Interactive Computer - Simulation Strategy and Physics Performance of Grade 8 Students

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Abstract-*This study investigated the effects of interactive computer-simulation strategy on Physics performance of Grade 8 students. The sample of the study constituted 80 Grade 8 students of Dr. Ramon De Santos National High School derived from two purposively selected classes. There were 33 students exposed in Interactive computer-simulation strategy (IC-SS) and 47 students were exposed to Traditional teaching strategy (TTS). Data of this study was collected using the Grade 8-Physics Achievement Test (G8-PAT) which utilized as a pre-test and post-test material. Descriptive and inferential statistics were used to test the null hypotheses of this study.*

This study revealed that Grade 8 students subjected in the study were mostly female, the majority had an outstanding and very satisfactory performance in Grade 7 Physics and most of the students had smartphones available at home. The result of this study revealed that the experimental and control group showed a respective increase in mean score from pre-test to post-test. However, the experimental group showed a greater mean difference of 12.21 compared to control group which had a mean difference of 9.06. In terms of performance level in post-test of Grade 8 students, the study revealed that most of the students in the experimental group had high (48.5%) performance level after exposure in IC-SS. While most of the students in the control group had an average (51.1%) performance level after exposure to TTS which is relatively lower compared to the experimental group.

Overall, the study revealed that there is a significant difference in pre-test and post-test performance within groups based on Fc= 254.065 with a significance value of .000. Moreover, results of this study showed a significant difference in Physics performance of Grade 8 students between experimental group and control group based on Fc=17.586 with an associated significance value of .000. Results above implied that IC-SS is more effective in improving Physics performance of Grade 8 students compared to TTS. In addition, only profile sex of students exposed in IC-SS have significant relationship in Physics performance. Findings of the study strongly recommended that science teachers specifically the non-physics major shall adopt the use of Interactive Computer-Simulation in teaching Physics in Grade 8.

Keywords *- Interactive Computer-Simulation, Physics, Physics Performance*

INTRODUCTION

Philippines is the only country in Asia that previously had only 10 years of basic education. This seems to be a disadvantage of Filipino students competing in the international job market. It was believed that a longer period of education would provide a greater and higher quality of education that could equip students into a well-rounded and competitive individual. In this regard, the Philippines system of education adopted the K to 12 curriculums which added three more years in the Philippines' basic education curriculum. In addition, teaching subjects like science were changed and new approaches were introduced to cope with the changing system of Philippine education.

According to Resurreccion,G.A., Taala, W., Adanza, J..[1], the idea in the spiral progression approach is to expose the learners into a wide variety of concepts/topics and disciplines, until they mastered it by studying it over and over again but with a different deepening of complexity. The four learning areas in science which were before taught at different year levels will be taught all at the same time. Within each school year, students are expected to master the topics in four science learning areas. These science learning areas include earth science, chemistry, biology, and physics. Each year, students are exposed to four learning areas enabling students to master the concept on every topic in each learning area.

Based on the old curriculum, Physics subject was used to teach in the higher year level which is totally different in the k to 12 curriculums specifically in spiral progression approach in teaching science. Physics is one of the major areas in Science that brings complex ideas and processes. The process of learning and teaching in Physics is often confronted

with abstract concepts. It makes difficult for students to understand and teachers to teach the concept [2]. In connection to this, the teacher must find effective ways to learn the topics in order for the teacher to deliver and impart the lesson and knowledge of the concept to the students. In this regard, it is pertinent to provide a tool that can make teaching and learning Physics easier and concrete. One of the tools that may be able to use is the concern of this study. The Interactive Computer-Simulation Strategy will be used in teaching the major concepts and topics in Grade 8 physics.

Students nowadays are very fond of using and maximizing their gadgets in browsing the net, chatting, posting and sharing their thoughts through social media. The advent and massive use and existence of technologies nowadays are inevitable and undeniable. Real images and actual videos of certain life processes and phenomena can easily view and understand because of technology. In addition, internet connectivity and Wi-Fi connection strengthen the availability of the above mentioned. From an educational perspective, such visualization can be a very useful tool in allowing the learners to digest complex and abstract processes or ideas into a simple and specific visual object that can be mentally manipulated. Further study has shown that by using well-designed visual tools, students can digest large amounts of information in a relatively short time and construct their own personal visualization of a process. It is indeed, computer and other technology can possibly be used in effective teaching and learning process.

