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Effects of Four Teaching Strategies on the Academic Performance of Senior High School Students

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ABSTRACT

Determining the effects of four teaching strategies on the academic performance of senior high school students was the main objective of this study. The quasi-experimental design, specifically the equivalent pretest-posttest design was used. A grade-11 class was divided into four sections, the three sections served as the experimental classes subjected to game-based, outcome-based, and technology-based teaching strategies, and one section served as the control group who undertook the traditional teaching method. Results showed that all groups were at a "*satisfactory*" level of performance before the treatment. Although the means of the experimental groups increased a little than that of the control group after the treatment, still all groups were at a "*satisfactory*" level. Before treatment, all groups were comparable, but difference was observed after the treatment. Improvement from pretest to posttest performance of the experimental groups and control group was found for outcome-based and traditional teaching methods. However, no significant statistical differences were found between the pretest-posttest for the other pairings. The utilization of outcome-based teaching strategies is an effective way of enhancing the level of performance of students in Mathematics compared to other teaching strategies. In the mean gain scores, statistical significance existed in the mathematics performance of the experimental groups and control group. Students exposed to outcome-based strategy performed better than those students who are exposed to other teaching strategies; while game-based, outcome-based, technology-based, and traditional teaching methods also improved the mathematics performance of students.

Keywords: *game-based, outcome-based, technology-based, traditional teaching method, mathematics performance*

INTRODUCTION

In the Philippines, the K to 12 Senior High School (SHS) curriculum started its implementation only in 2016. It is composed of four tracks: 1) Academic; 2) Technical-Vocational-Livelihood; 3) Arts and Design, and 4) Sports. Two of the core subjects required to be taken by all senior high school (SHS) students in any track and strands are mathematics subjects namely, General Mathematics and Statistics and Probability. It is expected that several problems in teaching and learning mathematics will arise since both the teachers and students are still in the adjustment period.

Jaudinez (2019) emphasized that teaching SHS Mathematics must embark on a learner-centered, contextualized, and relevant curriculum. In targeting the goals of the Department of Education (DepEd), teachers must be flexible enough and should learn to adapt to the new curriculum despite the several problems encountered during its implementation. She also revealed that there was a lack of recommended teaching strategies for difficult topics in mathematics. Also, she recommended that teachers should bestow tirelessly all their efforts in employing teaching and assessment strategies, and suitable instructional resources in SHS mathematics to fit lessons in the functional skills and college readiness standards, foundational skills articulated by DepEd, and Commission on Higher Education (CHED), respectively.

Since most of the teachers in senior high school came from junior high school, they should be fully aware that their students are matured enough compared to junior high school students. So, it is a challenge to them on how to match the teaching and learning approach to the level of maturity and intelligence of the learners. Thus, the DepEd conducted several pieces of training and seminars in mathematics to equip the teachers with the necessary knowledge and skills to prepare them for this new educational transition. Educational institutions are trying to devise effective

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teaching strategies that would best fit the abilities, skills, and interests of the learners.

It is noticeable that most of the grade 11 students have a negative attitude towards the subjects. Also, the student's poor performance had been attributed to their lack of mastery and basic skills. When the researcher asked the students why they act like that, their responses would be: 1) they believe that mathematics is a difficult subject; 2) they think that mathematics is a boring subject; 3) they cannot relate to the new lessons because they say that some of the lessons from junior high school mathematics were not yet tackled, and 4) they feel that they are not good enough in this subject. Besides, the mean percentage score of grade 11 students in mathematics for almost four years of senior high school operation is below 50%. This is an alarming situation. Although there might be several factors that affect the interest of the students in learning mathematics, it is indeed a challenge to the teachers on how they are going to achieve the target learning competencies in mathematics.

Teaching and learning strategies involve whole class, group, and individual activities that could develop and create different abilities, skills, learning rates, and styles that would help students to participate actively and to attain success. Since most of the schools are already provided with the needed tools and equipment like LED monitors, LCD projectors, and computers, these can be used to deliver quality education to the learners. The use of technology in the teaching and learning process can be employed. Another, with a higher maturity level, discovery approach through outcome-based education, perhaps, would be appropriate for them. Of course, learning while having fun through game-based learning would also be a great strategy for learners to interact actively. Literature and studies also revealed a positive effect of games on the academic performance of the students.

