

EFFECT OF INSTRUCTIONAL COMPUTER ANIMATION ON SECONDARY SCHOOL STUDENTS ACHIEVEMENT IN CELL BIOLOGY CONCEPT IN OYO TOWN

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<https://doi.org/10.37602/IJREHC.2024.5217>

ABSTRACT

This Study adopted a pretest-posttest, control group, quasi-experimental design. The research study covered four purposively selected secondary schools from two local government areas in Oyo town. One hundred and ten students of both gender (male and female) were inclusive and the topics covered was Cell Biology in the Senior Secondary Biology Curriculum was taught using the conventional method of teaching and computer animation. Three instruments were used for the study: Biology Achievement Test ($r=0.78$) this reliability index was obtained using Kuder-Richardson Analysis. Three hypotheses were tested at 0.05 level of significance. Data were analyzed using Analysis of Covariance. The result revealed that there is a significant main effect of treatment on students' achievement in Biology ($F(1,109) = 8.47$; $p < 0.05$, partial $\eta^2 = 0.77$) the students exposed to Instructional Computer animation performed better with the higher adjusted post-biology achievement test mean score (19.88) while the Control group had the least adjusted post-biology achievement Test mean scores (17.99). It was found that gender had no significant main effect on students' achievement in biology, so the null hypothesis was accepted. Based on the result of the study, it was recommended that schools should adopt Instructional Computer Animation in teaching to make learning more effective, real and to improve the achievement of senior secondary school students' in Biology.

Keywords: Instructional Computer Animation, Conventional method, Achievement and Gender

1.0 INTRODUCTION

1.1 Background to the study

Science serves as the foundation for modern technological advancements. The main objective here is to gain a more profound understanding of how our environment functions, with the ultimate aim of teaching mankind about the cosmos. Science education is vital for the progress of technology and science in Nigeria, as it is in every nation. Lewis (2015) contends that when children acquire knowledge in the field of science, they develop an enhanced comprehension and admiration for the natural world. The reason for this is that imparting scientific concepts and principles necessitates thorough investigation. Scientific education equips teachers, students, and society as a whole with the necessary tools to achieve benevolent actions that elevate the overall living standards for all individuals. Hence, the objective of scientific education should be to cultivate a heterogeneous group of proficient individuals who would pursue professions in science, engineering, and associated domains.

Okeniyi (2012) states that the objective of biology education is to transmit knowledge of the topic to students through instruction and study. The objective is to facilitate the acquisition of a comprehensive grasp of biology and its practical implications for students from diverse origins and varying levels of ability. Biology aims to investigate and understand biological systems. Biology has several practical uses in the natural world. Studying biology enables medical personnel to enhance their ability to identify and cure illnesses in both animals and humans. This is achieved by developing a comprehensive understanding of the interrelated systems that constitute these organisms. The National Policy on Education (FRN, 2013) states that the objectives of a biology education include developing a practical scientific mindset, acquiring information that can be applied in various aspects of life such as health, agriculture, personal and communal concerns, and developing the necessary laboratory and field abilities in biology.

Cell biology is a topic included in the biology curriculum for high school seniors. The addressed topics encompass cellular theory, the cellular structure in both plants and animals, and a comparative analysis of the two. Cell biology is the scientific discipline that focuses on investigating cells and their shapes and functions. It is important to note that cells serve as the fundamental units of all living organisms. By studying this subject, students may get a thorough understanding of biology and its practical applications. This knowledge serves as the foundation for the field of biological sciences and plays a role in addressing many social issues. The objectives of teaching cells in a classroom context encompass fostering students' comprehension of cell theory and structure, delivering a succinct chronicle of the cell's evolutionary progression, and establishing connections between the cellular architectures of animals and plants. Gaining expertise in cell biology can open up promising prospects in several domains, including microbiology, biotechnology, medicine, biomedical engineering, biochemistry, cytology, and forensic science, among others.

The inadequate performance of students in biology is attributed to several reasons. Several aspects that might influence educational outcomes include the quality of teachers (Akinsolu,

2010, Anita, 2013), factors related to the school environment (Mushtaq and Khan, 2016), the type of textbooks used (MeenuDev, 2016), and the teaching strategy employed (Owusu, Monney, Appiah, and Wilmot, 2010). However, studies indicate that the underperformance of students in scientific subjects may be mostly attributed to the teaching methods employed in Nigerian classrooms (Ukoh and Adewale, 2014). Utilising ICT (information and communication technology) to provide the biology curriculum is an instance of an innovative approach that has garnered minimal notice.

Some instructors still prefer the traditional method of teaching, where they stand at the front of the classroom and lead the class. The lecture, discussion, project, demonstration, and discovery procedures are all instances of traditional methods.