Computer animation, in particular, is a new educational tool that fosters long-term learning by calling the attention of objects during the early step of instructions [3]. Animations stimulate more than one sense at a time and therefore, make them more attention-getting and attention-holding [4]. According to Wieman, C.E., Perkins, K.K., Adams, W.K. [5], Research shows that when a simulation is designed and used based on learning foundations; it will be more effective and useful. The major aim of the teaching-learning process is an achievement in terms of grades, as it is the sole measure of learning in many cases. To achieve this target teachers use diverse teaching methods, including lecture, discussion, and demonstration. Among all these most widely accepted and practiced is the lecture method [6]. This study was conducted to find a better and more effective instructional strategy in teaching physics other than widely use traditional teaching strategy. The main purpose of this study is to examine the impact of Interactive computer simulation instructional strategy in physics performance of grade 8 students.

Integration of the Phet simulation program was used as an instructional material in teaching physics to understand heat and temperature, electricity and light concepts. The various topics mentioned were chosen because of the complexity of concepts associated with it. That student must see in physical and real the process before students able to grasps the concepts. In addition, this study also examined the relationship of Physics performance of grade 8 students exposed in interactive computer simulation and their profile variable such as grades in Physics 7, sex and technology available at home

In the study conducted by Geelen, David & Mukherjee, Michelle [7] which examined the performance of male and female students exposed in visualization. Result of their study shows significant difference on the performance of male and female students. The study revealed that male did better after the use of visualization than females did. On the other hand Huppert,J.,Michal Lomask S and Lazarowitz R [8], conducted a study using a computer simulation program 'The Growth curve of Microorganisms' which primary aim is to investigate the impact of computer simulation on students' academic achievement and on students' mastery of science process skills in relation to students cognitive stages. The result of their study in terms of the sex of students revealed that there is no significant difference in the academic performance between male and female high school students. Thus, this study also examined the effect of Interactive Computer Simulation Strategy in the Physics performance of Grade 8 students in terms of sex.

The researcher come up with this study based on personal experience as the researcher encountered the so-called "Critical content" along various science area specifically the areas not mastered by the researcher. Critical content pertains to a specific topic in science area where the student really hard to understand and teacher hard to teach. Thus, the

researcher sought an appropriate strategy that can lessen if not remove the impact of critical content.

OBJECTIVES OF THE STUDY

The main objective of this study was to determine the effect of Interactive Computer Simulation Strategy in Physics performance of Grade 8 students**.**

The following research questions were formulated to guide the study:

- What is the Profile of the students in terms of sex, grade in Physics 7 and Computer-base technology available at home?
- What is the pretest and posttest performance of Grade 8 Physics students exposed to a)Traditional Teaching Strategy
  b) Interactive Computer Simulation Strategy?
- Is there a significant difference in Physics performance of Grade 8 students within and between groups exposed to
  a) Traditional teaching strategy
  b) Interactive Computer- Simulation Strategy?
- Is there a significant relationship between Physics performance and profile variables of Grade 8 students exposed to Interactive computer-simulation strategy?

MATERIALS AND METHODS

This chapter of the study provides a complete description of the steps that were undertaken to answer the research questions, which primarily aim is to investigate the effects of Interactive computer-simulation strategy in physics performance of grade 8 students.

This study employed experimental, pre-test – post-test design. Two homogenous sections of Grade 8 students within the school year 2018-2019 were subjected to the study. The experimental group of this study comprised 33 Grade 8 students, 12 male and 21 female students who were taught using the interactive computer – simulation strategy. On the other hand, the control group was composed of 47 Grade 8 students, 23 male and 24 female students who were taught using traditional teaching strategy. Both classes were from Junior high school of Dr. Ramon De Santos National High School located at San Antonio, Cuyapo, Nueva Ecija. The age of students involved in the study ranges from 13-14 years. Students involved in the study learned three modules of physics including heat and temperature, electricity and light.

The main instrument that was used in the study was the Grade 8 Physics- achievement test (G8-PAT). This tool was developed by the researcher base on the important points and ideas in three modules of Grade 8 Physics which included Heat and Temperature, Electricity and Light. A comprehensive sixty multiple choice achievement examination with four distractors A-D was developed. Resources were used to construct the test questions such as Grade 8 Science – Learner's Module and Grade 8 science – teacher's module.

