

# EFFECT OF COMPUTER GAME-BASED LEARNING APPROACH ON ACADEMICS ACHIEVEMENT IN FOOD AND NUTRITION STUDENTS FOR SUSTAINABLE SECURITY DEVELOPMENT IN MINNA METROPOLIS

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## **Abstract**

This study investigate effect of multi-media instruction on academic performance of home students for sustainable economy development in Minna Metropolis of Niger State. The study adopted non randomized, non-equivalent pretest-posttest experimental-control group design. The population of the study comprises of 1620 Senior Secondary School home economics students. Target population was 531 SS II home economics students within Minna metropolis. Sample of the study comprised of 54 students, in which 27 students were randomly selected in each of the randomly selected schools through hat and draw method in the classes of SS II at Day Secondary School Maitumbi and Day Secondary School LimawaMinna, Niger State. They were grouped into experimental (D S SMaitumbi) and control groups (D S SLimawa). Home Economics Multi-Media Instruction was used as treatment instrument. Home Economics Achievement Test (HEAT) was developed and used as research instrument and Home Economics Multi-Media Instruction Interest Questionnaire (HEMIQ) was also administered on students by the researcher. A reliability coefficient  $r=0.76$  and  $0.80$  were obtained using PPMC and Crombach Alpha. The data obtained were analyzed using mean and standard deviation statistics at  $P \leq 0.05$  level of significance. The result showed that the students taught Home Economics (Food and Nutrition) using multimedia instruction performed better than those taught using lecture method. There was also an increase in interest after students were taught with multimedia instruction. Conclusion; it was concluded that multimedia instruction is more effective in improving students' performance and multimedia is taken into consideration in the teaching of Home Economics in secondary schools. Also recommended that teachers should use multimedia instruction in teaching Home Economics students as it will enable them to improve greatly in their academic performance and increase their interest in the subject.

**Keywords:** Multimedia Instruction, Academic Performance, Sustainable Economy Development, Home Economics Students and Interest

## **Introduction**

Information and Communication Technology have revolutionized the education system from the introduction of educational radio, television programme, internet connectivity to the current investment in computer game-based learning approach .Ke, (2008) opined that computer game is a method which used computer game in learning, strengthening students, motivate and educate students in the process of learning. It gives opportunities to both students and teachers to learn by their speed and combine active learning with computer technology. Computer games have received a lot of attention from educators as a potential way to provide learners with effective and fun learning environments. Gee (2005) agreed that a game would turn out to good for learning when the game is built to incorporate learning principle. Some researchers' have also supported the potentials of games for effective domain of learning and fostering a positive attitude towards learning (Oblinger, 2006).

Teachers face the problem of communicating information to learners and the task of absorbing and understanding current development (Abdullahi, 2010). It is logical then, that

efforts should be made to increase the efficiency with which information can be transmitted to learners (James, 2011). The careful organization of information through a variety of media should occupy 40 to 50 percent of the learners' conscious attention of living stimuli (Sterling, 2009). Therefore, the use of appropriate and carefully selected varieties of media which when presented to the learners through selected teaching strategies, will reinforce and strengthen one another so that the learners will achieve predetermined and desired behavioural objectives (Noah, 2008). It is an application-oriented technology that is used in a variety of ways, for example, to enhance presentation, and it is based on the increasing capability of computers to store, transmit and present many types of information. It also involves presentation of concepts or ideas that students will learn through the use of game process.

Basically, the use of computer-enhanced games has changed people's learning processes. Olukoya (2012), Bello (2013) and Harrison (2013) posited that computer-enhanced games instruction increases learners' learning performance in science, mathematics and literacy education. Tzeng (2009) stated that computer-enhanced games have important factors that can motivate, challenge, increase curiosity, control and promote fantasy in learners. The potential learning impact of computer games has often been discounted by educators and parents despite the fact that they have the same multi-media capability as Computer-Assisted Instruction (CAI) (Godson, 2010). Computer enhanced games' popularity have been growing and game developers and researchers have started to investigate computer games' impact on students' cognitive learning (Stephens, 2010). Adebayo (2007) investigated the impact of recreational computer games on pupils' subsequent performance on instructional tasks. The result showed a significant impact on the pupils' achievement level.