Further, there are only a limited number of studies regarding effective teaching strategies for senior high school students in the Philippines. Hence, the researchers would like to investigate several teaching strategies to determine which of these are most helpful and most appropriate to senior high school students.

The teacher is an important factor in the success of students (Baptiste, 2019; Meyers et al., 2019; Anderson, et al, 2020; Kawuryan, et al., 2021). It is relevant to further improve the quality of teachers to enhance the quality of the teaching and learning process. One of the subjects taught in school is mathematics. It plays an important role in the development of an educational system. However, problems in teaching this subject arise. Thus, the teacher devises several teaching strategies to ensure that the students can cope with the lessons. Since there are different types of learners, it is their task to motivate and encourage learners to actively engage in the teaching and learning process. One of the teaching strategies that could change the negative impression of the students in mathematics is game-based. Most of the studies revealed that games had an impact on the interest of the students. It was recommended to be part of the DepEd curriculum and that teachers should be equipped with the necessary skills and knowledge on how to conduct this classroom intervention. Also, research studies stated that games provide students with opportunities to develop their skills and talents, develop workmanship and sportsmanship, and could bring fun and enjoyment. Another teaching strategy that could help the students to become independent is outcome-based. Some studies stated that outcome-based is useful in terms of academics, attitude, and instruction. It is an individualized instruction since it focuses on the outcomes of the students. However, there were problems encountered especially in the submission of requirements of the students to the teachers. Nowadays, with the provision of Information and Communication Technologies (ICT) tools and equipment, technology-based would also be an appropriate teaching strategy. Most of the studies revealed that technology-based is more effective compared to the traditional teaching method. Moreover, in this digital age, the students are more interested in the use of technology since they are aware of the latest trends in ICT integration. Many teaching strategies could probably help the students to achieve their full potential. The challenge is how teachers are going to match these strategies to the learning styles of the students.

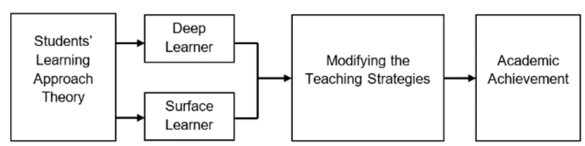

Figure 1. The student learning approach theory by Marton and Saljo (Macloone & Oluwadun, 2014).

Figure 1 explicates that learner can be classified based on the learners' approach to ascertain the student's depth of understanding (Mcloone & Oluwadun, 2014). This study used the student approaches to learning as a theory to examine differences in learning processes among students. The student's responses about their learning process were compared to their level of understanding. The original work on the learning approach was a phenomenography approach that involves obtaining descriptions of people's experiences and performing qualitative analysis to categorize and examine the relationship among them. The first group that was associated with a deep level of understanding and consequently a good learning

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outcome was identified as deep learners. Whereas the second group that was associated with a low level of understanding and poor learning outcomes was identified as surface learners (Mcloone & Oluwadun, 2014).

Maslow's hierarchy of needs theory was used also in this study. Needs lower down in the hierarchy must be satisfied before individuals can attend to needs higher up. From the bottom of the hierarchy upwards, the needs are physiological, safety, love and belonging, esteem, and self-actualization (McLeod, 2020). Furthermore, it has made a major contribution to teaching and classroom management in schools. This theory served as a basis in this study since it used teaching strategies to help achieve student's full potential.

Another theory that is crucial to this study is Bloom's Taxonomy. This study used teaching strategies that will help identify the student's cognitive learning abilities based on the six domains of learning. Besides, it was used to assess the level of abilities and skills of the students depending upon the strategies that will be employed.

Chandio and colleagues (2016) recommended that Bloom's Taxonomy should be incorporated in both the teaching and learning process and assessment practices. Also, Forehand (2011) stated that Bloom's Taxonomy provided the measurement with the dramatic changes in society over the last five decades, the Revised Bloom's Taxonomy provides an even more powerful tool to fit today's teachers' needs.

