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EFFECT OF COMPUTER ANIMATION ON SECONDARY SCHOOL STUDENTS' INTEREST IN BIOLOGY IN ANAMBRA STATE

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ABSTRACT

The study investigated the effect of computer animation on secondary school students' interest in Biology in Anambra State. The study was guided by two research questions and two hypotheses were tested at .05 level of significance. Quasi-experimental pre-test, post-test non-equivalent control group research design was adopted for the study. The population of the study consisted of 20,836 SS1 students made up of 9,737 males and 11,099 females in 2022/2023 academic session in Anambra State. Multistage sampling procedure was used to draw the sample size of 655 SS1 students for the study. The instrument titled Biology Interest Scale (BIS)'', validated by three experts with a reliability coefficient of 0 0.88 was used for data collection. Mean and standard deviation were used to answer the research questions and ANCOVA was used to test the hypotheses. The findings of the study revealed among others that the students taught biology using computer animation yielded greater interest mean gain score than those taught using expository method. It was also reported that there is significant difference in the mean interest scores of students taught biology using computer animation and that of those taught using expository method in favour of computer animation. Based on the findings, it was recommended among others that Biology teachers should utilize computer animation in teaching the subject to increase interest of students. Conclusion was drawn and suggestions for further studies in the related area were preferred.

Keywords: Computer Animation, School, Students, Interest, Biology

Introduction

The need for science and technology as potent tool for a nation's overall sustainable development can hardly be over emphasized. This is because the economic and social development of both developed and developing nations like Nigeria are to a large extent dependent on the level of scientific and technological literacy of her citizens, all branches of science have important contribution to make in any nation's technological advancement. Science and technology is the bedrock for acquiring scientific knowledge and skills for understanding and explaining of natural phenomena.

Ezechi and Adukwu (2018) posited that the technological progress of any country is predicted on a sound science education. The implication is that for any country to attain a meaningful level of advancement in technology, priority must be placed on the promotion of scientific knowledge and skills at all levels of educational cadre. Olayiwola (2014) stressed that science, as a secondary school subject, has over the years gained prominence in the school curriculum world wide. This is because it is at secondary level that foundation for all the core science subjects is laid for further studies in tertiary institutions.

Science teaching in Nigeria started in form of nature study and the general science. Progressively, Kola (2013) pointed that science was re-organized into three subjects namely biology, chemistry and physics. Bamidele and Yoade (2017) observed that the current mode of learning in Nigeria, Anambra State inclusive is principally structured on traditional chalk-and-talk method. The expository method is a teaching method in which the teacher presents a verbal discourse on a particular subject, theme or concept to the learners with little or no instructional aids (Nnorom, 2015). Expository method is teacher-centered instructional approach. In recent years, there has been a growing trend across a range of media to use highly illustrated materials for instruction rather than relying on largely text-based presentations of information (Obot, 2017). This trend is learner centered and among these strategies is the multimedia computer animation strategy. Bamidele and Yoade (2017) asserted that technology such as computer animation instructional packages make teaching effective as learning is enhanced with images, video and sound.

Computer animation is the use of graphics, text, video, sound and images in instructional process. Bamidele and Yoade (2017) defined computer animation as simulated motion pictures showing movement of drawn objects. Bamidele and Yoade (2017) added that it seeks to arouse students' interests, stimulates thinking and concretizes knowledge that could otherwise only be explained in abstract term. In the conceptualization of Owolabi and Olabode (2014) computer animation in teaching is the use of text, graphics, motion picture, background sound as well as some narrations in instructional delivery. This implies that computer animation has the features of both audio and visual presentations. The importance of role-playing in the instructional process cannot be over-emphasized.

The use of animated materials reduces the learning task and time; it creates room for consistency and learning mastery by increasing retention, safety and motivation (Owolabi & Olabode, 2014). Owolabi and Olabode (2014) added that it facilitates communication and appeals to senses of sight and hearing which makes learning more meaningful and permanent. In the same vein, Gambari, Falode and Adegbenro (2014) posited that multimedia computer animation seems to attract students' attention and increase their motivation to learn. It could be deduced from the above that the use of multimedia computer animation could increase students' motivation and make the learning of Biology more interesting, enjoyable and understandable.