The Grade 8 –Physics Achievement Test (G8 – PAT) was validated for content validity by validators including an expert in measurement and evaluation, an expert from Physical Science education, and the Head teacher of the Science department where the researcher is included. Reliability of the test was determined through Pilot testing; the researcher identified a group of grade 8 students from Dr. Ramon De Santos National High School which were not subjected to the study. The selected students answered the Grade 8 Physics Achievement Test (G8-PAT) containing 60 multiple choice test questions. After the Pilot test, the researcher analyzed the test results using the test item analysis template by Balajadia 2014. Test item analysis was done by identifying the 27% of highest scorers and 27% of lowest scorers. Test difficulty index and test discrimination index were considered. The discrimination index is the difference in the percentage of high achieving students who got an item correct and the percentage of low achieving students who got the item correct [9].

Experimental Procedures

The instrument developed which is the G8-PAT was given to the students both in the experimental and control groups as a pre-test-post-test. Prior to the instruction and discussions grade 8 students took pre-test which was given at the second meeting of the class. The same instrument was used as a post-test and was administered at the last meeting or at the end of the session. Students were given ample time to answer the test in order to assess students' performance.

In every session, the researcher prepared ICT integration plan presented in appendix G to O that included activities and instructions for the experimental group of students during the instruction and discussion phase, 33 students under the experimental group was taught using interactive computer-simulation strategy obtain from "PhET INTERACTIVE SIMULATIONS" originally, PhET (Physics Education Technology) focused solely on designing physics simulations, that in time expanded to other science learning areas, such as chemistry, biology earth science and even mathematics [10]. Forty seven students under control group were exposed in traditional teaching strategy which is teacher-centered instruction. Here students were taught using lecture and discussion. Each class or session on both strategies took 60 minutes and lasted for 9 days.

After 3 weeks of experimentation, both experimental and control groups took a post-test at the end of the study. Data from the pre-test and post-test were collected. In this study, Physics performance was coded by determining the percentage difference of scores that were obtained by the students in the pre-test and post-test. The scores that were obtained by the students in the pre-test and post-test were not counted or included in computing students' grades in physics 8.

Data Analysis and Statistics

Students profile variable was analyzed using descriptive statistics such as mean, standard deviation, kurtosis, frequency distribution and percentage. Data that was collected from the pre-test and post-test and was analyzed using various statistical tools. Students' pre-test and post-test performance of both experimental and control groups were analyzed using descriptive statistics such as mean, standard deviation, skewness, and kurtosis. The significant difference in students' Physics performance within and between groups was analyzed using analysis of variance for repeated measures. On the other hand, the relationship between Physics performance and students' profile variables was analyzed using Pearson-r and point biserial.

RESULTS AND DISCUSSION

This chapter reports the results of quantitative analysis to answer research questions. This chapter consists of two main parts, the first part of this chapter tackles Students' Profile variable which include sex, grades in Physics 7 and different technologies available at home.

The second part of this study features the Physics performance of the students before and after exposure in Traditional teaching strategy or Interactive Computer-Simulation strategy. Both experimental and control groups have completed their learning in Physics concepts about heat and temperature, electricity and light. This study assessed students Physics performance by collecting pre-test and post-test scores of the students exposed to different strategies. Results of assessments can show how the Interactive Computer – Simulation Strategy affects the Physics performance of Grade 8 students.

Profile of Grade 8 Physics Students

The profile of the students was determined in terms of sex, grade in Physics 7 and various technologies at their home. Table 1 presents the profile variable of the students.

In terms of sex, Table 1 reveals that in TTS there are 23 male students comprising 48.9% of the group and there are 24 female students comprising 51.1% of the group. On the other hand, data also

shows that in IC-SS there are 12 male students comprising 48.9% of the group and there are 21 female students comprising 63.6% of the group population. The table further reveals that in terms of profile sex female students outnumbered male students in both groups.

Table 1 also presents the profile of the students in terms of their grades in Physics 7. Data revealed that there are 31 or 66% of students in TTS ha a grade of 90-100 which described as outstanding and 15 or 31.9% had a grade of 85-89 described as very satisfactory. Only 1 student or 2.3% had a grade of 80-84 which described as satisfactory.