Nowadays, with the implementation of the new curriculum and the new ICT trends, it is a challenge for teachers how to adapt to this fast-changing environment. New teaching strategies may arise however, the most appropriate strategy that is suitable to the interest and learning abilities of the learners must be identified. Maslow's Hierarchy of Needs and the Revised Bloom's Taxonomy are truly great tools in helping the teachers and students clarify what should be done and what will be the goals and objectives to be achieved at the end of learning sessions.

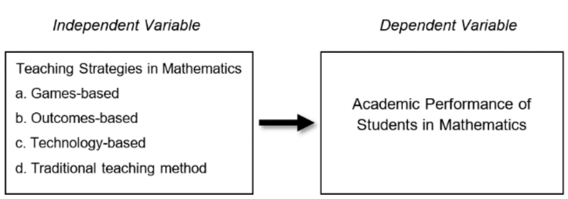

Figure 2. The paradigm of the study.

The integration of four teaching strategies which are the game-based, outcome-based, technology-based, and traditional teaching methods in teaching mathematics (Figure 2) may help encourage students to sustain their interest and work on a specific subject in a formal education setting. The integration of these four teaching strategies into schools could help reform the educational system. However, Fatta, et al., (2009) believed that new strategies cannot be blindly brought into our classrooms without carefully reviewing the process and the data that support its effectiveness. Thus, teachers should guarantee that the integration of the teaching strategies is properly and religiously implemented based on the types of learners.

The researchers wanted to investigate the effect of four teaching strategies on student's academic performance. In general, information that supports the question: What teaching strategy is the most appropriate in the learning process of senior high school students? Is being sought for. The initiative is to improve instructional competence and supervision as well as strengthening it.

METHODOLOGY

Table 1. The Pre-Test – Post-Test Control Group Design

Group		Pretest	Treatment	Post test
Experimental	Group 1	O_1	X_1	O_2
	Group 2	O_3	X_2	O_4
	Group 3	O_5	X_3	O_6
Control	Group 4	O_7		O_8

where:
O_1 – first experimental group pretest (game-based)
X_1 – first treatment/intervention (game-based)
O_2 – first experimental group posttest (game-based)
O_3 – second experimental group pretest (outcome-based)
X_2 – second treatment/intervention (outcome-based)
O_4–second experimental group posttest (outcome-based)
O_5 – third experimental group pretest (technology-based)
X_3 – third treatment/intervention (technology-based)
O_6 – third experimental group posttest (technology-based)
O_7 – control group pretest (traditional teaching method)
O_8 – control group posttest (traditional teaching method)

The quasi-experimental design specifically the equivalent pretest-posttest design was used to determine the treatment effect in the mathematics achievement of the students due to the exposure to four teaching conditions. The randomization process in selecting and assigning samples to the experimental and control groups, was not possible, hence the quasi-experimental research was employed in this study. The randomization provides an equal chance to all the comparable groups to be part of the experimentation (Sevilla et al., 2001). The model for the design is shown in Table 1.

The 80 grade 11 students at Carmen National High School were the participants of this study. The actual sectioning of grade 11 composed of block 1, block 2, block 3, and block 4 was used for the four groups. To determine which group will be assigned as an experimental and control group, simple random sampling was applied. The section name was written on a piece of paper and placed in a box. The first section that was picked was group 1, the second group 2, the third group 3, and the fourth group 4. The number of participants in the four groups was determined by grade matching. The grade matching identified the actual participants of the study. The average of the four groups should be the same. Three to five students with an average of 90 above, ten to fifteen students with an average of 80-89, and two to three students with an average of 75-79 in General Mathematics were chosen. The researchers ensure that each student in one group has a match grade with other students in other groups. There were 20 students identified using grade matching in each group (Table 2).

Table 2. Distribution of Subjects.

Category	n	%
Experimental Group 1(Game-Based)	20	25
Experimental Group 2 (Outcome-Based)	20	25
Experimental Group 3 (Technology-Based)	20	25
Control Group (Traditional Teaching Method)	20	25
TOTAL	**80**	**100**

The researcher-made multiple-choice test was used for pretest and posttest. The initial draft was submitted for face and content validation to the panel of jurors, meticulously selected by expertise in their major field. The panels for validation were the division supervisor in Mathematics and four (4) senior high school teachers from nearby secondary schools with specialization in Mathematics. In addition, almost all of them had experience in teaching Statistics and Probability.

