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EFFECT OF COMPUTER GAMES ON SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN COMPUTER STUDIES

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ABSTRACT: The study determined the effect of Computer Games on Senior Secondary School Students' Achievement in Computer Studies. The design of this study was non-equivalent quasi-experimental research. The population for the study was 4832 SS II students in the 30 secondary schools in Enugu Education zone. The sample size of the study was 236 SS II students with 117 students in control group and 119 students in Experimental group. The Experimental group was taught Computer Studies using Computer Games while the Control Group was taught using Conventional method. Computer Studies Achievement Test (CSAT) was used to collect data, which was validated by the experts in the Department of Mathematics and Computer Education, ESUT and found to be reliable with the Kuder-Richardson (KR-20) coefficient of 0.86. The researchers taught all the Computer Studies teachers that engaged in the study. The Computer Studies teachers taught their respective classes. The experiment lasted for four (4) weeks. Data gathered from the pre- and post-CSAT was analyzed using Statistical Package for Social Science (SPSS). Mean ($\bar{x}$) and standard deviation (s) were used in answering the research questions while ANCOVA was used to test research hypotheses. The study revealed that students taught Computer Studies using the Computer Games significantly achieved better than their counterparts taught Computer Studies using the Expository method and the female students taught Computer Studies using the Computer Games significantly achieved higher than their male counterparts. Hence, the study recommended that the Computer Studies teachers should adopt the use of Computer Games in teaching Computer Studies and the Federal/State governments and other relevant professional bodies should sponsor and organize seminars, conferences, workshops, refresher courses on the use of Computer Games in teaching Computer Studies.

INTRODUCTION

Computer Studies is inter-changeable used for Computer Education or even Computer literacy. In whichever way it is used, the primary objective of implementing it into our schools curriculum is to inculcate the ability of the child to read, write and speak the language of computer. Computer Studies is a process of educating the child on how to use the Computer to run a programme and diverse applications in other branches of education, business, industry, commerce, etc. (Okorie, 2012). This is because the computer is being applied in all spheres of human endeavor. The application of Computer will enhance effectiveness and efficiency in this fast growing and technological changing world. According to Ayogu

(2020), the National Policy on Computer Education (1988, revised in 2006) reported that by the end of secondary school education, the students should be able to acquire reasonable competencies in computer software such as word processing, spreadsheet, database, analyzing programs with the Computer the way they desire. At secondary school level, the students can explore and generate learning through Computer Studies programme. This is because according to Abimbade (2017), a good background in Computer Studies enables students to quickly learn and understand how things around them work. Abimbade asserted further that students need to master a minimum amount of scientific and technological knowledge to understand the world around them. Computers play a major role in the technological development all over the world. Countries which had successfully integrated computers in their educational system are in very advanced level of development in their economies (Adebayo, 2018).

Nowadays, computers which are a common form of ICTs, plays an important role in educational sector, especially in the process of integrating technology into the educational activities. Knowledge in computer is therefore pertinent, that every individual, young, old, male or female be scientific literate in order to have a better survival. In the light of the above facts, Adebayo (2018) posited that computer plays the following roles in education;

i. It promotes the principles of life-long learning/educating
ii. It increases a variety of educational services and medium/method
iii. It promotes equal opportunities to obtain education and information
iv. It develops a system of collecting and disseminating educational information
v. It promotes technology literacy of all citizens, especially for the students
vi. It develops distance education with national contents
vii. It promotes the culture of learning at school
viii. It supports schools in sharing experience and information with others

The Nigerian national policy for information technology (FRN, 2001), recognized the need for computer to be used for education, and three major objectives among several objectives emphasized the need to empower youths with computer skills to prepare them for competitiveness in a global environment, integrate computer into the mainstream of education and training, and establishment of multifaceted ICT institutions as centres of excellence on computer. The documents specifically noted the need for "Restructuring the education system at all levels to respond effectively to the challenges and imagined impact of the information age and in particular, the allocation of a special IT development fund for education at all levels" (p.4). To achieve these objectives, nine major strategies were outlined, these include: making the use of Computer compulsory at all educational institutions, developing of computer curricular for all levels of education, using computer in distance education, and computer companies' investment in education, Others include giving study grant and scholarship on computer, training the trainers' scheme for Youth Corp members in computer, ICT capacity building at the zonal, state, and local government levels, establishing private and public dedicated ICT institutions, and working with international and domestic initiatives to transfer ICT knowledge.

