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Effect of Game-Based Learning on Students' Interest in Basic Science in Calabar Education, Cross River State of Nigeria

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Abstract **Original Research Article**

This paper investigated the effect of Game-Based Learning on Students' Interest in Basic Science in Calabar Education Zone, Cross River State of Nigeria. Pretest-posttest quasi experimental research design was adopted in this study. One research question and one null hypothesis guided the study at .05 level of significant. Multistage sampling procedure was employed in this study to select 118 JS3 students from the population of 2,184. The study instruments were Basic Science Achievement (BSAT) and Basic Science Interest Scale Questionnaire (BSISQ). Kuder Richardson formula 20 and Cronbach alpha reliability estimates of .65 and .72 were reached respectively. Data collected were analyzed using mean, standard deviation and ANCOVA. The results have it that there is a significant effect of teaching methods on students' interest in Basic Science. Based on the findings, conclusion was drawn and recommendations made; some of which is Game-based among other innovative teaching methods like concept maps, jigsaw cooperative and problem-based learning should be encouraged among teachers of Basic Science to enable students improve on their academic interest and achievement.

Keywords: Game-Based Learning, Students' Interest, Basic Science.

INTRODUCTION

Science and technology play a key role in the development of every nation. This however depends greatly on the quality and standard of science education which helps to address both technological, scientific and societal aspirations. Oloyede (2010) stated that every nation depends on education for her development and its education must begin with a sound foundation. The importance of science and technology education can never be therefore overemphasized. The Federal Government of Nigeria (FGN) in recognition of this importance has invested so much in science and technology education by building laboratories in schools as well as equipping them. Nwagbo (2008) stated that modern development is no longer possible outside the framework of science and technology, hence, the need for sound science education. This emerging trends in science education has assured man a comfortable living within the society (FGN, 2018).

Katrina (2019) attributed the dwindling trend in Physics achievement to lack of qualified teachers, inadequate infrastructural facilities and poor students' achievement towards the subject. Other explanations bothered on poor teaching methods used by teachers as well as poor subject content mastery (Diamond, 2018). Coffey (2012) also noted that the dwindling trends in Physics achievement could be as a result of non-exposure of students to practicals before and during examinations. The authors stated that such condition left the students with no option than performing below average, hence called for innovative methods in teaching and learning. Such methods include game-based learning, collaborative methods, and cooperative learning among others. This suggests the need for improved teaching strategies that could enhance students' interest and academic achievement in physics (Ezeano, 2013). Many science teachers (Physics inclusive) in Nigerian schools still revert to the use of expository or "chalk-and-talk" methods for teaching of science rather than using

innovative and problem-solving methods such as game-based, problem solving method and concept mapping (Ifeakor, 2006).

Game-based learning is a teaching strategy that allows learners to explore different parts of games as a form of learning (Diamond, 2018). It is an interactive method which allows learners to have fun while gaining knowledge as it allows them interact with multiple learning scenarios to meet the pace at which they learn. It is a method which helps students to learn the real-world value of knowledge. The purpose of game-based learning is to give students an entertaining way to interact with their learning activities; it is also used to promote healthy and competitive environment (Travis & Diamond, 2023). Eric and Chen (2013) investigated the effect of game-based learning on students' interest and achievement in physics. A pretest post-test design was used with eighteen 5th grade students from a single elementary school in Northern Taiwan. The purpose of the study was to determine the extent to which game-based learning affect students' interest and academic achievement in Physics. 206 students drawn from a total population of 2,806 were used for data collection. Data collected were analyzed using mean and standard deviation for research questions while ANCOVA was used to test the hypotheses at .05 level of significance. Physics Interest Questionnaire (PIQ) ad Physics Achievement Test were the instruments used for data collection. Results of the study showed that students demonstrated greater interest and better academic achievement when taught with game-based learning than with the conventional method. The authors concluded that game-based learning had significant effect on the students' achievement in physics.