Abanikannda (2018) stressed that biology helps to explain the structure, function, development and existence of living things and also provide justification for their

reactions with the environment within which they exist. According to Ayotola and Abiodun (2010), biology which is an integral part of science and focuses on living things (plants and animals), is a highly popular subject amongst senior secondary students in Nigeria. Annan, Adarkwah, Abaka-Yawson, Sarpong and Santiago (2019) averred that biology helps learners to have insight on natural and environmental concepts, principles, theories, and laws. Continuing, Annan et al (2019) posited that among others, the objectives of teaching biology at secondary school level involve the ability of the learners to develop an awareness of the environment, to have meaningful and relevant knowledge in biology necessary for successful living in a scientific and technological world and to make room for technological advancement. Biology at senior secondary school has some contents.

The topics in Biology taught at senior secondary school level are numerous. Etobro and Fabinu (2017) averted that it includes; digestive system, transport system, respiratory system, execratory system, nutrient cycling in nature, ecology management, tolerance, adaptation, pollution, conservation of natural resources, pests and diseases of crops, reproduction system and classification in plants. Etobro and Fabinu observed that students perceived that ecological management and conservation of natural resources are among the major difficult topics in National curriculum. The two areas served all-encompassing and the peculiar problems justified the study of the areas. Ecology management is the process of conserving and restoring organisms. Conversation of natural resources is the rational and prudent use of natural resources in order to ensure that the same or a greater quantity of the resources will be available in future. The essence of conversation of natural resources is to prevent loss, waste or exploitation through rational use and to ensure their continued use or availability and preserve the quality or originally nature resources. However, biology lays foundation for the study of many science-related courses such as Medicine, Pharmacy, Nursing, Laboratory Sciences, Physiotherapy, Agriculture, Biochemistry and Microbiology among others in tertiary institution. Hence, achievement of students in Biology is very important as the subject is foundation to career in many science-related courses.

Yearly reports in public examination indicated low academic achievement of students in Biology. Statistics from West African Examination Council (WAEC, 2017,2018,2019, 2020,2021) revealed that students' achievement in biology was unsatisfactory and that students failed to obtain more grades at credit level and above, which would qualify them for University admission in biology and other science related disciplines. This is buttressed by Chibabi,. Umoru, Onah and Itodo (2018) who pointed out that there is an indication also that a good number of candidates could not do well in practical examinations like in Biology because they lack the basic skills for carrying out simple experiments. The basic skills for carrying out simple biological practical and experiments could be enhanced when the teaching method captured the students' interest.

There are many definitions given by different scholars in regards to interest based on their perception of the subject matter. For instance, Adu-Gyamfi (2013) defined interest as the cognitive and affective state of the students with respect to their experience with the

environment that supports the teaching and learning of science. Students' interest in Biology could influence how they interact in class during teaching of the subjects. Students with certain interest who are exposed to a Biology concept that matches the particular interest, may be motivated to actively participate in the teaching-learning process. According to Okwara and Upu (2017), interest is the students' reactions, feeling and impression about subject contents and concepts as well as related tasks. However, there have been contradictory reports on research findings regarding the effect of interest on students' academic achievement in Biology. For instance, Adekunle and Femi-Adeoye (2016) reported that there was significant relationship between students' interest in Biology and their academic achievement in the subject. This corroborated the finding of Agbaje and Alake (2014) who reported that there was significant relationship between students' interest and their academic performance in biology. On the contrary, Abanikannda (2018) reported that there was no effect of students' interest on students' academic achievement in Biology. This shows that effect of interest on students' academic achievement in Biology have not provided consistent and conclusive positive results. As a result of these controversial findings, the need aroused for further studies to take students interest in biology into consideration in an attempt to provide more evidence data from the perspective of Anambra State. Arousing students' interest could inculcate scientific spirits and attitudes in them, which is likely to enhance their mastery of Biology concept irrespective of their gender.