However Yusuf (2015) noted in his analysis of the Nigerian national policy for information technology (FRN, 2001) that the policy was inadequate for positive impact on the Nigeria education system. This, he noted, stems from the fact that the philosophical frame of reference is market driven, and that there is little emphasis on the integration of computer games in the instruction of Computer. This may be the real reason of poor achievement of citizenries to Computer literacy. Onoye, Oguejiofor & Ezenwagu (2021) reported that the students' achievement in West African Senior Secondary School Certificate Examination result in Computer Studies was very low, which was in line with Nwankwo and Obiakor (2020)'s report who noted that students' performance in computer science is low in both national and state examinations. According to Olarewaju (2016), Computer Studies teachers do not use activity-oriented method to teach the students Computer Studies which has grossly contributed to students' low performance in Computer Studies. Hence, there is need to determine whether Computer games contribute to students' achievement in Computer Studies. Thus, it is necessary to use computer game as the teaching and learning tool to reduce the complexity of learning object-oriented programming for the student as well as provides an efficient object-oriented design learning environment for them.

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Nowadays, computer games have widely applied in the learning process in education field due to the increasing of computer use in the market. Previously, most of the people felt that computer games are only for children, but soon, people found that this perception is wrong, not only children need games as entertainment; adults too. Adults could relieve their tensions and stresses by delving in the virtual world of games. Besides that, by using computer game as a learning tool, it will increase the student leaning and understanding capabilities (Seng & Yatim, 2014). This is because educational computer game will provide an interaction context for the students. Students could interact with the game and get back the feedback or response immediately (Seng & Yatim, 2014). In this modern era, most of the secondary schools in Enugu Education zone were equipped with computer facilities, and this is reason to think about the effect of Computer games on students' academic performance in Computer Studies.

Computer games are programs that enable a player to interact with a virtual game environment for entertainment and fun. There are many types of computer games available, ranging from traditional card games to more advanced video games such as role playing games and adventure games. Computer games also have the potential to create an entertaining learning environment as games have the potential to motivate students (Bokyeong, Hyungsung & Youngkyun, 2019). Besides, computer games contain competitive activities which conform to rules, aims, feedback, interaction and result. Computer game has become popular among children as free time activity, be it in the form of video, mobile application or computer. Research by Johannes (2013) showed that in a week, users of between 6 to 13 years of age are more prone to doing things using computer games (be it individually or in groups). In average, children could play up to 1hr of a game in each day in a year nowadays (Seng & Yatim, 2014). Because of this huge popularity, a lot of researchers are helping the game developers to explore the possibilities of using game as learning and teaching tools. Originally, the first education computer games have been designed as drill-and practice game for the learner. Normally the format of this type of games like problem or multiple choices question about so intended topic within the context of an unrelated story. However, these kinds of education games are different from the commercial game. This is because the drill and practice game only embedded with basic single goal compare to the commercial game with plenty of goals need to achieve. The most common game genre for the education games are simulations and Role Person Games (RPG) (Luigi & Alfredo, 2018).

The simulation games are suitable to apply to the education context because participant or learner will give full control of the game play and react as the game hero of the game. Base on this circumstance, student will have a simulation environment for them to practice on particular skill or technique. This is because RPG games normally required student act the character of the game and solve problem or puzzle within a circumstance where it needs learner to collect necessary informative information. Thus, this study proposes a Simple Role-Playing Game as teaching and learning tool to teach object-oriented programming in Computer Studies in classroom teaching. The main objective is to demonstrate and determine how efficient to teach and learn object-oriented programming via computer game. Bokyeong, Hyungsung & Youngkyun (2019) posited that computer game-based learning supports a few aspects of the learning process as follows:

- Encourage students to gather ideas from different fields so as to solve or decide on a solution.
- Encourage students deter their learning outcome using the game based on the outcome and action taken.
- Encourage students to interact with other group members and discuss the steps to upgrade learning skills.

The important aspects of the games include: seeking information, choosing suitable and required information, developing discussion strategy, settling conflicts and problem solving. According to Fenggeng (2018), educational researchers have recommended computer games as a potential learning tool. Their findings are based on the following arguments:

- Students can strongly associate themselves with the computer games.
- Computer games encourage active learning (learning by doing).
- There is empirical evidence which proves that games can be an effective tool to improve understanding during learning.
- Computer games can encourage collaboration between students.

According to Roslina and Nazli (2018), computer games require a distinctive learning principle. Roslina and Nazli

(2018) stated that a good computer game integrates up to 16 learning principles.

