

IMPROVING STUDENTS' ACADEMIC PERFORMANCE IN GRADE 7 PHYSICAL EDUCATION THROUGH E-GAMES STRATEGY: A MIXED-METHOD ANALYSIS

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ABSTRACT

The use of computer-based games for educational setting can improve the learning process of the students. With the emerging use of computer-based instructional strategies for the 21st century learning, teachers are obliged to innovate and modify techniques that would cater the interest of the students. This two-group quasi-experimental action research sought to investigate the effectiveness of E-Games to improve the students' achievement in Physical Education (PE) among the Grade 7 students of Pamibian Integrated School. A total of 30 students served as the participants in the control (15 students) and experimental groups (15 students). The control group made use of the traditional method (TM) of teaching while the experimental group was exposed using E-Games method as intervention. Pre-test and post-test with 30 items determined the level of achievement of students before and after the treatment. Results revealed that before the intervention, the level of achievement of the students in the control group is satisfactory and also satisfactory in the experimental group. After the intervention, the control group belonged to the satisfactory level and the experimental group improved to very satisfactory. It is concluded that the use of E-Games is an effective instructional strategy in improving the achievement of Grade 7 students in Physical Education (PE) at Pamibian Integrated School (PIS). The students perceive the intervention as engaging and motivating; interactive and hands-on; foster unity and camaraderie; not boring; quite difficult at first but provides learning. The study recommends the use of the CSG in improving the achievement of the students in Physical Education and may be applied in a longer duration.

Keywords: Computer-based sports games strategy, physical education, Candelaria Zambales, Philippines.

1. INTRODUCTION

It is indeed correct that according to Hari Krishna Arya of India, teachers will not be replaced by technology, but teachers who do not use technology will be replaced by those who do. In the modern era, students are more indulged to use computer at home than playing sports activities outside. By doing so, students perform passive, non-participative and reluctant to try new sports activities making them to be weak to attain healthy lifestyle and obtaining below average academic performance in Physical Education (PE) learning activities and various concepts provided by PE teacher. Zamani, Chashmi, and Hedayati (2009), investigated the effect of addiction to computer games on physical and mental health of students, and found that addiction to computer games affects various dimensions of health and increases physical problems, anxiety and depression, while decreases social functioning disorder. Thus, the researcher used computer games as strategy to improve performance of students in PE. So these students could have more hand on practices in computer games, therefore, they can easily adopt the computer based activities found of using E-games strategy for both qualitative and quantitative experimentation.

In this context, the researcher focused to reinvent valuable innovative strategies to improve students' academic performance in PE among the Grade 7 students of Pamibian Integrated School using computer-based games. It was aimed to explore the capability of the students to adjust their learning environment in computer games by making them suitable to achieve good learning performance, as well as achieving good academic standing in classroom teaching and learning situations. According to Tennyson and Jorczak (2008) as cited in Pohl, Rester, and Judmaier (2009), the simulation games offer the highest potential as instructional games because they motivate students to apply-real world behavior. Similarly, the study of Taclay (2013) has comparable concentration on what the research intends to find out, he investigated the effects of games on achievement in geometry in a public high school in the Division of Nueva Vizcaya, Philippines. Taclay (2013) concluded that the students who were exposed to mathematical games strategy obtained higher achievement scores compared to students taught using the traditional

method. As a result, the researcher recommends the use of mathematical games strategy in presenting and discussing lessons for the purpose of achieving higher grades in Geometry.

The use of instructional games motivates student to apply-real world behavior (Tennyson, & Jorczak, 2008). A study conducted by Sherry, Lucas, Greenberg, and Lachlan, (2006), investigating the reasons for playing video and computer games by adolescents and their game priorities on 535 adolescents in age 15-20 in the West USA found that 68% of the adolescents had these games as their weekly entertainment. Moreover, it has been found that boys primarily playing sports and violent games. Diverse activities have been reported in research papers published in peer-reviewed journals to improve children's executive functions e.g., reasoning, working memory, and self-control. These activities include computer-based training, certain school curricula, and training in aerobics, traditional martial arts, yoga, or mindfulness (Diamond & Lee, 2011). Although computer and video games are most often used for entertainment purposes, it is important to understand that they are enormously powerful learning tool as well. Realizing that computer based games can also express many different messages such as to create an effective learning opportunities (Prensky, 2006).