Irene and Kostas (2019) examined the effect of game-based learning on students' academic achievement and possibly sustain their interest in Genetics. 128 higher class students from Texaco form the sample size. A pretest quasi-experimental design only was adopted. The results showed that game-based learning promote academic achievement and increase students' interest. The authors, recommended the use of game-based learning and other innovative teaching methods over the conventional methods. In the same vein, Ezeaguine and Augustine (2021) investigated the effect of game-based learning on primary students' outcome in Basic science in Port Harcourt. The researcher explored the pupil's perceptions based on the incorporation of the game into science learning. A one-group pretest-posttest design was used with eighteen (18) primary 5 and primary 6 pupils from a single primary school. Basic Science Performance Test (BSPT) and Basic Science Interest Scale Questionnaire (BSISQ) were the instrument used for gathering data. A reliability analysis of a pilot test with the study instrument yielded reliability coefficients of .78 and .68 respectively. The results showed that pupils have positive interest towards their studies when game-based learning is applied.

Similarly, Keong (2019) investigated the effect of using game-based approach on pupils' interest in primary and by extension academic achievement in Wawasem. Two research questions and two corresponding null hypotheses guided the study. A pretest-posttest quasi-experimental design was adopted in this study with control group. The control group was taught with conventional method while the experimental group was taught using game-based learning approach. Basic Science Achievement test (BSAT) with 30 multiple choice items and Basic Interest Inventory (BII) were used for data collection. A reliability estimates of .86 was established via Kuder Richardson (KR_{20}) formula for BSAT and Cronbach alpha coefficient for BII and these yielded 0.70 and 0.78 respectively. Data were tested at .05 level of significance using both one-way ANVOCA and 2-way ANCOVA. Result of the study showed no significant effect of teaching methods on students' interest in Basic Science.

Lay and Osman (2018) investigated the effect of digital games on Malaysian students' achievement and interest in chemistry. The study adopted a quasi-experimental research design with non-equivalent control group. The subjects were 138 chemistry students who were provided opportunities to interact with games while learning the chemistry concepts used for the study. Both chemistry Achievement Test (CAT) and Chemistry Interest Questionnaire (CIQ) were used for data collection. The reliability indices of the instruments were .64 and .66 respectively. Data collected showed that the mean scores ($x = 56.1$) for experimental group was found to be higher than the mean scores ($x = 28.9$) for control group. More so, the authors reported a disparity in both the academic achievement of students and level of interest in Chemistry taught using game-based learning and conventional method. The authors therefore recommended that the use of game-based learning be encouraged among science teachers. The author reported that, outside improve performance, game-based learning helps to improve interest in Chemistry.

The background of the study shows that there is endorsement that secondary school students' interest in Basic Science as well as their academic achievement could be influenced by instructional strategies adopted by teachers. This study therefore sought to investigate the effect of game-based learning on students' interest in Basic Science in Calabar Education Zone, Cross River State.

Statement of the problem

Students' academic interest in Basic Science in Nigerian school system, especially in external examinations has been quite an issue of great concern. Science educators, government and stakeholders in education sector, general public and students themselves, have been worried over dwindling interest and academic achievement in science which has also led to limited students' enrollment into Biological, Physical and Chemical Science subjects and some professional courses like Medicine, Pharmacy, Engineering (electrical, mechanical, computer and civil) in their higher institutions. In spite of all these lucrative areas of career choices, observations and reports over decades have it that students show very little interest towards learning science related subjects particularly Basic Science at junior school levels across the state thereby performing below expectation during examinations.

Conditions which prevail in the education sector, however discourage good achievement in science and by extension Basic Science. Inadequate instructional facilities, poor utilization of

instructional approaches, poor teachers' preparation, and non-challant attitude of students toward Basic Science have been the commonly cited factors responsible for the poor academic interest in Basic Science. However, the issue of instructional approach has become a recurrent factor associated with lack of interest among learners. Some strategies or approaches which have been in use by teachers tend not to substantially address the problem. There is therefore, need to search for better and possible innovative approaches that could help curb students' lack of interest in Basic Science. Thus, the problem of the present study put in question form is; what could be the effect of game-based learning method on students' interest in Basic Science?

Purpose of the study

The main purpose of this study was to examine the effect of game-based learning on students' interest Basic Science in Calabar Education Zone, Cross River State. Specifically, the study sought to:

1. Investigate the effect of teaching methods (game-based learning and conventional) on students' interest in Basic Science.