1. *Introduction:* Pupils need to role-play characters to fulfill the given task. This means the player should represent their own characters.
2. *Interaction:* Pupils must interact to the optimum so that they can fully experience the learning process.
3. *Production:* Actions carried out by pupils must be in accordance to the storyline that depict the learning process that will take place.
4. *Risks taking:* Games must encourage pupils to be brave in making decision and prepare them in risks taking.
5. *Specialization:* Games must be of different levels so as to enable pupils of different levels to play according to their capability
6. *Agent:* Pupils are able to feel the roles that they have chosen and control, in order to be themselves with what they do.
7. *Problems prepared in orderly manner:* Problems that arise in a game ought to be solved by pupils in an orderly manner
8. *Challenges and reinforcement:* A good game offers a set of problems and allows pupils to solve them. In schools, weaker students are often deprived of reinforcement activities while good students face limited challenges in solving problems
9. *Suitable time and demands:* Gee (2006) believes that textbooks are not very efficient and some people face problems dealing with them. On the other hand, during games, information is available when needed
10. *Meaningful situation:* Games often provide meaningful situations in terms of action, image and dialogue
11. *Loosing but entertaining:* Loosing in a game is a choice. It is challenging for pupils to overcome it by improving on the skills to win back the game
12. *System for thinking:* Games should encourage pupils to think of the relationships between facts, happenings and skills.
13. *Exploring, lateral thinking and thinking of the objective:* Through games, players are encouraged to explore based on their choices, move at an average pace, think laterally to achieve an objective.
14. *Smart equipment and spreading of knowledge:* Equipment used in the games is considered smart equipment, e.g. avatar which is smartly programmed for movements and actions.
15. *Multitask groups:* Multiplayer games require players who play different roles to fulfil given tasks. Players should be competent in the games in order to achieve the goals no matter who the other players are. This will encourage teamwork as well as problem-solving ability among the team members.
16. *Pre competent achievements:* The games allow players to participate using the smart tools even if they are not competent in that particular subject matter.

Basically, computer games allow certain of interaction and communication to the person who participates in the game play. In order to use computer game as learning and teaching tools certain question should be answer such as:

- How the interfaces teach the learner?
- The story board of the game
- The rule of the games.

The most important concern for computer game is how to retain the student focus on the gameplay. One of the significant aspects is the user interface. This is because without a user friendly and easily-understand interface, learners will get bored and frustrated easily, and thus end up leaving the game. Besides that, the user interface represent the first impression deliver to the learner it also the first thing to teach learner from the game. A clear and simple interface will make the learner having better and more comfortable feeling. Normally, most of the games are provide tutorial to the learner. Learner can explore themselves to the tutorial to get more detail of the gameplay. Therefore, computer games take into consideration the creation of a tutorial for the learner. At this stage, students will explore the entire game and gets amused as well. For example the game Banjo Kazooie, in the first level of this game, the player must demonstrate the ability to complete certain important tasks. Meanwhile, there is a tutor to help if the player gets stuck, but they don't have to listen to the instruction (Pagulayan, Keeker, Wixon, Romero & Fuller, 2003). For this study, the researcher was applying 2D tile based design for the game

interface. Researchers like Johannes (2013) and Fenggeng (2018) have revealed that computer games improves the students' achievement but none to the best knowledge of the researcher has been seen on Computer Studies in Enugu Education zone. Thus this study determined the effect of Computer Games on Senior Secondary School Students' Achievement in Computer Studies. Also, the study determined the influence of gender on students' achievement in Computer Studies. This is because Fakeye (2010) revealed that there was significant difference in the male and female teachers' knowledge of ICT with the males demonstrating a higher level of knowledge than their female counterparts while Ajani, Bakar & Sidek (2013) discovered that 59% of males and 37% of female confessed that they did not have any knowledge of computer. This implied that female students have more knowledge of the computer than their male counterparts whereas Yusuf and Afolabi (2010) concluded that gender has no influence in the academic performance of male and female students exposed to CAI either individually or co-operatively. Therefore, the study investigated the influence of gender on the effect of Computer Games on Senior Secondary School Students' Achievement in Computer Studies.

Purpose of the Study

The purpose of the study was to determine the effect of Computer Games on Senior Secondary School Students' Achievement in Computer Studies. Specifically, the study determined the;

1. Mean Achievement Scores of Senior Secondary School students taught Computer Studies using Computer Games and those taught using the Expository method;
2. Mean Achievement Scores of Senior Secondary School male and female students taught Computer Studies using Computer Games.