Based on the studies of Klingberg et al. (2005); and Thorell, Lindqvist, Bergman-Nutley, Bohlin, and Klingberg (2009), it is clear that working memory and reasoning can be improved in children via computer-based training and specially designed games. The most researched approach for improving children's Executive Functions (EFs), and one repeatedly found to be successful, is Cogmed computerized training. When Cogmed training is on working memory, working memory improves even on untrained tasks. In addition, according to Smith, (2016) games such as Minecraft have an opportunity for students to apply and sharpen skills such as problem solving and analytical thinking. The study also found that playing computer games can boost a student's school performance and should be incorporated into classroom activities. Gibbs (2016) in his article entitled, "positive link between video games and academic performance", the study found that students who played online games almost every day scored 15 points above average in mathematics and reading tests and 17 points above average in science.

The use of E-games strategy among the Grade 7 students is a potential solution to improve the students' learning performance and obtaining higher grades in classroom physical education topics. The E-games strategy is recommended to PE teachers as an effective classroom intervention for students with poor learning results in Physical Education due to high exposure on internet games and the use of social media. Thus, this study aimed to investigate the effectiveness of E-games using qualitative and quantitative method to improve the students' academic performance in Physical Education subject among the Grade 7 students of Pamibian Integrated School, Municipality of Candelaria.

2. METHODS AND MATERIALS

2.1 Study Design

The study utilized two-group quasi-experimental research design comparing the two variables, the control and experimental group using pretest and posttest. The Group 1 was assigned as the control group while the Group 2 was assigned as the experimental group. The control group was given Tradition Method (TM) of classroom instruction while the other group served as the experimental group was testing the effectiveness of Computer-based Sports Games or E-games strategy as classroom intervention in Physical Education topics.

2.2 Participants

The participants of this study were the Grade 7 students of Pamibian Integrated School for the academic year 2017-2018. The participants were between 11-12 years old. The sample of the study includes thirty (30) randomly selected male and female students distributed over the two groups: the Group 1 had fifteen (15) participants as the control group coming from the 7-Phythagoras, while the Group 2 composed of student from 7-Euclid are assigned as the experimental group with also fifteen (15) participants.

The groupings of the two groups were determined based on the first quarter Physical Education grade result. The students selected were recognized by the classroom adviser/PE teacher as low performing students commonly due to high participatory rate and involvement on computer games and other similar activities. The study investigated the effect of Computer-based Sports Games to improve the students' academic performance among the Grade 7 students in Physical Education subject as new strategy to promote effective classroom instruction. Some of the ethical concerns considered by the researcher is the informed consent among the participants, the anonymity of the participants' identity and the confidentiality of the written journal entries.

2.3 Data Collection

The researcher asked permission from the school principal to conduct the study through a formal letter. Upon the approval of the research proposal, the researcher asked the first quarter final grade from the advisers to serve as basis for the selection of the participants and pairing of the students. Students with higher grades were matched with those with low grades. The researcher administered the pretest to determine the level of achievement of the students prior to the treatment. The interventions were given in three weeks. After the application of the treatment, a post-test was administered.

2.4 Instrument

Pretest and posttest were designed by the researcher. Likewise, the researcher used sports applications which can be downloaded online using personal computer through internet access. A total of three (3) personal computers from the schools' computer laboratory were used to perform the student assessment. The researcher used sports applications such as Taekwondo World Champion as intervention from the second quarter Physical Education topics such as Individual Sports, Dual Sports and combative sports. The focus of this is to know how the online sports applications can improve the academic performance in Physical Education subject of the Grade 7 students who have attained high addiction on the use of computer games necessary to decrease their school and classroom participation, performance and attendance.