Computer-Game Based Learning Approach is a learning strategy in which students will learn eating habit and other concepts through the use of educational game and this can be uploaded through the use of internet services, because of prevailing security in our country so that learning will not suffer as a result of closure of school due to security threat that is affecting our environment.

The re-scrutinization of the influence of games in teaching and learning context has become highly imperative due to their crucial nature and persistent usage of instruction (Alaba, 2013). Research results from the studies of Adebisi (2011) revealed that children in Nigeria are beginning to advance in media usage, and are spending several hours every day watching television and video using computers. In fact, today's children are exposed to technologies and media at a much younger age than previously thought (Wilson, 2010). Investigations carried out by educators have therefore, become critical about the impact of technologies and media on children's development (Lassa, 2009 & Alkinson, 2011).

Several studies that are related to computer enhanced games have focused on the discussion on psychological studies and child behaviour (Provenzo, 2006). Research results indicated that computer games can promote visual scanning, auditory, discrimination, and spatial skills (Johnson, 2009). Computer-enhanced games explored how some of the motivating aspects of the games could be harnessed to facilitate learning of students in secondary schools nutrition.

Today, a great deal of emphasis is placed on health education through vast development in information technology (IT) and rapid social change. People's attention has

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gradually been turning to the use to address health problems. Blakke, McBride and Spencer (2006) opined that health habits should be formed as early as possible. To shape learners to have correct food and drink habits and establish a balanced diet, nutrition education has to be carried out in the early stage of schooling. The objective of health education is behavioural implementation during which health concepts are acquired to form personal value. It is paramount in teaching to shape students' values that can influence attitudes and behaviours.

Nutrition has been recognized as a crucial factor in promoting good health. Researchers have indicated that healthy eating habits not only influence the normal growth of students but also advance chronic disease (Hang, Yang, Hung, Chen & Hsu, 2009).

Other researchers stated that nutrition education should be a kind of experience learning through which eating habits and nutrition knowledge can be changed. Students spend a lot of time in school so that school environment can have a certain degree of influenced on both sex. Gender is a very vital variable in the teaching and learning process and it is a composition of male and female in an educational setting. Researchers like Blakke, McBride and Spencer (2006) have shown that implementation of nutrition education knowledge is helpful in improving good eating habits. Scholars who have indicated the difficulty of conducting effective nutrition learning activities since most students show low interest in nutrition and health courses. It is therefore, imperative to educate students to foster good eating habits in school. Computer games developer have spurred students' interest in studying health-related courses. This study investigates the improvement of students' academic learning achievements in nutrition related course through Computer-Game Based Learning Approach.

Games are tools that enhance the participation of learners in learning activities (Alabi, 2010). It promotes students' learning skills and motivational competence. Game-based learning approach provides a good chance to stimulate children's abstract thinking during the process of cognitive development and also fosters their higher order thinking abilities. Computer games boost motivation owing to some characteristics such as adventure, challenges and freshness (Carbonaro, Szafron, Cutumisu & Schaeffer, 2010). If teachers apply computer games to teaching students, it may enhance achievement of students. Boringtonjon, Valake, Soetelerti and Schellens (2010) revealed the usefulness of computer games through the application of computer-game based learning approach to a variety of learning activities. Using computer games for learning in secondary schools can increase internal motivation and academic achievements. Yi Jiang and Li (2010) state that education in primary and secondary schools, the learning motivation and learning achievements of the students, can be increased if their competence and knowledge. Many theories are recognized to be relevant to the computer-game based learning approach. Among these are whose Cognitive theory and Situated theory. Cognitive theory emphasizes that learners should master basic skills needed to further acquire higher level abilities while learning new things. It also emphasizes that learning processes are progressive and move from simplicity to complexity. Games adopted in educational setting should motivate learners and make learning mere fun.