Gender is an attribute that distinguishes male and female. According to Onyali and Nnebedum (2018), gender is a physical, biological and behaviourable characteristics which differentiate masculinity and feminity. However, it appears that studies conducted on the effects of computer animation on students' academic achievement in relation to gender are few and have yielded inconsistent results. In other words, gender differences in students' academic achievement in Biology have been examined for some time resulting in substantial empirical studies. For instance, Ezechi and Adukwu (2018) reported that there was a significant difference in the mean achievement score of male and female students in Biology. In the same vein, Odagboyi (2015) reported that there was a significant difference between the mean scores in favour of the males in Biology. On the contrary, Okoye (2016) found out that gender has no significant influence on the academic achievement scores of students in Biology. The possible explanation for these controversial findings might be probably because the studies were carried out with different classes and on different biology content areas under different testing condition. The need arises for further studies to take gender into consideration in an attempt to build a new evidence of influence of gender on students' interest in Biology. Therefore, the study investigated the effect of computer animation on secondary school students' interest and academic achievement in Biology in Anambra State.

Purpose of the Study

The main purpose of the study was to find out the effect of computer animation on secondary school students' interest in biology in Anambra State. Specifically, the study sought to find out:

1. Mean interest scores of students taught Biology using computer animation and that of those taught using expository method.
2. Mean interest scores of male and female students taught Biology using computer animation and that of those taught using expository method.

Research Questions

The following research questions guided the study:

1. What are the mean interest scores of students taught Biology using computer animation and those taught using expository method?
2. What are the mean interest scores of male and female students taught Biology using computer animation and that of those taught using expository method?

Hypotheses

The following hypotheses were tested at .05 level of significance:

1. There is no significant difference in the mean interest scores of students taught Biology using computer animation and that of those taught using expository method.
2. There is no significant difference in the mean interest scores of male and female students taught Biology using computer animation and that of those taught using expository method.

Research Method

Quasi-experimental research design was adopted in this study. Specifically, the non-randomized pre-test and post-test control group design was used. The study was conducted in secondary schools in Anambra State. The population of the study consisted of 20,836 SS1 students made up of 9,737 males and 11,099 females in 2022/2023 academic session in public secondary schools in Anambra State. The sample for the study comprised 655 SS 1 biology students from three education zones. Stratified random sampling technique was used to select 3 education zones out of the six education zones in Anambra State. Purposive sampling technique was used to draw two schools, each from the three education zones. Therefore, six schools participated in the study. Schools with double streams and qualified teachers were purposively sampled. Therefore, intact classes were randomly assigned to experimental and control groups. The treatment groups which were exposed to computer animation were made up of 319 students (141 males and 178 females), while the control group constituted 336 students (150 males and 186 female).

The instrument for data collection was Biology Interest Scale (BIS). The face validation of the instrument was determined. To ascertain the face validation, the researcher presented the title, purpose of the study, research questions, hypotheses, table of specification, BIS and lesson notes to three experts who are lecturers, two are specialists in Measurement and Evaluation, one from the Department of Science Education in Chukwuemeka Odumegwu Ojukwu University Uli and the other from the Department of Educational Foundations as well as an expert in Department of Educational Management and Policy from Faculty of Education, Nnamdi Azikiwe Univeristy, Awka. The experts suggested among others that interactive effect should be mapped out.

The reliability of the instrument was established using Cronbach alpha. The instrument was administered once to 40 SSS one students in secondary schools in Enugu

State. The choice of Enugu state was because secondary school teachers in Anambra and Enugu states share similar characteristics in teaching Biology. The overall reliability of the instrument was found to be 0.88.