2.5 Data Analysis

The consolidated data' were gathered, interpreted and analyzed using the different statistical tools. Mean Comparison was used to compare the level of performance of the class before and after the study as reflected on their average scores of the class during pre-test and post-test. Independent t-test was used to measure the significant difference in the average score of the pupils in the pretest and post-test both in the control and experimental group. Standard Deviation was used to measure how the class is distributed. This determines whether the class is homogenous or heterogeneous in terms of their academic performance on the subject matter. Thematic analysis was done in the qualitative data gathered from the students' journal entries. Themes were assigned based from the categorized significant statements from the students' writings.

3. RESULTS AND DISCUSSION

Pre-test results determined the level of students' achievement in physical education in the control and experimental groups prior to the intervention is presented in Table 1.

Table 1: Level of students' achievement in physical education before the intervention

Pre-Test Scores	Control Group		Experimental Group	
	Frequency (n=15)	Percent (100.00)	Frequency (n=15)	Percent (100.00)
19-24	4	26.67	1	6.67
13-18	5	33.33	9	60.00
7-12	6	40.00	4	26.67
1-6	0	0.00	1	6.67
Average	14.67 (Satisfactory) sd = 4.70		13.67 (Satisfactory) sd = 3.72	

Legend: 25-30 (Outstanding); 19-24 (Very Satisfactory); 13-18 (Satisfactory); 7-12 (Fairly Satisfactory); 1-6 (Did Not Meet Expectations)

The results of the pre-test of students in the control group showed that the group belonged to the satisfactory level in terms of achievement in Physical Education as revealed by the weighted mean of 14.67 (sd=4.70). The test scores came majority from the bracket of 7 to 12 out of the 30-item PE test. Meanwhile, the experimental group gained a mean score of 13.67 in the pre-test which is likewise classified as Satisfactory. Majority of the students got scores within the bracket of 13 to 18 out of the 30-item test.

Before the intervention, the academic performance of both groups is very low. The mean scores are almost similar in the control and experimental group. Fischer, Hilton, Robinson and Wiley (2015) believe that properly selected interactive learning tools can improve the quality of learning new material. DeBacker, van Keer and Valcke (2015) consider that students can be provided with additional information while completing computer-based control tasks. Furthermore, Barker-Ruchti, Barker, Rynne and Lee

(2016) argued that computer training program is required for successful training of students and athletes since it provides strong performance (Kumar, & Mohammad, 2019).

The level of achievement in Physical Education (PE) in both groups was determined after the treatment. The control group used the traditional method of teaching while the experimental group used the Computer-Based Sports Games. Table 2 shows the frequency and percentage distribution of students' scores in posttest.

Table 2: Level of students' achievement in physical education after the intervention

Post-Test Scores	Control Group		Experimental Group	
	Frequency (n=15)	Percent (100.00)	Frequency (n=15)	Percent (100.00)
25-30	0	0.00	0	0.00
19-24	4	26.67	8	53.33
13-18	8	53.33	7	46.67
7-12	3	20.00	0	0.00
1-6	0	0.00	0	0.00
Average	16.27 (Satisfactory) sd = 3.75		18.73 (Very Satisfactory) sd = 1.98	

Legend: 25-30 (Outstanding); 19-24 (Very Satisfactory); 13-18 (Satisfactory); 7-12 (Fairly Satisfactory); 1-6 (Did Not Meet Expectations)

The results of the post-test of students in the control group showed that the group still belonged to the Satisfactory level in terms of achievement in Physical Education as revealed by the weighted mean of 16.27 (sd=3.75). The test scores came majority from the bracket of 13 to 18 out of the 30-item PE test. Meanwhile, the experimental group gained a mean score of 18.73 in the post-test which has improved to Very Satisfactory. Majority of the students got scores within the bracket of 19 to 24 out of the 30-item test.

It can be noted that the experimental group has improved based from the post-test mean score. This supports the findings of Papastergiou (2009) that electronic games improve young people's knowledge, skills, attitudes and behaviours in relation to health and physical exercise. The use of interactive electronic games can potentially enhance young people's physical fitness, motor skills and motivation for physical exercise, (Papastergiou, 2009). Aside of intellectual development for young students, the study of Miguel and Nussbaum (2003) confirmed that the use of video games as academic intervention in Physical Education also improve motivation to learn, classroom dynamics and a positive technological transfer of experimental tool for learning (Kumar, & Mohammad, 2019). Moreover, Papastergiou (2009) added that gaming approach was more effective in promoting students' knowledge of computer memory concepts and more motivational than the non-gaming approach in teaching. To measure the significant difference in the achievement of the students in Physical Education using the traditional method and using the Computer-Based Sports Games, the mean difference between the scores in pretest and posttest in the Achievement Test is presented in Table 3.