The full experiment procedure comprised of three stages: pre-experimental stage, experimental –with 3 sub-stages- stage, and post-experimental stage as presented in matrix form in Table 3.

The effect size was used when significant difference was found between variables which indicates the significant difference between groups. Significance of the results expresses the practical importance of a study finding as big effect size signifies that the conclusion has practical value, while a small effect size indicates limited practical implications.

RESULTS AND DISCUSSION

Level of Mathematics Performance

Before the treatment, the experimental groups which are a) game-based was in "satisfactory" level of mathematics performance (Table 4) (*M=13.65, SD=2.89*), b) outcome-based was in "satisfactory" level (*M=13.05*, *SD=3.61*), and c) technology-based was in "satisfactory" level (*M=13.60*, *SD=3.75*). The control group which is the traditional teaching method had the same "satisfactory" mathematics performance (*M=13.60, SD=3.02*). The two groups showed the same narrow dispersion of scores about the mean.

After the treatment, the experimental groups which are game-based showed the same "satisfactory" mathematics performance level (*M=21.55*, *SD=3.89*) outcome-based showed the same "satisfactory" mathematics performance level (*M=25.35*, *SD=6.79*), and technology-based showed same "satisfactory" mathematics performance level (*M=22.30*, *SD=5.69*). The same "satisfactory" mathematics performance level is revealed in the control group which is the traditional teaching method (*M=21.40*, *SD=2.58*).

Looking at the overall performance of the respondents, the experimental groups, and the control group both generated a "Satisfactory" performance before the treatment. This implies that the respondents had already prior knowledge of the topics in their previous study in Mathematics. After the treatment, although a higher mean was evident among the experimental groups and control group, still, both groups remained at a "Satisfactory" level of performance. This shows that the respondents demonstrated an improvement in their level of performance after the treatment; however, they remained in the "Satisfactory" level of performance.

Furthermore, the level of performance for each of the experimental groups and the control group is also taken into consideration. Among the experimental groups, respondents assigned with outcome-based got the lowest mean before the treatment. On the other hand, they got the highest mean after the treatment. This implies that the integration of outcome-based in the teaching and learning process is the most effective in enhancing the performance of the students in Mathematics.

The significance of the differences in the experiment was likewise ascertained. To determine if significant differences existed between the groups, the researcher employed Dunnett's t-test for conducting post hoc tests on a one-way analysis of variance (ANOVA). All statistical computations were set at a 0.05 level of significance to determine if the null hypotheses are to be rejected or accepted.

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Table 3. Experimental Stages on the Implementation of Four Teaching Strategies.

Pre-Experimental Stage

Before the actual experimentation, the pretest was administered. After administering the pretest, the data were gathered, and the test for the difference between the two pretests. If in case those significant differences were found in the number of participants, the groups were recomposed until no significant difference will be found in the pretest performance of the participants. This procedure must be done to level the playing field before starting the experiment. The experimental stage started only until the time that the playing field was all leveled in both the experimental and control groups. The implementation of teaching strategies lasted for forty-five (45) days, two (2) hours per session twice a week, every Monday and Wednesday simultaneously.