A two weeks intensive training was given to the research assistants from the sampled schools teaching Biology in SSS one class. To control for experimental bias regular Biology teachers were used for the study. The Biology teachers were trained by the researcher on how to use the developed lesson plan in order to minimize errors which might arise as a result of teacher difference. The researcher also supervised the teaching to ensure that the teachers performed according to specified procedure. For the researcher to control the Hawthrone effect in which there is tendency that noticeable difference may occur, if the students become aware that they are engaging in an experiment, the experimentation was done using the classroom teachers of the students. In addition, both the experimental group and control groups were in different schools. To estimate initial group difference, analysis of covariance (ANCOVA) was used. The study lasted for four weeks. The pre-test was administered in the first week, thereby allowing extra three weeks before the post-test. Also the post-test was reshuffled. The research questions were answered using mean, while Analysis of Covariance (ANCOVA) was used in testing the hypotheses at .05 level of significance. The reason for adopting the ANCOVA procedure was to help eliminate any initial differences in the entry abilities of the participants that extraneous-variable control measures could not properly addressed. If the p-value < .05, reject H_o and if p-value is ≥ .05, accept H_o.

Presentation of Results

Research Question 1: What are the mean interest scores of students taught biology using computer animation and those taught using expository method?

Table 1: Mean Pre-test and Post-test Interest Scores of Students taught Biology using Computer Animation (CA) and those taught using Expository Method (EM)

Method	N	Pretest Mean	Posttest Mean	Mean Gain	Pretest SD	Posttest SD
CA	319	27.18	67.65	40.37	4.12	2.30
EM	336	19.99	38.11	18.12	4.22	3.99

Result presented on Table 1 revealed that the pretest mean interest score of students taught biology using the computer animation was 27.18 with standard deviation of 4.12; their posttest mean achievement score was 67.55 with 2.30 value of standard deviation and 40.37 mean gain. The pretest mean achievement of students taught biology using the expository method was 19.99 with standard deviation of 4.22; their posttest mean score was 38.11 with 3.99 standard deviation and 18.12 mean gain. The mean interest gain difference between students taught biology using the computer animation and those taught biology using the expository method was 22.25 in favour of the experimental group. The mean achievement gain difference between students taught biology using the computer animation and those taught biology using the expository

method was 29.54 in favour of the experimental group. The results show that the students taught biology using computer animation yielded greater interest mean gain score than those taught using expository method.

Research Question 2: What are the mean interest scores of male and female students taught biology using computer animation and those taught using expository method?

Table 2: Mean Pre-test and Posttest Interest Scores of Male and Female Students taught Biology using Computer Animation (CA) and those taught using Expository Method

	Gender	N	Pretest Mean	Posttest Mean	Mean Gain	Pretest SD	Posttest SD
CA	Male	141	21.08	53.52	32.44	3.98	2.25
	Female	178	33.28	81.78	48.50	4.26	2.35
EM	Male	150	18.03	32.99	14.96	4.00	3.27
	Female	186	21.95	43.23	21.28	4.44	4.71

As shown on Table 2, the male students taught biology using computer animation has mean gain interest score of 53.52, while the females have mean gain interest score of 81.78. The mean interest gain difference between male and female students taught biology using the computer animation was 28.26 in favour of female students. The results show that the female students taught biology using computer animation yielded greater interest mean gain score than male students. On the other hand, the male students taught biology using expository method has mean gain interest score of 32.99, while the females have mean gain interest score of 43.23. The mean interest gain difference between male and female students taught biology using expository method was 10.24 in favour of female students. The results show that the female students taught biology using expository method yielded greater interest mean gain score than the male students. The findings indicated that female students taught biology using computer animation and expository method yielded greater interest mean gain score than male students.

Hypothesis 1: There is no significant difference in the mean interest scores of students taught biology using computer animation and that of those taught using expository method

Table 3: ANCOVA on Difference between the Mean Interest Scores of Students taught Biology using CA and those taught using EM

Source of variation	SS	Df	MS	F	P-value	Decision
Corrected Model	298.197[a]	2	149.0985	443.345	.055	
Intercept	54386.134	1	54386.134	3203.181	.000	
Pretest	7.131	1	7.131	.019	.404	
Method	10.234	1	10.234	9.503	.041	Sig.
Error	1898.789	68	27.923			
Total	424567.009	84				
Corrected Total	21723.381	79				

Table 3 shows that at 0.05 level of significance, 1df numerator and 91 df denominator, the calculated F is 9.503 with p-value of .041 which is less than .05. Thus, the null hypothesis was rejected. Therefore, there is significant difference in the mean interest scores of students taught biology using computer animation and that of those taught using expository method in favour of computer animation.