Table 3: The *t*-test of the pretest and posttest mean gain of the control and experimental groups in the PE test

Group	Posttest Mean	Pretest Mean	Gain Score	<i>t</i> -value	<i>p</i> -value	Remarks
Control	16.27	14.67	1.60	2.037	0.061	Not Significant
Experimental	18.73	13.67	5.06	6.185	0.000	Significant

p<0.05

*equal variances assumed

Using the *t*-test for paired samples, the control group obtained a gain score of 1.60 from the 16.27 and 14.67 mean scores of the posttest and pretest, respectively. The *t*-value obtained was 2.037 and the *p*-value was 0.061. This means that there is no significant difference in the control group using the traditional method of teaching.

Meanwhile, the experimental group registered a gain score of 5.06. This gain score is considered significant based on the *t*-test results. The computed *t*-value and *p*-value are 6.185 and 0.000, respectively. The *p*-value is less than the level of significance set in the study; therefore there is a significant difference between the pretest and posttest scores of the students exposed with the Computer-Based Sports Games. A substantial body of studies revealed that computer games could establish powerful learning environments (Dede, 2000; Gee, 2003; Honey & Hilton, 2011; Oblinger, 2006; Shaffer, 2006; Squire, 2011). Similarly, the present study confirmed the effectiveness of computer-based sports games in increasing achievement in Physical Education. Moreover, the effectiveness of computer games in class was confirmed in the aspects of learning, motivation and classroom dynamics (Rosas et al., 2003). The traditional method of teaching is

not effective as revealed by this study. The students who were exposed with computer-based sports games achieve better than those students who were not given the same treatment. This is revealed by the higher mean gain score of the experimental group which is 18.73 compared to the gain score of control group which is 16.27. One method of encouraging physical activity which has been the focus of some interest is the use of computer-based activity programmes. In typically developing children such programmes have been shown to improve the general level of fitness of participants, particularly in those children who have a low level of initial fitness (Lanningham-Foster, et al. and Grave, et al as cited in Dickinson & Place, 2014). To elicit students' perceptions in the use of computer-based sports games, the teacher-researcher asked the students to write a reflective journal entry with a key question: How do you find the use of computer-based sports games in our class? The following text table shows the students' varied perceptions in the use of the intervention in their class (Table 4).

Table 4: Perception of the students in the use of computer-based sports games

Emerging Theme	Categorized Significant Statements*
Engaging and motivating	<ul style="list-style-type: none"> I enjoyed the sports applications we manipulated in the computer (EP2). It excites me whenever our teacher asks us to play using the computer. I love the Table Tennis Touch that we played (EP10).
Interactive and hands-on	<ul style="list-style-type: none"> I feel motivated in using the computer-based sports games. It's fun (EP4). The computer applications are interactive. I love playing them (EP5). It's not hard to do, it's hands-on and interactive (EP12).
Fosters unity and camaraderie	<ul style="list-style-type: none"> We enjoy the computer-based applications. Not only did we learn but we become closer with each other (EP3) I enjoyed playing the sports in the computer especially with the assistance of my classmates (EP1).
Not boring	<ul style="list-style-type: none"> I find it very different. It's not boring. It's fun to play (EP15).
Quite difficult at first	<ul style="list-style-type: none"> The technique used by my teacher is quite hard in the beginning but later, I was able to enjoy it (EP14).
Provides learning	<ul style="list-style-type: none"> I learned a lot from the strategy of my teacher in teaching us (EP7).