Meanwhile, Grades in Physics 7 of students under the IC-SS shows that 25 or 75.8% of the students had a grade of 85-89 which described as very satisfactory and only 8 or 24.2% of students had a grade of 90-100 which described as outstanding performance in Physics 7. In terms of Grades in Physics 7 table 1 further reveals that there are more students from TTS that had an outstanding performance in Physics 7 compared to students in IC-SS. On the other hand, there is a student in TTS that had a satisfactory performance which is not found in IC-SS.

Table 1
Profile variables of Grade 8 Physics students

Profile	**Category**	**TTS (N=47)**		**ICCS (N=33)**	
		F	**%**	**F**	**%**
Sex	Male	23	48.9	12	36.4
	Female	24	51.1	21	63.6
Grades in Physics 7	Outstanding (90 – 100)	31	66.0	8	24.2
	Very Satisfactory (85 – 89)	15	31.9	25	75.8
	Satisfactory (80 – 84)	1	2.1	0	0.0
Technology available at home[a]	Smartphones	45	97.8	32	97.0
	Pocket Wifi	32	69.6	23	70.0
	Tablet	28	60.9	23	70.0
	Laptop	24	52.2	24	73.0
	Personal Computer	11	23.9	11	33.0
	Broadband	11	23.9	9	27.0

TS = Traditional Teaching Strategy
ICSS = Interactive computer Simulation Strategy
[a]Multiple responses

The various technologies listed in the survey are broadband, laptop, personal computer, pocket Wi-Fi, smartphone and tablet. In terms of technologies, students were asked to select multiple responses. In this regard, results shows that among the students in TTS the following are the results revealed in table 1. There are 45 students or 97.8% have smartphones at home, 32 students or 69.6% have pocket Wi-Fi, 28 students or 60.9% have a tablet, 24 students or 52.2% have a laptop, 11 students or 23.9% have a personal computer and 11 students or 23.9% have broadband at home.

Results also show that the computer-based technologies available at home among students in IC-SS are the following; 32 students or 97% have a smartphone, 24 students or 73% have a laptop, 23 students or 70% have pocket Wi-Fi, 23 students as well or 70% have tablet, 11 students or33% have personal computer and only 9 students or 27% have broadband.

Pre-test and Post-test Scores of Students exposed to Traditional Teaching Strategy

Table 2 presents the descriptive statistics of the control group (TTS-Traditional Teaching Strategy) and the experimental group (IC-SS- Interactive

Computer-Simulation Strategy) in terms of students' performance in pre-test and post-test.

In Pre-test, data reveals that students taught using the Traditional teaching strategy had a minimum score of 11 and a maximum score of 38 points with a pre-test mean of 22.13 and a standard deviation of 6.84. On the other hand, the results of performance in post-test of students exposed in Traditional teaching strategy had a minimum score of 18 and a maximum score of 49 points with a mean score of 31.19 and a standard deviation of 7.57

Data revealed that the post-test mean were higher compared to pre-test mean which indicates that Physics performance of grade 8 students under traditional teaching strategy increased.

Table 2
Descriptive Statistics on Pre-test and Post-test Performance of Grade 8 Physics Students

Descriptive Statistics	**Traditional Teaching Strategies n=47**		**Interactive Computer Simulation n=33**	
	Pre – test	**Post – test**	**Pre – test**	**Post – test**
Mean	22.13	31.19	26.61	38.82
Std. Deviation	6.84	7.57	6.15	7.17
Minimum	11	18	14	28
Maximum	38	49	37	52
Skewness	**.862***	.169 ns	-.286 ns	.073 ns
Std. Error	.347		.409	
Kurtosis	.230 ns	-.364 ns	-.608 ns	-1.224 ns
Std. Error	.681		.798	

*Significantly skewed, ns Not significant skewed/platykurtic

Pre-test and Post-test Scores of Students exposed to Interactive Computer-Simulation strategy

Table 2 also shows the performance of students taught using Interactive computer-simulation strategy. In pre-test experimental group had a minimum score of 14 and a maximum score of 37 points with a pre-test mean of 26.61 and a standard deviation of 6.15. The performance in post-test of the experimental group, on the other hand, had a minimum score of 28 and a maximum score of 52 points with a mean score of 38.82 and a standard deviation of 7.17. Data further revealed that the post-test mean was higher compared to pre-test mean which indicates that students' performance in physics increased using this strategy.