Hypothesis 2: There is no significant difference in the mean interest scores of male and female students taught biology using computer animation and that of those taught using expository method.

Table 4: ANCOVA for Testing Significance Difference in the Mean Interest Scores of Male and Female Students taught Biology using Computer Animation and that of those taught using Expository Method

Source	SS	Df	Mean Square	F	Sig.	Decision
Corrected Model	213225.203[a]	4	53306.303	225.124	.000	
Intercept	54321.234	1	54321.232	2134.115	.000	
Pretest	.043	1	.043	.001	.970	
Gender	10984.231	1	10984.231	923.6004	.060	
Method	123.104	1	123.104	8.238	.073	
Method * Gender	4.123	1	4.123	.410	.466	Not Sig.
Error	1345.998	66	20.393			
Total	31343.136	78				
Corrected Total	18753.134	70				

Table 4 shows that at .05 level of significance, 1df numerator and 91 df denominator, the calculated F is 0.410 with p-value of 0.06 which is greater than 0.05. Thus, the null hypothesis was not rejected. Therefore, there is no significant difference in the mean interest scores of male and female students taught biology using computer animation and that of those taught using expository method.

Discussion of Findings

The result of this study shows that the students taught biology using computer animation yielded greater interest mean gain score than those taught using expository method. This is in line with the finding of Salisu (2015) who reported that there was difference in mean interest score of students exposed to computer animation and those taught using expository method in favour of experimental group. The possible reason for the agreement between the findings could be due to the fact that the two studies were conducted in the same country and in connection to biology. The visual presentation of biology concept through computer animation elicits students' interest and improves their comprehension of lesson taught. The finding may be triggered by the fact that the use of computer animation in teaching biology makes learning fun and interesting to students. Students learn faster and develop interest in biology, when the teaching process is fun and exciting through the use of computer animation.

Further finding shows that there is significant difference in the mean interest scores of students taught biology using computer animation and that of those taught using expository method in favour of computer

animation. This is in agreement with the finding of Salisu (2015) which reported that there was significant difference in mean interest score of students exposed to computer animation and those taught using expository method in favour of experimental group. The similarity in the findings is not surprising as a result of the fact that the two studies were in the same state and thus the same population of students with similar characteristics participated in the two studies.

The findings of this study shows that the female students taught biology using computer animation and expository method yielded greater interest mean gain score than male students. This is in line with the finding of Ezenwosu (2013) which indicated that female students have higher interest in biology than male students. The agreement between the two findings could be attributed to the fact that the two studies were conducted in the same geographical location. This finding indicated that female students' interest in biology suppress that of their male counterparts when both groups were taught using computer animation and expository method. The possible explanation for the finding is that female students may be more inclined to computer animation involving graphics which makes learning an active process.

It was also indicated that there is no significant difference in the mean interest scores of male and female students taught biology using computer animation and that of those taught using expository method. This corroborated the finding of Salisu (2015) which reported that there was no significant difference in mean interest score of male and female students exposed to computer animation and those taught using expository method. The agreement between the findings could be attributed to the fact that the two studies utilized different subject. This is an indication that male and female interest in biology do not significantly differ when taught using computer animation and expository method.

Conclusion

Based on the findings, it is concluded that the use of computer animation is an effective method of teaching biology. It has enhanced students' interest in biology. The students taught biology using computer animation have exhibited higher level of interest in biology than those taught using expository method.

Recommendations

Based on the findings, it was recommended among others that

1. Biology teachers should utilize computer animation in teaching the subject to increase interest and academic achievement of students.
2. Post Primary School Service Commission should organize regular training programmes such workshops, seminars and conference for biology teachers for them to acquire knowledge and skills on the integration and application of computer animation in teaching biology in order to enable students learn in a variety of ways.

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