Experimental Stage

Stage	Game-Based	Outcome-Based	Technology-Based	Traditional Teaching Method
Stage 1	**Pre-Game Discussion** This was the introduction of the lesson and the game-based activity that was integrated. The teacher presented the lesson objectives; introduced the materials to be used, the mechanics, rules, and regulations of the games, and the expected learning outcomes.	**Orientation** This was the beginning of the instruction process where the teacher orients the students of the objectives of the lesson, the outputs that will be made, the scheduled time for submission, materials to be used, and the procedures and rules to be followed.	**Introduction to the Lesson** The teacher presented the objectives of the lesson through a PowerPoint presentation.	**Introduction to the Lesson** The teacher presented the objectives of the lesson.
Stage 2	**Integration of Games** This was the stage where the students work independently or collaboratively through games. a. Truth or Dare b. Game of Thrones c. Jeopardy d. Who Wants to Be a Millionaire? e. Family Feud f. Deal or No Deal g. Who's Brainy?	**Outputs Creation** This was the stage where the students conducted research work, activities, and other tasks in creating and complying with their outputs. The tasks of the teacher here were to monitor the students and to provide assistance to them.	**Presentation of the Lesson through Video and PowerPoint Presentations** In this stage, the teacher showed videos of the lessons and gave additional discussions using PowerPoint presentations. a. The video presentation and additional discussions using PowerPoint presentations for the following topics: a.1 Random Sampling a.2 Parameter and Statistics a.3 Sampling Distributions a.4 The Central Limit Theorem a.5 Point and Interval Estimation a.6 The t-Distribution a.7 Interval Estimate of Population Mean with Unknown Variance a.8 Population Proportion a.9 Length of Confidence Interval and Appropriate Sample Size	**Presentation and Discussion of the Lesson** The teacher discussed the contents of the lesson, provided examples, and demonstrated the process, concepts, and principles of the lessons. a. Lecture Method/Conventional Approach of Teaching
Stage 3	**Post-Game Discussion** This was the stage where the teacher assessed the students learning through feedbacking, brainstorming, and allowed students to relate and connect the learning from the games to the lessons.	**Submission, Analysis, and Evaluation of Outputs** This was the stage where students submit their outputs. Also, it was the stage where the teacher rates the output of her students, gives her evaluation towards the submitted outputs, and provides feedback, recommendations, and suggestions. Outputs: a. Notebook with a written research topic as a result of the library work. b. Individual portfolio as a product of their understanding and application of their learning based on research and library works	**Learning Demonstration and Application** The teacher then provided opportunities for the students to share and demonstrate their learning based on the video and PowerPoint presentations shown.	**Application and Evaluation** The teacher provided seatwork exercises and board work activities

Post-Experimental Stage

After forty-five (45) days of teaching strategies integration and if all learning competencies were met, the posttest was administered. The scores of the participants were tabulated, compared, analyzed by the researcher. To interpret the results of the performance of the students both in pretest and posttest, the following norm was used:

Norms	Descriptive Rating
39.80-50	Excellent
29.60-39.79	Very Satisfactory
10.40-29.59	Satisfactory
9.20-10.39	Fair
0.0-9.19	Poor

Table 4. Level of Mathematics Performance of the Students Before and After the Treatment

Category	Mean	Standard Deviation	Description
A. Pretest			
Experimental			
Game-Based			
Outcome-Based	13.65	2.89	Satisfactory
Technology-Based	13.05	3.61	Satisfactory
Control	13.60	3.75	Satisfactory
Traditional Teaching Method	13.60	3.02	Satisfactory
B. Posttest			
Experimental			
Game-Based			
Outcome-Based	21.55	3.89	Satisfactory
Technology-Based	25.35	6.79	Satisfactory
Control	22.30	5.69	Satisfactory
Traditional Teaching Method	21.40	2.58	Satisfactory

Difference between Pretest Mathematics Performance of Experimental and Controlled Group

There was no statistical significant difference (Table 5) between pretest Mathematics performance of experimental groups and the controlled group as determined by one-way ANOVA [$F(3,76) = 0.145, p = 0.932$]. Therefore, the null hypothesis is accepted. This implies that before the treatment, both the experimental groups and the control group had the same level of performance.

Difference between Posttest Mathematics Performance of Experimental and Controlled Group

There was a statistically significant difference (Table 6) between the posttest Mathematics performance of experimental groups and the controlled group as determined by one-way ANOVA [$F(3,76) = 3.101, p = 0.032$]. Therefore, the null hypothesis is rejected. The overall result indicates that after the treatment, the experimental groups showed improvement in their level of performance in Mathematics. The effect size of 0.2811 means that 28.11% of the change in the mathematics performance can be accounted for by the integration of the four teaching strategies. In other words, the respondents' mathematics performance was 28.11% higher in the post-intervention manifesting a large effect size. According to McLeod (2019), the effect size is a quantitative measure of the magnitude of the experimenter effect. The larger the effect size, the stronger the relationships between two variables.