In relation to the results above table 2 shows that for each of the groups, the post-test means were higher than pre-test means. This indicates that students' performance in Physics increased both in the control group and the experimental group. However, statistical data presented in table 2 reveals that the experimental group had higher performance in the post-test compared to the control group. Podolefsky, N.S., Moore, E.B., Perkins, K.K. [11], agrees that Interactive computer-simulation enhances learners' understanding and retention of information because it gives learners the opportunity to own and control the exploration and discovery of learning.

The combined visual and interactive learning experiences provided by Computer simulation supports the modern learning style of millennial

students which allows them to apply their knowledge thus enables them to get higher scores than the students exposed to traditional teaching strategies. Furthermore, the interactive computer simulation used in this study is in line with the factors mentioned by Mohr, S.D. [12], the various simulations utilized in the conduct of this study provided students a believable representation that enhanced and developed students' knowledge and conceptual understanding and lessen students misconception in respective topics.

Table 2 also shows the skewness and kurtosis distribution of pre-test and post-test scores of both groups. Results reveal that the control group had a pre-test skewness of .862* with kurtosis of .230 ^{ns} and post-test skewness of .169^{ns} with kurtosis of -.364 ^{ns}. On the other hand, data reveals that the experimental group had a pre-test skewness of -.286 ^{ns} with kurtosis of -.608 ^{ns} and a post-test skewness of .073 ^{ns} with kurtosis of -1.224 ^{ns}

Normality Test

By looking at the histogram (a), the peak of scores on pre-test of the control group occurs within 16 to 19. The data of scores reflected in histogram spread from 11 to 38. The figure also distributed on the left side of the histogram. Furthermore, the tail of the graph where the bars are getting shorter is to the right which indicates that performance on the pre-test of a control group is positively skewed which indicates that most of the scores were distributed to the other side of the graph and that the mean score is higher the median.

Histogram (b) on the other hand, shows the scores on the post-test of the control group. The histogram shows two tallest clusters of bars that indicate the peak of the graph which occur within scores of 31 to 35. Scores on the post-test of the control group spread from 18 to 49 which relatively wider compared to the pre-test. The histogram also shows that the data is moderately skewed to the right side of the histogram while most of the scores are distributed to the left side. Thus, it reveals that performance on the post-test of a control group is positively skewed.

In relation to all the results reflected, histograms of both group was platykurtic which means that performance on pre-test and post-test of both groups had shorter and thinner tails and the central peak is lower and broader compared to a normal distribution. According to Mbaskool [13], platykurtic is a distribution in which the peak of the curve of the frequency distribution is comparatively flatter than that of normal distribution.

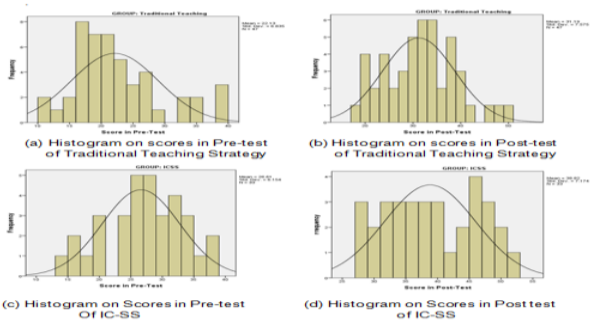

Figure 3. Histogram on Scores in Pre-test and Post- test of Two Groups

Performance of the experimental group on pre-test and post-test are reflected in the histogram (c) and histogram (d). Histogram (c) shows that there are two tallest clusters of bars that indicate the peak of

the graph which occurs within scores of 25 to 29. Scores in the pre-test of the experimental group spread from 14 to 37. The tail of the graph is moderately skewed to the left side of the graph as shown in the histogram which indicates a negative skewness this means that there are few low scores. William, Y. [14], shows that distribution is negatively skewed if the scores fall toward the lower side of the scale and there are very few higher scores.

Post-test performance of the experimental group is reflected in the histogram (d). the histogram shows the peak of post-test performance of the experimental group occurs in scores of 45 to 47 and scores reflected in histogram spread from 28 to 52. In addition, the histogram also shows that the post-test performance of experimental group is moderately skewed to the right which indicates a positive skewness. William, Y. [14] stated that a distribution is positively skewed if the scores fall toward the lower side of the scale and there are very few higher scores.

Frequency Distribution of Performance level of Grade 8 students in Physics

Table 3 presents descriptive statistics that report the performance level of the control group and experimental group. Performance of students in both groups in pre-test and post-test have been classified into five levels such as Very low, Low, Average, High and Very high.

