



**EFFECTS OF SIMULATION STRATEGY AND PLAYWAY STRATEGY IN
BREAKING BARRIERS TO STUDENTS' LEARNING OF DIFFICULT CONCEPTS IN
BIOLOGY IN ODEDA LOCAL GOVERNMENT AREA, OGUN STATE**

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ABSTRACT

This study investigated the effects of simulation and playway strategies on students' learning of difficult Biology concepts in Odeda Local Government Area, Ogun State. The study adopted a quasi-experimental design involving pre-test and Post-test non-equivalent research design. The sample size comprised of two hundred research participants comprising of Senior Secondary School class two drawn from four (4) Senior Secondary Schools. Four research hypotheses guided the study and were tested at 0.05 level of significance using ANOVA and t-test statistical tools. The results showed a significant difference in academic performance between students taught with simulation ($t\text{-cal} = 3.69$, $p\text{-value} < 0.05$) and playway methods ($t\text{-cal} = 2.57$, $p\text{-value} < 0.05$), with both methods outperforming traditional teaching. However, no significant difference was found between simulation and playway methods ($t\text{-cal} = 1.96$, $p\text{-value} > 0.05$). The study concluded that simulation and playway methods enhance Biology students' performance, and recommended that teachers incorporate these methods into their lessons, while support should be given from government and school authorities by providing play and simulation teaching aids and instructional materials such as models, charts, real-life objects, projectors, DVD, Video CDs, etc., which will enhance the teaching of biological concepts.

Keywords: Simulation Strategy, Playway Strategy, Breaking Barriers, Learning, Difficult Concepts, Secondary School.

INTRODUCTION

Biology, a fundamental subject in science education, often poses challenges for students, particularly in grasping complex concepts. However, science education is vital for developing problem-solving and life-coping skills (Ayodele, 2013). However, the traditional teaching methods prevalent in Nigerian classrooms often neglect the interactive and experiential approach recommended by national education policy (Ayodele, 2013). Consequently, students miss out on engaging learning experiences and may exhibit disinterest or frustration during lessons (Ajaki, 2016). This disconnection between teaching methods and student needs contributes to poor academic performance, particularly in science subjects like biology (Gumus, 2013). Despite efforts

to promote science education and conduct research on effective teaching methods, challenges persist, including a lack of laboratory facilities and qualified teachers (Isah, 2015). The reliance on traditional instructional methods further exacerbates these issues, hindering students' comprehension and retention of scientific concepts (Muhammad, 2013).

Efforts to address these challenges have led to the exploration of alternative teaching strategies, such as the playway and simulation methods (Adesoji, 2016). These methods emphasize hands-on, experiential learning, allowing students to actively participate in the discovery and application of scientific principles (Okereke and Uwa, 2018). Despite their potential benefits, traditional teaching methods continue to dominate science classrooms, limiting students' opportunities for meaningful engagement and deep learning (NERDC, 2012; NCCE, 2013). Consequently, many students struggle to grasp abstract concepts and perform poorly in science subjects (Idowu, 2018).

To address these challenges, educators must embrace innovative teaching methods that cater to students' diverse learning needs (ASUBEB, 2014). Simulation and playway methods offer promising alternatives that promote active learning, critical thinking, and problem-solving skills (Umoke and Nwafor, 2019). By creating immersive and interactive learning environments, these methods can enhance students' understanding of complex scientific concepts and foster creativity (Ezeudu and Ezinwanne, 2018). Moreover, they align with the evolving needs of the digital age, providing students with practical skills and experiences that are essential for success in the modern world (Goldsim, 2018).

However, the adoption of innovative teaching methods, such as simulation and playway, holds the potential to revolutionize science education in Nigeria. By prioritizing experiential learning and student engagement, these methods can enhance academic performance, promote creativity, and contribute to national development goals (ASUBEB, 2014). However, their successful implementation requires a concerted effort from educators, policymakers, and stakeholders to prioritize pedagogical innovation and provide necessary support and resources for effective teaching and learning.

In Nigerian circumstances, simulation and playway methods, if used in teaching and learning science in schools, may lead to a better understanding of science and, in the long run, give room for the acquisition of practical skills, which encourages entrepreneurial skills, wealth creation, poverty alleviation, employment opportunities, national development, and creativity. Creativity is very necessary in science teaching because the summary of whatever we are doing in science classrooms revolves around being creative. Ability to use a piece of information gathered in science classrooms to solve our problems at both individual and societal levels.

STUDY JUSTIFICATION

This study aims to examine the impact of simulation strategy and playway teaching methods on the learning of challenging biology concepts among secondary school students. Despite the recognized standards for effective science education, the academic performance of students, particularly in biology, remains below expectations as evidenced by secondary examination results (James, 2017). Various authors have identified factors contributing to poor performance, including teaching strategies such as playway and simulation methods, which can either positively or negatively influence student performance (Nwosu, 2014). Isah (2021) notes that many science

students struggle with biology topics due to a lack of understanding of the teaching method. Traditional teaching methods often fail to accommodate individual learning rates, highlighting the need for approaches that cater to diverse learning styles. Playway and simulation strategies have been shown to enhance performance by promoting group work, encouraging participation, and facilitating the exchange of scientific ideas (James, 2017). This study investigates whether these methods significantly improve the performance of biology students at the senior secondary level.

HYPOTHESES

H₀₁: There is no significant difference in the academic performance of students when taught Biology concepts using simulation strategy and traditional method.