Lectures are a prevalent instructional approach utilised in biology teachings. Abimbola (2013) states that most scientific classrooms in Nigerian primary and secondary schools predominantly utilise the traditional approach. According to a research conducted by Olatoye and Adekoya (2010), the usage of the traditional technique is ineffective for teaching and learning science.

The lofty objectives of biology teaching in senior high schools need meticulously structured lectures that facilitate students' comprehension of the subject matter and enhance their performance on assessments. To effectively teach biology and promote understanding and genuine learning, it may be important to utilise appropriate approaches. Implementing UNESCO's (2002) recommendations for improving scientific education, such as fostering creative thinking, hypothesis testing, and information sharing, might be advantageous for biology curriculum.

Platzner and Lower (2012) assert that the prevailing belief is that computer animation involves the portrayal of an inanimate object with human attributes such as movement, growth, and speech. The omnipresent television robot that does tasks such as chopping vegetables or placing goods into a basket serves as a prominent illustration of computer animation. According to Lander and Lunderstorm (2013), computer animation is a collection of different pictures that are shown in a dynamic form based on the activities of the users. This helps the users to perceive a continuous change over time and construct a more suitable mental representation of a job.

Moreover, animations may be regarded as a readily available kind of instructional entertainment that has the ability to engage students of all age groups (Kylie, 2012). Akor (2011) states that the purpose of integrating animation into the classroom is to capture students' interest, motivate them to learn, and eventually enhance their independence, creativity, and critical thinking skills. Furthermore, Iravani and Delfechresh (2011) emphasised that animation-based learning provides a wider range of stimuli, which in turn stimulates students' attention and facilitates more profound learning. The foundation of every educational system is built around academic success, engagement, and retention. In a study conducted by Gupta and Lata (2014), it was discovered that animation enhanced students' academic achievement in the field of science when compared to the conventional lecture format. Ogundokun and Adeyemo (2010) further elaborated on the notion that the decreasing availability of instructional resources in schools is a contributing factor to students' underperformance in the classroom.

The term "academic achievement" refers to the cumulative knowledge and actions undertaken within an educational setting, as stated by Parveen, Syed, and Nazir (2013). It offers a concise overview of the student's academic progress over a period of time. The academic standing can be evidenced by the outcomes of both internal and external examinations and evaluations. Rivers (2006) utilised students' self-reported grade point averages as an operational indicator of academic achievement for his research. In this study, the researcher defines academic achievement as the scores that students obtain on Biology tests created by their teachers. In this study, the researcher defines academic success as the students' performance on biology tests that are designed by the teacher.

Several authors have presented conflicting interpretations of gender. Gender parity is a key target of the MDGs, which stands for millennium development objectives. Women's duties are often neglected in many communities, which limits their capacity to participate to and benefit from development projects (Fatokun and Odagboyi, 2011). According to them, there is a prevailing assumption that areas such as physics and mathematics are more inclined towards men, whereas fields like home economics and secretarial studies are considered more appropriate for women. This research is crucial as it validates the previous suspicion of Adeyegbe (2010) that male students excel over female students in the subjects of biology, chemistry, and physics. According to Olom (2010), Agwagah's research revealed considerable gender differences in mathematics performance among children, with female students outperforming their male counterparts. According to Adigwe (2014), male students exhibit superior performance compared to female students in the field of chemistry. Ugwuadu (2011) found that the gender of students does not have an impact on their motivation and performance in biology classrooms that utilise discourse patterns.

2.0 STATEMENT OF THE PROBLEM

The Knowledge of Cell biology has helped in improving the wellbeing of man; diagnosing and treating diseases, bringing criminal to justice and in achieving improved crops and animals specie. However, in spite of the reported benefits of Cell concepts, the dwindling achievement of students has been attributed to number of factors, including biology teachers' failure to use multimedia resources in their classes, which could be due to a lack of materials or, in the case of materials that are available, a lack of knowledge of how to use them properly. Students' low achievement can also be caused by a lack of enthusiasm and inventiveness on the part of teachers, as well as inadequate teaching methods, language barriers, lack of adequate resources provided by school authorities to support instruction. As a result, there is a need to investigate the effect of computer animation as a predictor of student achievement in Cell biology.

2.1 Hypotheses

The following null hypotheses were generated and would be tested in the course of study at a 0.05 level of significance:

H01: There is no significant main effect of treatment on students' achievement in biology.

H02: There is no significant main effect of Gender on students' achievement in biology.

H03: There is no significant interaction effect of treatment and gender on students' achievement in biology.

2.2 Scope of the Study

The Study is limited to secondary school two biology students in Oyo town. Two Local government Areas will be randomly selected from the four (4) local government in Oyo town. Two senior secondary school II students will be purposively selected from each selected local government areas. Intact class of the senior secondary two science students will be used from the four selected secondary schools will take part in the study. This study intends to investigate the effect of computer animation package on students' achievement in Cell biology moderated by gender.