Table 3
Frequency Distribution of Performance Level in the Pre-test and Post-test of Grade 8 Physics Students Exposed to TTS and IC-SS

Level	Score Range	Traditional Teaching Strategies n=47				Interactive Computer Simulation n=33			
		Pre-test		Post-test		Pre-test		Post-test	
		f	%	F	%	f	%	f	%
Very High	49 – 60	0	0.0	1	2.1	0	0.0	3	9.1
High	37 – 48	3	6.4	11	23.4	2	6.1	16	48.5
Average	25 – 36	11	23.4	24	51.1	21	63.6	14	42.4
Low	13 – 24	31	66.0	11	23.4	10	30.3	0	0.0
Very Low	0 – 12	2	4.3	0	0.0	0	0.0	0	0.0

The performance level in the pre-test of the control group are as follows; High 6.4% or 3 students, Average 23.4% or 11 students, Low 66% or 31 students and Very low 4.3% or 2 students. None among the students had a very high performance level during the pre-test. In addition, the data also shows that most of the students in the control group had a low performance during the pre-test.

Furthermore, the following are the performance level of the control group in the post-test. Very high 2.1% or 1 student, High 23.4% or 11 students, Average 51.1 % or 24 students, Low 23.4% or 11 students. Based on the results none among the

students exposed in Traditional teaching strategy had a very low- performance level in the post-test. Results show that the performance level of students increased after exposure in traditional teaching strategy

On the other hand, the following are the results of students' performance level in the pre-test of the experimental group; High 6.1% or 2 students, Average 63.6% or 21 students, low 30.3% or 10 students. None among the students from the experimental group had a very high and a very low-performance level. Most of the students exposed to Interactive computer-simulation strategy had an Average performance level in pre-test.

Performance level in the post-test of the students in the control group are as follows; Very high 9.1% or 3 students, High 48.5% or 16 students and Average 42.4% or 14 students. None among the students from the group found had a low and Very low-performance level in Post-test. Results show that students' performance level in Physics increased after exposure in interactive computer-simulation strategy

Difference in Physics performance of Grade 8 Students

Table 4 features analysis of variance for repeated measures in order to determine if there is a significant difference between pre-test and pot-test performance within groups and between groups.

Table 4
Difference in Physics performance of Grade 8 Students within and between groups

Difference	Mean		Mean difference	F – computed	Sig.
Within (Pretest and Posttest)	Pre test	24.37	-10.63	**254.065****	**.000**
	Post test	35.00			
Between (Traditional and ICS)	Traditional	26.66	-6.05	**17.586****	**.000**
	ICS	32.71			

**Significant at 1% level

Within group, the table shows that Pre-test had a mean of 24.37 and post-test had a mean of 35.00. Overall, the table shows that there is a significant difference in the pre-test and post-test performance in Physics of Grade 8 students within an instructional group based on the fc = 254.065 with an associated significance value of .000 which is lower than the level of significance (.05). this means that both strategies shows a significant effect in Physics performance of Grade 8 students from pre-test to post-test.

The difference in Physics performance between students exposed to Traditional teaching strategy and Interactive computer-simulation strategy was revealed in Table 4. Traditional teaching strategy had a mean score of 26.66 while the experimental group had a mean score of 32.71. In relation to this, results indicate that there is also a significant difference in the mean performance of those students exposed to traditional teaching strategy and Interactive computer-simulation strategy based on the Fc = 17.586 with an associated significant value of .000 which lower than the level of significance (.05). The null hypothesis assuming that there is no significant difference in Physics performance of Grade 8 Physics students along traditional teaching strategy and interactive computer-simulation strategy was rejected.

Results indicate that students' Physics performance from pre-test to post-test in both strategies show a statistically and significantly different. However, when Physics performance in post-test of the control group and experimental group was compared, results show that there is a statistically and significantly difference in Physics performance of Grade 8 students. This shows that learning with IC-SS helped students improve their scores from pre-test to post-test, instruction with Interactive computer-simulation is more effective than the traditional instruction [15].