Situated learning theory states that learners should enter learning scenarios of acquiring knowledge. The knowledge that is actively explored in the scenario should not only be useful but also be analogical. Therefore, establishing a rich learning scenario enables learners to develop problem-solving abilities via observation and behavioural exploration.

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Some researchers that is have also argued that the best teaching materials and techniques are not as good as having students learn happily via games. Games are closer to the children's world, and are easily accepted. They help students to develop problem-solving skills. Study carried by Gambari and Ikusanu (2014) developed computer-based simulation instructional package for teaching physics concepts. Results revealed that the students taught with CBSP performed better than the control group. The CSBP was found also to be gender friendly. Also Olumide (2013) carried out a research to establish computer simulation package and gender as predictors in the teaching of Genetics on students' achievement in Biology. There was no significant achievement of male and female students exposed to computer simulation package. The achievement of students in food and nutrition examination at secondary school level are persistently poor (previous examination scripts record, 2018, 2019 & 2020). This has been unsatisfactory over the years in secondary schools in Minna metropolis. The persistent poor achievement, according to the school records was as a result of: poor understanding of food and nutrition and mode of approach by teachers at secondary school level in Minna, has been identified as one of the major factors contributing to poor achievement of students in food and nutrition.

Therefore, as a result of this poor achievement by students, there is need to investigate the effect of computer game-based learning approach on academic achievement in food and nutrition students for sustainable security development in Minna Metropolis.

### **Purpose of the Study**

The main purpose of the study was to investigate the effect of computer game-based learning approach on academic achievement in food and nutrition students for sustainable security development in Minna Metropolis. Specifically, the study seeks to:

The main specific objectives of the study are to find out if:

1. The use of computer-game based learning package would improve the learning and teaching of food and nutrition in Minna metropolis Niger State
2. Gender differences have no effect in the teaching and learning of food and nutrition

### **Research Questions**

**This study attempted to find answers to the following questions;**

1. What are the effect of computer-game based learning package on the academic achievement of students taught food and nutrition and those taught without the package?
2. What are the effect of computer-game based learning package on the academe achievement of male and female students taught food and nutrition

### **Research Hypotheses**

In order to answer the research questions the following null hypotheses were formulated and tested:

**H<sub>01</sub>:** There is no significant difference in the achievement mean scores of students taught food and nutrition with computer-game based learning package and those taught using conventional teaching method.

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**Ho<sub>2</sub>:** There is no significant difference in the achievement mean scores of male and female students taught food and nutrition with computer-game based learning package.

## **Methodology**

### **Research Design**

The design adopted for the research is the pretest, posttest experimental control randomized design..

### **Population and Sample**

The population consisted of 1620 senior secondary school food and nutrition students in Minna and target population was 531 senior secondary school (SS II) food and nutrition students in Minna. In order to arrive at sample size for the study, intact class of SS II students of Day Secondary School Tunga was used as experimental group while Army Day Secondary School students was used as control group ( experimental group=31, control group=35). Students distribution in gender (male-21, female=45)

Procedures of experiment: students in the experimental group were pretested in the first week of the experiment, later students in the experimental groups was exposed to food and nutrition using computer-game based learning package for three week while the students in the control group was taught using conventional method. Immediately after they were exposed to package posttest was given to them

### **Instrument for Data Collection**

Nutrition Achievement Test was adopted from the past questions, it contains 30 multiple choice objectives question that was later converted to percentage after marking for easy analysis of data. In the first research question pretest was given to the students and after three weeks of students exposure to the package post-test was given to them.

**Validity of Test Instrument:** Nutrition Achievement Test was given to experts in home economics in ministry of education Niger State.

**Pilot Test:**Test retest method was used on the students of Day Secondary School Maitumbi Minna to carry out pilot testing using Nutrition Achievement Test.

### **Reliability of Instrument**

Pearson Product Moment Correlation Coefficient (PPMC) was used to get reliability coefficient of the test instrument (Nutrition Achievement Test), reliability coefficient of 0.71 was derived from (NAT) which implies the instrument is reliable for the study.