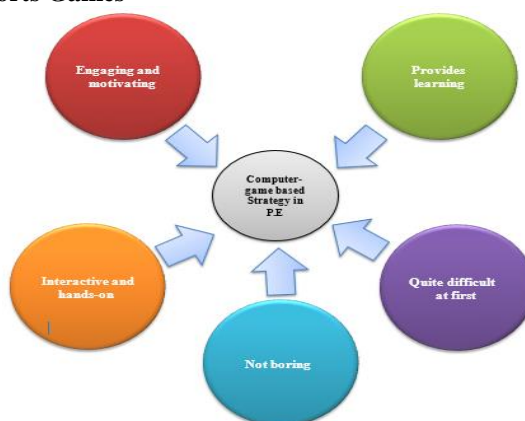
*Some responses were translated to English for easy interpretation

[EP means Experimental Participant number, used for coding the name's identity]

Based from the students' responses, six themes emerged on the students' perceptions on the computer-based sports games. According to the students, the following were the emerged themes as follows: the intervention employed by the teacher is engaging and motivating; interactive and hands-on; foster unity and camaraderie; not boring; quite difficult at first but provides learning.

According to Thomas (2017), states that...It implies that the students who were exposed in the intervention found the strategy very positive. A subtler impact of video game technology on education is the expectation by children that all learning must take a gaming approach and be "fun". Classroom teachers find they must compete with numerous video game "personalities" when determining the lesson plans for the day. The demand for entertaining education has given rise to "edutainment" media (Dorman, 1997). The findings also corroborate the study of Okanlawon, Fakokunde, Yusuf, Abanikannda, and Oyelade (2017) that students have positive attitude towards instructional games and there is a significant relationship between students' attitudes towards the instructional games and their achievement. Furthermore, computer-based interventions offer a visual and non-judgmental opportunity for them to take part in games that make no social interaction demands (Dickinson & Place, 2014).

Figure 1: A diagram that shows the qualitative interpretation of the perception of the students in the use of Computer-Based Sports Games



The following are the transcript of responses in the students' journal entries using the Guide Question: What is your perception in the use of the computer-based sports games?

EP1	I enjoyed playing the sports in the computer especially with the assistance of my classmates.
EP2	I enjoyed the sports applications we manipulated in the computer.
EP3	We enjoy the computer-based applications. Acquired not only learning but we become closer with each other.
EP4	I feel motivated in using the computer-based sports games. It's fun.
EP5	The computer applications are interactive. I love playing them.
EP6	I enjoyed the activity.
EP7	I learned a lot from the strategy of my teacher in teaching us.
EP8	It's not hard to do and fun.
EP9	I like the activity.
EP10	It excites me whenever our teacher asks us to play using the computer. I love the Table Tennis Touch that we played.
EP11	I love the given activity.
EP12	It's not hard to do, it's hands-on and interactive.
EP13	I enjoyed the task we did.
EP14	The technique used by my teacher is quite hard in the beginning but later, I was able to enjoy it.
EP15	I find it very different. It's not boring. It's fun to play.

Evaluating transcript responses of the participants were the critical and most exciting part of a qualitative research. It gives the researcher more diverse explanations on how Grade 7 participants answer the specific question, "What is your perception in the use of the E-games approach in Physical Education?"

The Qualitative Participant No. 1, for the theme "Quality Education" answered "*I enjoyed playing the sports in the computer especially with the assistance of my classmates*". The participant's statement explained that he enjoyed playing sports games though the use of computers due to the assistance given by his/her classmates in a collaborative method.

The Qualitative Participant No. 2, answered "*I enjoyed the sports applications we manipulated in the computer*". The participant's statement explained that the use of computer-based application in the learning process can effectively improve students' behavior on class participation because of the enjoyment they acquired from it.

The Qualitative Participant No. 3, answered "*We enjoy the computer-based applications. Acquired not only learning but we become closer with each other*". The participant's statement explained the use of e-games approach in teaching not only cater students' cognitive development but also a venue to perform quality bonding to improve camaraderie among learners.

The Qualitative Participant No. 4, answered "*I feel motivated in using the computer-based sports games. It's fun*". The participant's statement explained that motivation occurred when students are hands-on on the given electronic games, furthermore, this also creates a mind of fun to the students because e-games is a new Physical Education that would improve them holistically.