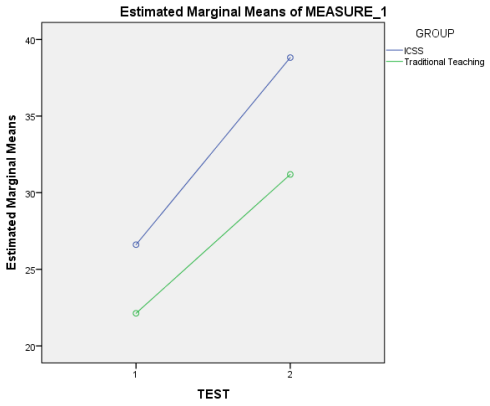

Figure 4. Profile Plot of the difference in
Physics Performance of Grade 8 Students within and between groups.

Asogwa, U.D., Muhammed, A., Asogwa, E.N. and Ofoegbu, T.O. [16] supports that the findings above are in line with the fundamental belief of constructivism which suggests that students have an intuitive derive to make sense of their own environment. Thus, students can create their own interpretations according to their prior learning experiences. As shown in Figure 3, The above results mean learning with Traditional teaching strategy and Interactive computer-simulation strategy helped students improve their scores from pre-test to post-test. However, because of the effect size difference in the mean scores of experimental group is greater than the control group the Interactive computer-simulation strategy is more effective than Traditional teaching strategy in improving students' performance in the post-test.

The immediate feedback and interactive engagement of computer simulations allow learners to easily repeat trials and also allow learners to work on their own pace and thus develop conceptual reasoning and deeper understanding [17]. Adegoke, B.A and Chukwunenye, N. [18] significant findings showed that the abstract nature of Physics perceived by the learners may be extracted if interactive computer simulated lessons are used in schools. These findings are in accordance with Kuti, J.B. [19], the use of multimedia in the form of computer simulation may lessen the abstract nature of Physics and accordingly be used to engage more learners to study Physics.

Table 5
Relationship of Students, Profile variables and Physics Performance in Post-test of Grade 8 Students

Profile	**Physics Performance**	
	Interactive Computer-Simulation Strategy	
	R	**Sig.**
Sex	**.378***	**.030**
Grades in Physics 7	-.055	.761
Number Technology available at home	.029	.873

*Significant at 5% level

Table 5 also shows the result of the relationship between physics performance in relation to profile variables of students exposed in Interactive computer-simulation strategy and post-test scores. The ***r*** value of .378 with a significant value of .030 reveals that there is a significant relationship between sex and physics performance in the post-test. Females tend to have a higher performance than males. The result of this study agreed with the findings of a study conducted which revealed that females perform better in science subject compared to their counterparts. Results imply that female students valued academic activities more than males [20].

On the other hand, ***r*** value of -.055 with significant value of .761 reveals that there is no significant relationship on Grades in Physics 7 and Physics performance in the post-test. Data further reveals ***r*** value of .029 with a significant value of .873 which reveals that there is no significant relationship on technologies available at home and Physics performance on post-test.

CONCLUSIONS

On the basis of the results, the following are the conclusions which have been drawn from this study.

1. There are more female Grade 8 students than male Grade 8 students in both groups. In Traditional teaching strategy, most of the students have outstanding performance while students under Interactive computer-simulation mostly had a very satisfactory performance in Physics 7. In addition, smartphones appeared to be the most common computer-based technology available at home among students.
2. Interactive Computer – Simulation strategy helped Grade 8 students improved their performance in Physics. Since it exhibits an increase from pre-test to post-test compared to the control group which is traditional teaching strategy.
3. There is a significant difference in Physics performance of grade 8 students within and between groups. Interactive Computer-Simulation Strategy is more effective than the Traditional teaching strategy.
4. There is a significant relationship between sex of students and their Physics performance when exposed to interactive computer-simulation strategy. Female students perform better than male students. The profile sex influenced the performance ^{of} the students in Physics 8.

RECOMMENDATIONS

The following recommendations have been made based on the findings and conclusions of the study.

1. Science teachers shall encourage students to use Interactive-computer simulation to enhance the performance level of students in physics.
2. Encourage science teachers to use Interactive computer simulation strategy in teaching and be more resourceful and creative in selecting interactive computer-simulation relevant to a particular topic to assure effective teaching and learning process.
3. Science teacher shall encourage male students to download and use the interactive computer – simulation than computer games to enhance their performance in Physics.
4. School administrator shall support teachers in using Interactive computer simulation as an instructional strategy. In addition, administrators shall conduct more training and seminars about interactive computer simulation.
5. School administrators shall also add more computer units through the help of stakeholders to cater to the students in using computers for computer simulation.

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