### **Method of Data Collection**

The data for this study were collected by administering the test instrument on the samples for pretest, posttest for the study. The pretest was administered before teaching. This was to determine the entry knowledge of the sample (control and experimental). After the pretest, both groups were taught the selected topics Beverages on Food and Nutrition for three week. While the experimental group was taught using computer game-based instruction package, the control group was taught with the conventional method. The posttest was

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conducted after three weeks of teaching. This was to find out if the treatment given to the experimental group has any effect on the group. The instrument was administered personally by the researcher to all the sixty six senior secondary 11 students in the two selected secondary schools in Minna, Niger State. The students were given thirty minutes to answer the thirty objective questions covering Food Beverages the validation marking scheme was used. The subject scores were converted to percentages and used as the study data

**Procedure for Data Analysis**

Mean and standard deviation were used to answer research questions which ANOVA was used to answered research hypotheses.

**Results**

**Research Question one:** What are the effect of computer-game based learning package on the academic achievement of students taught food and nutrition and those taught without the package?

**Table 1: Pretest and Posttest Scores of Experimental group (Game Based Approach) and Control Group (Conventional method)**

Group	N	Pretest		Posttest		Mean Gain
		$\bar{X}$	SD	$\bar{X}$	SD	
Game-based	31	29.85	7.35	77.49	7.35	47.64
Conventional method	35	26.30	5.99	49.71	5.99	23.41

**Table 1** shows the mean and standard deviation of achievement scores of experimental group (Game based), and control group (Conventional method) in pretest and posttest. The result revealed that mean and standard deviation scores of the pretest and posttest experimental group Game based approach are  $\bar{X} = 29.85$ ,  $SD = 7.35$  and  $\bar{X} = 77.49$ ,  $SD = 7.35$  respectively. This gives a mean gain of 47.64 for Game based group. On the other hand, the mean and standard deviation of the pretest and posttest of the control group (conventional method) are  $\bar{X} = 26.30$ ,  $SD = 5.99$  and  $\bar{X} = 49.71$ ,  $SD = 5.99$  respectively. This give a mean gain of 23.41.16 for the control group. The results revealed that experimental group and control group had mean gain of 47.64 and 23.41 respectively with the experimental group Game Based Approach had the higher mean gain than Conventional method.

**Research Question Two:** What are the effect of computer-game based learning package on the academic achievement of male and female students taught food and nutrition?

**Table 2:** The mean and standard deviation of pretest and posttest scores of male and female computer-game based learning package

Group	N	Pretest		Posttest		Mean Gain
		$\bar{X}$	SD	$\bar{X}$	SD	
Female	22	30.55	8.04	79.81	11.13	49.26
Male	9	28.14	5.29	71.81	14.97	43.67

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Table 2 shows the mean and standard deviation of the pretest and posttest scores of female and male experimental group (computer-game based learning package). From the result, it can be seen that mean score of the pretest and posttest score of the female are  $\bar{X} = 30.55$ ,  $SD = 8.04$  and  $\bar{X} = 79.81$ ,  $SD = 11.13$ . The mean gain is 49.26 in favour of the female posttest achievement score. Similarly, the mean and standard deviation of pretest and posttest score of male are  $\bar{X} = 28.14$ ,  $SD = 5.29$  and  $\bar{X} = 71.81$ ,  $SD = 14.97$ , the mean gain is 43.67 in favour of the female posttest score. Also the result reveals the difference of 5.59 between the posttest mean gains score of male and female in favour of the female students.

**Hypothesis One:** There is no significant difference in the achievement mean scores of students taught food and nutrition with computer-game based learning package and those taught using conventional teaching method.