Since there is a significant difference found between the posttest on mathematics performance of the experimental and controlled group, a Dunnett's t-test post hoc test was administered. As shown in Table 7, it revealed that between the posttest mathematics performance of experimental groups and controlled groups, there is a significant difference in mathematics performance between the posttest of outcome-based and traditional teaching methods (p = 0.015). However, there was no significant difference found between the posttest on mathematics performance of the game-based and traditional teaching method (p = 0.925) and technology-based and traditional teaching method (p = 0.571). Based on the result, among the experimental groups, students assigned with outcome-based had the highest posttest performance as compared to the other control groups. Therefore, it implies that the integration of outcome-based teaching strategy is the most effective among the other teaching strategies.

Table 5. Analysis of Variance (ANOVA) Value on the Differences in the Pre-Test Mathematics Performance between the Experimental and Control Groups.

SV	Sum of Squares (SS)	Degrees of freedom (df)	Mean Squares (MS)	F-ratio	Sig.	Description	Decision	Eta squared (η^2)
Between Groups	4.85	3	1.617					
Within Groups	845.1	76	11.12	0.145	0.932	Not Significant	Accept H_o	0.005
Total	849.95	79						

Table 6. ANOVA value on the Difference between the Post Test on Mathematics Performance of Experimental and Control Groups.

SV	Sum of Squares (SS)	Degrees of freedom (df)	Mean Squares (MS)	F-ratio	Sig.	Description	Decision	Eta squared (η^2)
Between Groups	232.238	3	77.413	3.101	0.032	Significant	Reject H_o	0.2811
Within Groups	1897.15	76	24.963					
Total	2129.388	79						

Table 7. Dunnett's t-Test Value on the Difference between the Post Test on Mathematics Performance of Experimental and Control Groups.

(I) Strategies	(J) Strategies	Mean Difference (I-J)	Sig.	Description	Decision
Game-Based	Traditional Teaching	-.150	.925	Not Significant	Accept H_o
Outcome-Based	Traditional Teaching	-3.950*	.015	Significant	Reject H_o
Technology-Based	Traditional Teaching	-.900	.571	Not Significant	Accept H_o

Table 8. t-Test Value on the Difference between the Pretest and Post Test on Mathematics Performance aof Experimental and Control Group.

Teaching Strategy	Test	Mean	df	t	Sig.	Description	Decision	Cohen's d
Game-Based	Pre	13.65	19	-8.75	.000	Sig.	Reject H_o	-1.96
	Post	21.2						
Outcome-Based	Pre	13.05	19	-7.889	.000	Sig.	Reject H_o	-1.76
	Post	25.45						
Technology-Based	Pre	13.6	19	-9.537	.000	Sig.	Reject H_o	-2.13
	Post	22.3						
Traditional Teaching Method	Pre	13.6	19	-9.831	.000	Sig.	Reject H_o	-2.20
	Post	21.4						

Table 9. ANOVA Value on the Difference in the Mean Gain Scores of Experimental and Control Groups.

SV	Sum of Squares (SS)	Degrees of freedom (df)	Mean Squares (MS)	F-ratio	Sig.	Description	Decision	Eta squared (η^2)
Between Groups	302.838	3	100.946	4.317	0.007	Sig	Reject H_o	0.1456
Within Groups	1777.15	76	23.384					
Total	2079.988	79						

Table 10. Dunnett's t-Test Value on the Difference in the Mean Gain Scores of Experimental and Control Groups.

(I) Group	**(J) Group**	**Mean Difference (I-J)**	**Sig.**	**Description**	**Decision**
Game-Based	Traditional Teaching	-0.25000	0.997	Not Sig	Accept H_o
Outcome-Based	Traditional Teaching	4.60000*	0.010	Sig	Reject H_o
Technology-based	Traditional Teaching	0.90000	0.885	Not Sig	Accept H_o

Difference between the Pre-test and Posttest Mathematics Performance of Experimental and Control Group

The *t*-test for dependence results in Table 8 showed that there is a significant difference between the pretest and posttest of students assigned to game-based (p = 0.000), outcome-based (p = 0.000), technology-based (p=.000), and traditional teaching method (p = 0.000). Although the *t*-value is negative, according to Glen, you can ignore the minus sign when comparing the two *t*-values, as $\pm$ indicates the direction; the p-value remains the same for both directions. By examining the result, both the experimental groups and the control group showed an improvement after the treatment. This means that the students exposed to four teaching strategies improved their mathematics performance after the treatment.