Research Questions

1. What are the mean achievement scores of Senior Secondary School students taught Computer Studies using Computer Games and those taught using the Expository method?
2. What are the mean achievement scores of Senior Secondary School male and female students taught Computer Studies using Computer Games?

Research Hypotheses

The following research hypotheses which were tested at 0.05 levels of significance guided the study.

H0 1: There is no significant difference between the mean achievement scores of Senior Secondary School students taught Computer Studies using Computer Games and those taught using the Expository method.

H0 2: There is no significant difference between the mean achievement scores of Senior Secondary School male and female students taught Computer Studies using Computer Games.

H0 3: There is no significant interaction effect of method and gender on the achievement score of students in Computer Studies.

Research Method

The design of this study was non-equivalent quasi-experimental research. The population for the study was 4832 SS II students in the 30 secondary schools in Enugu Education zone. The sample size of the study was 236 SS II students in the 3 sampled coeducational secondary schools in Enugu Education zone. Hence, the researchers sampled 117 students in control group and 119 students in Experimental group. The Experimental group was taught Computer Studies using Computer Games while the Control Group was taught using Conventional method. Computer Studies Achievement Test (CSAT) was used to collect data, which was validated by the experts in the Department of Mathematics and Computer Education, ESUT and found to be reliable with the Kuder-Richardson (KR-20) coefficient of 0.86. CSAT had sections A and B. Section A consisted of the respondent's personal data and section B has 50 multiple choice items with 2.5marks for each item (that's a maximum score of 100marks). The researchers taught all the Computer Studies teachers that engaged in the study. The Computer Studies teachers taught their respective classes. The experiment lasted for four (4) weeks. Data gathered from the pre- and post-CSAT was analyzed using Statistical Package for Social Science (SPSS). Mean ($\bar{x}$) and standard deviation (s) were used in answering the research questions while ANCOVA was used to test research hypotheses. The null hypothesis (H_0) was rejected if the significance of F (value of the test statistics) was less than 0.05. Otherwise do not reject at 0.05.

Data Analyses

Research Question 1

What are the mean achievement scores of Senior Secondary School students taught Computer Studies using the Computer Games and those that

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were taught using expository teaching method (ETM)?

Table 1: Mean Achievement Scores and Standard Deviations of students taught Computer Studies in both pretest and posttest

Groups	Number	Pretest		Post-test		Gained Mean
		Mean ($\bar{x}$)	Standard Deviation (s)	Mean ($\bar{x}$)	Standard Deviation (s)	
Experimental	113	48.48	9.95	66.93	10.61	18.45
Control	111	48.62	8.90	51.45	9.61	02.83
Total	**224**					

From the results in table 1, the pre- and post-test mean achievement scores for the experimental group were 48.48 and 66.93 with their respective standard deviations of 9.95 and 10.61 while the pre- and post-test mean achievement scores for the control group were 48.62 and 61.45 with their respective standard deviations of 8.90 and 9.61. The table revealed that the Senior Secondary School students taught Computer Studies using the Computer Games gained higher with the mean gain of 18.45 than those that were taught using expository teaching method (ETM) with the mean gain of 2.83.

Research Question 2

What are the mean Computer Studies achievement scores of male and female Senior Secondary School students in the experimental groups?

Table 3: Mean Achievement Scores and Standard Deviations of Male and Female Students in Experimental Group

Gender	Number	Pretest		Posttest		Gained Mean
		Mean ($\bar{x}$)	Standard Deviation (s)	Mean ($\bar{x}$)	Standard Deviation (s)	
Male	56	47.80	9.96	65.29	9.48	17.49
Female	57	49.16	9.94	68.57	9.74	19.41
Total	**113**					

The results in table 3 showed that the pre- and post-test mean achievement scores for the male students were 47.80 and 65.29 with their respective standard deviations of 9.96 and 9.48 while the pre- and post-test mean achievement scores for the female students were 49.16 and 68.57 with their respective standard deviations of 9.94 and 9.74. The table revealed that the female students taught Computer Studies using the Computer Games gained higher with the mean gain of 19.41 than their male counterparts with the mean gain of 19.41.