**Summary of Analysis of Variance (ANOVA) comparison on the posttest mean achievement scores of the experimental and control group taught Nutrition Education using computer-Game-Based Learning Package and those Taught using conventional method**

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	12687.143	1	12687.143	128.862	.000
Within Groups	6301.135	64	98.455		
Total	18988.278	65			

Table 3 shows the results of the analysis of variance on achievement of students who taught Nutrition using computer-game based learning package and conventional method. As shown in (Table 3) revealed  $F(1, 64) = 128.864$ ,  $p = 0.00$ . With  $P < 0.05$ , the null hypothesis ( $H_{01}$ ) was rejected. Therefore, students taught Nutrition using computer-game based learning package compared to those taught using Conventional Method. The mean standard deviation for each of the groups were (Game Based Approach)  $\bar{X} = 77.49$ ,  $SD = 7.35$  and Conventional Method  $\bar{X} = 49.71$ ,  $SD = 5.99$  with this finding, the student who use computer-game based learning package have the highest mean gain.

**Hypothesis Two:** There is no significant difference in the achievement mean scores of male and female students taught food and nutrition with computer-game based learning package

**Table 4: ANOVA Analysis of Achievement of Male and Female Students Taught Nutrition using Computer-Game Based Learning Package**

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	409.332	1	409.332	2.701	.111
Within Groups	4394.662	30	151.540		
Total	4803.994	31			

Table 4 shows the result of the analysis of variance on achievement of female and male students taught Nutrition using computer-game based learning package. As shown in table 4 revealed  $F(1, 30) = 2.701$ ,  $p = 0.111$  with  $p > 0.05$ , the null hypothesis was accepted. Therefore, there was no significant difference in the mean achievement scores of male and female students taught Nutrition using computer-game based learning package. The mean and

standard deviation for each of the group are (female)  $\bar{X} = 79.81$ ,  $SD = 11.13$  and (male)  $\bar{X} = 71.81$ ,  $SD = 14.97$ . With this finding, the female students who used computer-game based learning package have the highest mean gain achievement.

### **Discussion**

The student taught food and nutrition using computer game-based learning package performance better than those taught using conventional method. Therefore, there was significant difference in the mean achievement scores of students taught Nutrition Education using computer-game based learning package compared to those taught using conventional teaching method. This is in agreement with finding of Gambari, *et al.*, (2014) that developed computer-based simulation instructional package for teaching physics concepts. Results of the study revealed that the students taught with computer-based simulation instructional package performed better than the control group. This shows from the mean standard deviation for each of the groups were (computer-game based learning package)  $\bar{X} = 77.49$ ,  $SD = 7.35$  and Conventional Method  $\bar{X} = 49.71$ ,  $SD = 5.99$  with this finding, the student who use Game Based Approach have the highest mean gain.

There was no significant difference in the mean achievement scores of male and female students taught food and nutrition using computer-game based learning package. This concurred with the findings of Olumide (2013) who carried out a research to establish computer simulation package and gender as predictors in the teaching of Genetics on students' achievement in Biology. There was no significant difference in the achievement of male and female students exposed to computer simulation package. Also in line with Gambari & Ikusanu (2014). who's found out that computer-based simulation instructional package was found also to be gender friendly. This shows from the mean and standard deviation for each of the group are (female)  $\bar{X} = 79.81$ ,  $SD = 11.13$  and (male)  $\bar{X} = 71.81$ ,  $SD = 14.97$ . With this finding, the female students who used computer-game based learning package have the highest mean gain achievement.

### **Conclusion**

The aim of the study was to investigate the effect of game based approach on academic achievement of nutrition students for sustainable security development in Minna Metropolis. The experimental results revealed that computer game-based learning approach can improve the learning achievements of students. It was found that the game-based learning approach is equally helpful to both male and female students in terms of nutrition knowledge in food and drink habits. This finding is quite different from other researches on the difference between genders in using computers and networks. Longer experiments (in terms of package usage by the students) with larger samples (65 students) in senior secondary schools in Minna, were also used to further investigate the effectiveness of the game-based learning approach for nutrition education. It is expected that the innovation approach not only improved the students' nutrition knowledge but also fostered their food and drink habits in their daily lives.



### **Recommendations**

The following recommendations were made:

Game based approach should be used in teaching and learning of Nutrition in schools for sustainable security development in Minna.

Students should adopt usage of Game based approach in order to bridge the nutrition knowledge gap in male and female students.

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