Research questions

One research question guided the study:

1. What is the effect of teaching methods (game-based and conventional) on students' interest in Basic Science?

Statement of hypotheses

The study was guided by one null hypothesis:

1. There is no significant effect of teaching method on students' interest in Basic Science.

METHODOLOGY

The study adopted a pre-test post-test intact class quasi – experimental design with control group. The target population of this study comprised 2,184 JS3 Basic Science students in the 87 co-educational public secondary schools in Calabar Education Zone during the 2024/2025 academic session. The researcher employed both stratified, simple random and purposive sampling technique in this study. The first procedure was the stratified sampling technique. Each LGA in Calabar Education Zone was considered as a stratum. Thus, out of seven LGAs, two were randomly sampled through balloting. The sample for this study consists of one hundred and eighteen (118) junior secondary 3 students, where the male constitutes 75 and the female 45. See Table 3 for distribution based on gender and LGA. Two research instruments titled: Basic Science Achievement Test (BSAT) and Basic Science Interest Scale Questionnaire (BSISQ) were used for data collection. Data collected were subjected to mean, standard deviation and one-way analysis of covariance (ANCOVA) as presented in table 1.

Table 1: One-Way ANCOVA of Students Interest by Teaching Method

Methods	**N**	**Mean**	**Std. Dev.**	**Adjusted Mean**	**Std Error**
Game-Based	66	41.834	12.899	41.898	1.606
Conventional	52	34.908	13.082	34.976	1.809
Total	118	38.848	13.377	38.473	1.209

Source	**Type lll sum of square**	**df**	**Mean-square**	**f**	**P-value**
Corrected model	1390.679	2	.695	4.092*	.019
Intercept	13341.540	1	13341.540	78.502*	.000
Covariate	.863	1	.863	.005	.943
Methods	1389.882	1	1389.882	8.178*	.005
Error	19544.376	115	169.951		
Total	199012.000	118			
Corrected total	20935.254	117			

**Results significant at 0.05 level*

Results from Table 1 show the mean interest score (41.834) for students taught Basic Science via game-based were found to be higher than the mean score (34.908) for those taught with conventional method. The results also indicated the p-values (.019, .000 & .005) associated with the computed F-value (4.092, 78.502 & 8.178) for corrected model, intercept and teaching methods are significantly less than the chosen 0.05, while the P-value (.943) associated with the computed F-value (.005) is greater than the chosen 0.05. The null hypothesis was rejected for corrected model, intercept, and methods but rejected for covariate. The results showed that there is a significant effect of teaching methods on students' interest in Basic Science.

DISCUSSION OF FINDINGS

Results of this study revealed that teaching methods has significant effect on students' interest towards the learning of Basic Science with particular reference to game-based learning and conventional methods. The study finding is in line

with the works of Eric and Chen (2013) who reported a significant effect of game-based learning over conventional method on students' interest. Irene and Kostas (2019) reported also that game-based learning is superior to lecture method in promoting pupils' interest in Basic Science. Similarly, Lay and Osman (2018) holds that Chemistry students develop positive interest toward learning of the concepts when the games were introduced.

On the contrary, Keong (2019) gave a counter report toward game-based learning as a better method of teaching sciences than the traditional methods. The authors added that game-based does not have a significant effect on students' interest in school subjects.

The significant effect of the present results could be attributed to the introduction of games in teaching concepts in Basic Science they may have not experienced. The presentation of these games in teaching these concepts may have been enough to arrest both the slow learners and the gifted ones to be on the same track. However, the non-significant result of the previous studies may be as a result of not presenting the games while demonstrating the concept.

CONCLUSION

From the analysis of the data collected, it was concluded that there is a significant effect of game-based and lecture methods on students' interest in Basic Science. It was also concluded that there exist a disparity in students' interest in favor of either the experimental group,

RECOMMENDATION

On the basis of the findings and based on the conclusion, the following recommendations are made;

Game-based among other innovative teaching methods like concept maps, jigsaw cooperative and problem-based learning should be applied in the teaching of Basic Science.

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