The effect size of -1.96 of game-based means that the mathematics performance of the respondents in post-intervention was at 2.5% above the mean of their pre-intervention performance, the overlap was 32.7%, and there was an 8.3% probability that the respondents have a higher score in the posttest than in the pretest. In other words, respondents' Mathematics performance was 2.5% higher in the post-intervention manifesting a huge effect size.

The effect size of -1.76 of outcome-based means that the mathematics performance of the respondents in post-intervention was at 3.9% above the mean of their pre-intervention performance, the overlap was 37.9%, and there was a 10.7% probability that the respondents have a higher score in the posttest than in the pretest. In other words, respondents' Mathematics performance was 3.9% higher in the post-intervention manifesting a huge effect size.

The effect size of -2.13 of technology-based means that the mathematics performance of the respondents in post-intervention was at 1.7% above the mean of their pre-intervention performance, the overlap was 28.7%, and there was a 6.6% probability that the respondents have a higher score in the posttest than in the pretest. In other words, respondents' Mathematics performance was 1.7% higher in the post-intervention manifesting a huge effect size. The effect size of -2.20 of traditional teaching method means that the mathematics performance of the respondents in post-intervention was at 1.4% above the mean of their pre-intervention performance and the overlap was 27.1% and there was a 6% probability that the respondents have a higher score in the posttest than in the pretest. In other words, respondents' Mathematics performance was 1.4% higher in the post-intervention manifesting a huge effect size.

The difference in the Mean Gain Scores between the Experimental and Control Group

A statistically significant difference in the mean gain scores between the experimental groups and the control group (See Table 9) as determined by one-way ANOVA [$F(3,76) = 4.317, p = 0.007$]. This implies that the mean gain of the four teaching strategies was different from each other. The effect size of 0.1456 means that 14.56% of the change in the mean gain scores can be accounted for by the integration of the four teaching strategies. In other words, the group's mean gain scores were 14.56% higher in the post-intervention manifesting a large effect size.

Since the significant difference was found in the mean gain scores between the experimental and controlled groups, a Dunnett's t-tests post hoc test was administered. On the difference in the mean gain scores of experimental groups and controlled groups (Table 10), there is a significant difference in the mean gain scores of outcome-based and traditional teaching methods (p = 0.010). However, there was no significant difference found in the mean gain scores of the game-based and traditional teaching methods (p = 0.997) and technology-based and traditional teaching methods (p = 0.885). Since outcome-based teaching strategy had the highest mean gain score after the treatment; it is an indication that an outcome-based teaching strategy is the most effective among the four teaching strategies. Large effect size was also observed between the mean gains of the four teaching strategies.

CONCLUSION

With the results presented it is safe to conclude that the respondents before the treatment had a "satisfactory" level of mathematics performance. The same level of Mathematics performances among the groups is comparable. The respondents, after the treatment had a "satisfactory" level of mathematics performance and they had maintained the same level of conceptualization that they had before treatment. Both groups have the same level of mathematics performance from the start of the treatment. Students exposed to outcome-based performed better than students who are exposed to other teaching strategies after the treatment. Game-based, outcome-based, technology-based, and traditional teaching methods significantly improved the mathematics performance of students as shown in their mean gain scores; hence, these can be alternative strategies inside the classroom if all the needed resources are available. However, among the four teaching strategies, outcome-based had the highest mean gain scores.

It must be noted that the participant in this study that are on the same section but not match paired in terms of their grade were still in the group, but their performance is not included in this study, only in the personal records of the teacher.

AUTHORS' CONTRIBUTION

J.T.L.: Conceptualization, methodology, validation, formal analysis, writing original draft, supervision. J.C.P: Conceptualization, formal analysis, investigation, writing original draft.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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