics to be delivered by the teacher in mathematics subject. This should be done to the learners because each one of them have the chance to learn new things and they should be catered based on their capacity to deal to the different challenges. Those learners who are belong to the highest level of performances though they are in that level of performances , they still need guidance to let them maintain their performances. For those learners having the poor performances should given proper attention to make them improved and address the learning gap that they have learned from the past. Students' comprehension and general performance can be greatly enhanced by addressing this diversity through targeted interventions, interactive learning techniques, ongoing progress monitoring, and active parental involvement. To support each student's individual learning journey, a customized and collaborative approach is crucial.

Table 2
POST TESTPERFORMANCE OF GRADE 5 LEARNERS IN MATH

Score Range	Description	POST TEST	
		Frequency	%
21-25	Excellent	12	63
16-20	Very Good	5	26
11-15	Good	2	11
6-10	Fair	0	0
1-5	Poor	0	0
Total		19	100
Weighted Mean		**20.84**	**Excellent**

Table 2 shows the posttest performance of Grade 5 learners in Mathematics after the integration of game-based learning strategy in improving the four basic fundamental operations of the respondents in the delivery of the most essential learning competencies (MELC) in Mathematics. The table 2 shows the result of posttest on the performance of Grade 5 pupils in Mathematics into the different categories from excellent to poor level of performance which covers 5 level of performances. Giving games while learning is an exciting part that should be experience by any of the learners specially in dealing with one of the most difficult subjects which is mathematics. the teaching and learning process were learners are really involved. Table 2 give emphasis on the number of learners in each and every category which composed of the different score range and each category has corresponding equivalent of percentage as well number of respondents present. From the table 2, it was found out that in the in the excellent level of performance having considered as the highest level of performance based on the categories, based on the results, there were 12 learners or having a 63 percent having the scores ranging from 33-40 under the descriptive performance which is excellent level. For the scores ranging to 16-20 under the category of very good level, there were 5 out 19 learners or 11 percent out of the 19 total number of learners being validated who got this very good level of performance. Under the good level performance, with the scores ranging from 11-15, it was found out that there were 2 total of learners which has an equivalent percentage of 11 percent. In this level of performance, it is said to be lowest compared to other categories of level of performance except for fair and poor level of performance. On the other hand, there were none respondents out of 19 total of respondents belong in the fair level performance having the scores ranging from 6 to 10. Lastly, in the poor level of performance with the scores ranging from 1-5.

Results in table 1 which presented the posttest performance of Grade 5 pupils in Mathematics after the game-based learning strategy in the delivery of the most essential learning competencies or to deliver the identified least learned skills in Mathematics based on the diagnostic conducted by the teacher-researcher. Based on the pretest result, it was implied that there was a significant increase of the results of the learners from the pre-test to the posttest performance after the implementation of the identified intervention that were last for 4 weeks of the implementation. It further discuss that the intervention being integrated in the lesson is very effective and brought positive results to the test performance of the learners and could make a big impact to their performances at the end of every grading period. Teachers should give also emphasis to those learners who gained highest level of performance and recognized their efforts of attaining such performance so tha they will be more motivated to learn new things and could reinforce them to create ties among those learners who have less in their performance in Mathematics. Furthermore, teachers should allow the parents to know the performance of their child in order for them to be more engaged in dealing with the performances of the learners

Table 3
TEST OF DIFFERENCE BETWEEN THE SCORES IN THE PRE-TEST AND POST-TEST OF GRADE 5 LEARNER IN MATH

Aspects	Test Scores		Computed T	Critical T	Decision	Interpretation
GRADE 5 Pupils	Pre Post	11.42 20.84	1.336	0.745	Reject H_o	Significant

Table 3 shows the test of difference between the scores in the pre-test and post-test of Grade 5 pupils in Mathematics subject before and after the integration of game-based learning strategy in learning Mathematics. Aspects being measured (Grade 5 learners), test scores for the pre- and post-test, computed and critical T-values, decision based on comparison of computed and critical T-values, and interpretation of decision are all shown in the table. Table 3 above showed that the pre-test of Grade 5 pupils performance in Mathematics was 11.42 which is lower than the post-test which is equal to 20.84. From the pre-test and post-test performance of Grade 6 pupils after the integration of the Game-based Learning Strategy which resulted to a computed t value of 1.336 which is higher than the critical t value at 0.745 under the level of significance and the the hypothesis which states that there is no significant difference between the pretest and post test performance of Grade 5 pupils in mathematics before and after the integration of the game-based learning strategy is rejected.

Table 3 results about the test of difference between the scores in the pre-test and post-test of Grade 5 pupils in Mathematics subject before and after the integration of Game-based learning strategy in Mathematics implied that the aforementioned results are statistically significant considering that the scores were improved from the pretest to the posttest performance. This is due to the fact that the intervention is effective in improving the performance of the learners mathematical skills of learners. The rejection of the null hypothesis signifies that the teaching approaches shared by the teacher-researcher is successful, which means that it really serve its purpose which is to increase the mathematical skills of learners.

IV. Conclusion

Based from the findings of this research, it can be concluded that there is a significant difference between the pre and post-test scores of grade 5 pupils in Mathematics. Therefore integrating of Game-based learning strategy in teaching Mathematics is statistically significant considering that the scores were improved from the pretest to the posttest performance. This is due to the fact that the intervention is effective in improving the performance of the learners mathematical skills of learners.

V. Recommendations

1. The proposed enhancement plan crafted should be utilized in order for other teachers to be aware on the new teaching approached that could help and guide them to be more aware on the different innovation shared.

2. Teachers should integrate game sessions during the activity to ensure that those identified topics is seamlessly into the plans and can help reinforce different concepts in mathematics.

3. In order for the learners to be more aware of the different learning competencies, the teachers should encourage the learners to analyze problems through games.

4. School Administrators, District Supervisor and Education Program Supervisors should initiate trainings and workshops focusing on how to develop and integrate further the game-based learning strategy in Mathematics.

5. Master Teachers should demonstrate during the LAC session on how to deliver the lessons through the use of game-based learning strategy.

6. Mathematics Teachers should develop learning materials in every least learned competency every quarter.

7. Based from the results of the study , the supervisor should conduct observations in the classroom to evaluate the implementations of game-based learning. Based on your observations, give teachers helpful feedback that identifies their strengths and areas for development.

8. Encourage parents to take part in learning activities based on video games at home. Inform parents how to use appropriate math games at home to supplement what their children are learning in class.

9. In relation to the abovementioned, the researcher is giving the authority to the future researcher to conduct the same study to validate the significant findings of the study.

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The author is born on April 13, 1987 at Calbugos, Villaba, Leyte, Philippines. She finished with her Bachelor's degree in Elementary Education at Visayas State University – Villaba Campus. In her high school and college days, she was really into the supervision field. She was a leader in different organizations when she was a student and that helped her decide to take administration and supervision as her field of specialization for her master's degree. She is currently finishing her Master's degree of Arts in Education major in Administration and Supervision at Western Leyte College of Ormoc City.

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