3.0 METHODOLOGY

The research design used for this study was quasi-experimental design, using pretest, posttest control group. Purposive sampling technique was used to select four secondary schools in Oyo town. The research instruments used for this study was Biology Concept Achievement Test (BCAT), and lesson note format. The Biology Concept Achievement Test (BCAT) consisted of thirty (30) multiple choice objectives questions. The research questions was validated by an expert. A reliability index value of 0.70 was obtained using Kuder Richardson formular (Kr20).

Lesson note was prepare for both experimental and control group to teach the biology concepts. Students in the experiment group were taught using the conventional method. The teaching was carried out for four (4) weeks while post-test was administered at the end of teaching.

The hypothesis formulated for the study were tested using analysis of covariance (ANCOVA) at 0.05 level of significance.

Table 1: Analysis of Covariance (ANCOVA) of Biology Achievement Test scores on Treatment and gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	146.465 ^a	8	18.308	2.113	0.041	.143
Intercept	1029.499	1	1029.499	118.829	0.000	.541
Pretest	4.988	1	4.988	.576	0.450	.006
Treatment	73.341	1	73.341	8.465	*0.004	.077
Gender	8.194	1	8.194	.946	0.333	.009
Treatment * Gender	6.107	1	6.107	.705	0.403	.007
Treatment * Gender *	2.387	1	2.387	.275	0.601	.003
Error	875.035	101	8.664			
Total	38669.000	110				
Corrected Total	1021.500	109				

R Squared = .143 (Adjusted R Squared = .076) Denote significant difference at 0.05 level of significance.

Hypothesis 1: There is no significant main effect of treatment on students' achievement in Biology.

Table 1. Shows that there is significant main effect of treatment on students Biology Achievement Test scores in ($F(1,101) = 8.465$; $P < 0.05$, partial $\eta^2 = 0.77$). The effect size is 77.0%. This indicates that 77.0% of the variation in students' achievement is as a result of the significant main effect of the treatment. Thus, hypothesis 1 was rejected. Therefore, there is significant main effect of treatment on students' achievement in Biology.

Hypothesis 2: There is no significant main effect of Gender on students' achievement in Biology.

Table 2. Shows that there is no significant main effect of gender on students' Biology Achievement Test Scores ($F(1,101) = 0.946$, $p > .05$, partial $\eta^2 = 0.009$). This means that gender has no significant effect on students' achievement in Biology. Thus, hypothesis 3 was not reject.

Hypothesis 3: There is no significant interaction effect of treatment and gender on students' achievement in Biology.

Table 4.2 shows that there was no significant interaction effect of treatment and gender on students' Biology Achievement Test Scores ($F(1,101) = 0.705$, $p > .05$, partial $\eta^2 = 0.007$). This means that the treatment and gender have no interaction effect on students' achievement in Biology. Thus, hypothesis 5 was not rejected.

4.0 DISCUSSION OF FINDING

The findings of the study revealed significant differences in the achievement scores of students in the experimental and control group. Students exposed to instructional computer animation had higher achievement scores than students in the control group. The findings showed that the experimental strategy (using instructional computer animation) is more effective than the conventional teaching method in improving students' academic achievement in Biology. The result is in support of the findings of Achor and Ukwuru (2014) the findings of their study revealed that the experimental group that received experimental treatment of instructional computer animation performed significantly better than those taught using conventional method. Result is also in support of the finding of Gupta and Lata (2014) that discovered that animation led to the improvement in students' achievement in science better than conventional lecture method.

The findings of this study supported the view of Ugwuadu (2011) that there was no difference in the mean achievement and interest of male and female students taught biology. It was therefore, concluded that gender has no influence on achievement of students in biology. The findings of the study also revealed that there was no significant interaction effect of treatment and gender on students' achievement in Biology. This implies that there's no influence of

treatment (Instructional computer animation and instructional conventional method) and gender (male and female) on students' academic achievement.

5.0 CONCLUSION

The study found that compared to the traditional way, instructional computer animation significantly improved students' level of success in Biology. The study's findings suggest that using instructional computer animation can greatly improve the teaching and understanding of cell concepts. Students are better able to visualise the many cellular organelles and understand the subject of biology thanks to computer animation, which also makes the material more engaging. Thus, computer animation may be a powerful tool to enhance students' comprehension and performance in Biology classes. Additionally, the study found no correlation between students' gender and their academic performance.

5.1 Recommendations

1. Teachers taking biology in secondary schools should adopt this instructional delivery method in teaching Biology.
2. To achieve no. 1 above, seminars and workshops should be organized by the school management to train teachers on the use of instructional computer animation. As computer animation is not meant just to entertain students, it has systemic approach, therefore it should be learnt.
3. Adequate and good facilities, equipment, laboratories, conducive learning environment should be provided and made available in both private and public schools.

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