Test of Research Hypotheses

Research hypotheses were tested using ANCOVA at 0.05 levels of significance and are in table 3

Table 3: Analysis of Covariance (ANCOVA) of the Mean Achievement Scores of the Experimental and Control Groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	4947.981[a]	4	1236.995	14.288	.000	
Intercept	29308.108	1	29308.108	338.533	.000	
PRETEST	3.052	1	3.052	.035	.851	
GROUP	1381.017	1	1381.017	15.952	.000	S
GENDER	3322.418	1	3322.418	38.377	.000	S
GROUP * GENDER	.021	1	.021	.000	.988	NS
Error	17228.176	219	86.574			
Total	861348.000	224				

Corrected Total	22176.157	223

a. R Squared = .223 (Adjusted R Squared = .208)
b. WHERE S = Significant at P< .05; NS = Not Significant at P> .05

Hypothesis 1

H_O1: There is no significant difference in the mean achievement scores of students taught Computer Studies using Computer Games and those taught using ETM.

From the result of ANCOVA in Table 3, it was observed that Group (treatment and Control) gave an F-value of 15.952 and was significant at 0.000. Since 0.000 was less than 0.05, the null hypothesis 1 was rejected as stated. Hence, the study concluded that there was significant difference in the mean achievement scores of students taught Computer Studies using Computer Games and those taught using ETM. This implied that the students that were taught Computer Studies using Computer Games significantly achieved higher than their counterparts taught Computer Studies using the Expository teaching method.

Hypothesis 2

H_O2: There is no significant difference between the mean achievement scores of male and female students in the experimental group.

From the result of ANCOVA in Table 3, it was observed that Group (treatment and Control) gave an F-value of 30.377 and was significant at 0.000. Since 0.000 was less than 0.05, the null hypothesis 2 was rejected as stated. Hence, the study concluded that there was significant difference between the mean achievement scores of male and female students in the experimental group. This implied that the female students significantly achieved higher than their male counterparts taught Computer Studies using the Computer Games.

Hypothesis 3

Ho3: There is no significant interaction effect of method and gender on the achievement score of students in Computer Studies.

From the result of ANCOVA in Table 3, it was observed that Group (treatment and Control) gave an F-value of 0.000 and was not significant at 0.988. Since 0.988 was higher than 0.05, the null hypothesis 3 was accepted as stated. Hence, the study concluded that there was no significant interaction effect of method and gender on the achievement score of students in Computer Studies.

Major Findings

The study discovered that;

1. Senior Secondary School students taught Computer Studies using the Computer Games significantly gained higher than those that were taught using expository teaching method (ETM).
2. The female students taught Computer Studies significantly gained higher than their male counterparts in Computer Studies
3. There was no significant interaction effect of method and gender on the achievement score of students in Computer Studies

Discussion of the Findings

This study examined the effect of Computer Games in students' achievement in Computer Studies. The study discovered that the Students taught Computer Studies using the Computer Games achieved better than their counterparts taught Computer Studies using the Expository method and the differences were statistical significant. This finding confirmed the findings of Musa (2017) and Kurbanoglu, Yavuz & Mustafa (2015) who in their respective studies revealed that Computer Games enhances students' achievement. This finding is important for Computer studies teachers as that Computer Games can be used to teach Computer Studies despite the constraints a Computer studies teacher may be facing in their individual schools. Secondly, the study discovered that the female students taught Computer Studies using the Computer Games achieved and retained higher than their male counterparts and the differences were statistically significant. This finding agreed with the findings of Achuonye and Olele (2019) and Aitokhuehi & Ojogho (2014). Achuonye and Olele (2019) revealed that more female students were personally connected to the internet than their male counterparts. Aitokhuehi & Ojogho (2014) disclosed that computer literate female students performed better than male students who were also computer literate. This implied that female students have more knowledge of the computer than their male counterparts. Finally, the study discovered that there was no significant interaction effect of method and gender on students' achievement in Computer Studies. The female students achieved more than their male counterparts was because according to Brazier (2016), the female students had better retentive memories than male students and not because of the treatment provided. This implied that the Computer Games

did not favour a particular gender. In Computer Games, male and female students are allowed to advance through the instructional process in a particular order as they provide the correct answers.

Conclusion

This study examined the effect of Computer Games in students' achievement and retention in Computer Studies. The study revealed that students taught Computer Studies using the Computer Games significantly achieved better than their counterparts taught Computer Studies using the Expository method and the female students taught Computer Studies using the Computer Games significantly achieved higher than their male counterparts.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. The Computer Studies teachers should adopt the use of Computer Games in teaching Computer Studies.
2. Computer Studies teachers should ensure that there is no gender discrimination in Computer Studies lesson.
3. Federal/State governments and other relevant professional bodies should sponsor and organize seminars, conferences, workshops, refresher courses on the use of Computer Games in teaching Computer Studies.

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