The Qualitative Participant No. 5, answered "*The computer applications are interactive. I love playing them*". The participant's statement explained that using computers in teaching creates a source of interaction towards a mindful delivery of discussion and innovation to the students. Students are eager to play e-games because it connects them to the 21st century learners' activity while learning Physical Education module intended for Grade 7.

The Qualitative Participant No. 6, answered "*I enjoyed the activity*". The participant's statement explained that they enjoyed doing the e-games activity because it's a new strategy for them to enhance learning.

The Qualitative Participant No. 7, answered "*I learned a lot from the strategy of my teacher in teaching us*". The participant's statement explained that learning comes when the teacher innovates techniques and strategies in teaching Physical Education.

The Qualitative Participant No. 8, answered "*It's not hard to do and fun*". The participant's statement explained that when the teacher applied innovative techniques and strategies in teaching, the students will never be tired of acquiring learning because they made feel the excitement and fun of learning through the use of computer-based games.

The Qualitative Participant No. 9, answered "*I like the activity*". The participant's statement explained that he/she felt happy of doing the activity which introduced by the Physical Education teacher. This made them realized that teaching Physical Education inside the classroom will never been boring if the teacher seeks techniques and innovations like computer-based sports games to improve his/her teaching and learning process.

The Qualitative Participant No. 10, answered "*It excites me whenever our teacher asks us to play using the computer. I love the Table Tennis Touch that we played*". The participant's statement explained they are very optimistic to do the Physical Education activity using computers. Student interactions were became alive and their cooperative learning exceeds the normal expectation of the teacher.

The Qualitative Participant No. 11, "*I love the given activity*". The participant's statement explained that they have a positive interaction about the learning strategy that they engaged in. Due to the

fact that the intervention was used a computer game-based strategy, this helps the students to apply their current learning on computers inside the classroom setting.

The Qualitative Participant No. 12, "*It's not hard to do, it's hands-on and interactive*". The participant's statement explained that the use of computer-based strategy performs students to become hands-on and produces interactive delivery of learning for those students who perform below average in classroom discussion.

The Qualitative Participant No. 13, "*I enjoyed the task we did*". The participant's statement explained he/she enjoyed well the task that they teacher gave them. Using computers, students had fun of doing the task assigned to them.

The Qualitative Participant No. 14, "*The technique used by my teacher is quite hard in the beginning but later, I was able to enjoy it*". The participant's statement explained the teacher used higher order thinking skills from the beginning until the end of the activity, however, it entails a deep sense of mastery from each activity which the student needs to acquire.

The Qualitative Participant No. 15, "*I find it very different. It's not boring. It's fun to play*". The participant's statement explained he/she found the test different from many test he/she hurdled in physical education, however, amidst of difficulty, students found the fun and excitement due to the fact that the computer-based game activity is a new intervention that would enhance their effectiveness in computers and in Physical Education subject, as well.

4. CONCLUSION

Based on the gathered, analyzed and interpreted data, the following conclusions have been made-

- Before the intervention, the level of achievement in Physical Education of the students in the control group is Satisfactory as revealed by the weighted mean of 14.67 (sd=4.70). In the experimental group, the level of achievement of the students is Satisfactory based from the mean score of 13.67 (sd=3.72).
- After the intervention, the control group, which was exposed to traditional method (TM) of teaching, belonged to the Satisfactory level in terms of achievement in Physical Education as revealed by the weighted mean of 16.27 (sd=3.75). While the experimental group improved to Very Satisfactory based from the mean score of 18.73 (sd=1.98).
- There is a significant difference in the pretest and posttest scores of students in the experimental group using the computer-based sports games which posted a gain score of 5.06. The computed t-value and p-value were 6.185 and 0.000, respectively.
- The students perceive the intervention as engaging and motivating; interactive and hands-on; foster unity and camaraderie; not boring; quite difficult at first but provides learning.

The use of E-games strategy is an effective instructional strategy in improving the achievement of Grade 7 students in Physical Education (PE) at Pamibian Integrated School (PIS). The experimental group yielded a higher gain score, implying that the students exposed in CSG perform better than those taught using the traditional method of teaching. The students likewise have positive perceptions regarding the use of the said intervention in the class.

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