H₀₂: There is no significant difference in the academic performance of students when taught Biology concepts using the playway method and traditional method.

H₀₃: There is no significant difference in the academic performance of students when taught Biology concepts using the simulation strategy and playway method.

H₀₄: There is no significant difference in the academic performance of students when taught Biology concepts using traditional teaching methods, simulation strategy, and playway strategy.

SIGNIFICANCE OF THE STUDY

The study's results have significant implications for education stakeholders. Biology teachers will receive a guide on implementing playway and simulation methods, making lessons more engaging and effective. Students will benefit from innovative activities that stimulate interest and improve understanding, leading to better academic outcomes. Authors will be encouraged to publish student-centered materials and government bodies will be informed of the need for training workshops. Ultimately, the study's findings can revolutionize Biology education, making it more engaging and effective for all.

RESEARCH METHODOLOGY

This study employed a quasi-experimental pre-test post-test non-equivalent design, conducted in Odeda Local Government Area, Ogun State, Nigeria. The population comprised SS II students offering Biology in public schools, with a sample of 200 students selected from four schools using purposive and random sampling techniques. A Biology Achievement Test (BAT) was developed by the researcher, containing 30 multiple-choice questions, to assess students' knowledge.

A pre-test was administered to determine students' initial knowledge and ensure comparability of the experimental and control groups. The experimental group was then taught using simulation and playway methods, followed by a post-test to assess the effectiveness of these methods. The procedure was justified by the need to control for extraneous variables, ensure accurate measurements, and reduce bias. The use of t-test and ANOVA in data analysis ensured a robust and reliable comparison of the results, providing answers to the research questions at a 5% significance level.

RESULTS

H₀₁: There is no significant difference in the academic performance of students when taught Biology concepts using simulation strategy and traditional method.

Table 1: T-test on the Significant Difference in the Academic Performance of Students When Taught Biology Concepts Using Simulation Strategy and Traditional Method.

Variable	N	Mean	Std.Dev	df	t-cal	p-value	t-crit
Simulation Strategy	100	16.25	5.11				
Traditional Method	100	11.40	4.18	198	3.69	0.00*	1.96

(t-cal. = 3.69; $p < 0.05$; $df = 198$). * Indicates significant difference

H₀₂: There is no significant difference in the academic performance of students when taught Biology concepts using the playway method and the traditional method.

Table 2: T-test on the Significant Difference in the Academic Performance of Students When Taught Biology Concepts Using Playway Method and Traditional Method.

Variable	N	Mean	Std. Dev	df	t-cal	p-value	t-crit
Playway Method	100	17.63	5.82				
Traditional Method	100	11.40	4.18	198	2.57	0.003*	1.28

(t-cal. = 2.57; $p < 0.05$; $df = 198$). * Indicates significant difference

H₀₃: There is no significant difference in the academic performance of students when taught Biology concepts using the simulation strategy and playway method.

Table 3: T-test on the Significant Difference in the Academic Performance of Students When Taught Biology Concepts Using Simulation Strategy and Playway Method.

Variable	N	Mean	Std. Dev	df	t-cal	p-value	t-crit
Simulation Strategy	100	16.25	5.11				
Playway Method	100	17.63	5.82	198	1.96	0.081	2.49

(t-cal. = 1.96; $p > 0.05$; $df = 198$). * Indicates significant difference

H₀₄: There is no significant difference in the academic performance of students when taught Biology concepts using traditional teaching methods, simulation strategies, and playway strategies.

Table 4: ANOVA table on Difference in the Academic Performance of Students When Taught Biology Concepts Using Traditional Method, Simulation Strategy, and Playway Method.

Sources of variation	Sum of squares	df	Sum of mean	F-ratio	P-value	F-crit
Between Groups	31.91	2	10.63	2.68	0.03	*1.07
Within Groups	1146.59	192	9.88			

Total	1178.50	199
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($F = 2.68$; $p < 0.05$; $df = 199$). * Indicates significant difference

FINDINGS

The present study investigated the effect of simulation strategy and playway method of teaching method on biology students learning of some difficult concepts among secondary school students in Odeda Local Government Area in Ogun State. As Idowu (2018), observes, many students find it difficult to study Biology; so many issues have been attached to this trend. The issue of poor performance in Biology examinations might be the problem of teaching methods. From the findings of the study, there is a significant difference ($t\text{-cal. } 3.69 > t\text{-crit. } 1.96$; $p\text{-value } 0.000 < 0.05$) in the academic performance of students when taught Biology concepts using simulation strategy and traditional method indicating that the mean scores of students in simulation strategy are better than the traditional method mean score of students. This is supported by Ezeudu and Ezinwanne (2018) who observed that the use of simulations to teach science gives positive results over time and permits the learner to manipulate variables or parameters and then observe the consequences of their actions.

Furthermore, based on the result in hypothesis two, table 2 revealed that there is a significant difference ($t\text{-cal. } 2.57 > t\text{-crit. } 1.28$; $p\text{-value } 0.003 < 0.05$) in the academic performance of students when taught Biology concepts using playway method and traditional method indicating that the mean scores of students in playway method is better than the traditional method mean score of students. Isah (2021) stated for teachers to capture the interest of the learners; there is a need to develop a teaching 42 method such as the playway method for improving the student's positive attitude, retention ability, and academic performance.

However, in hypothesis three, it was revealed that there is no significant difference ($t\text{-cal. of } 1.96 < t\text{-crit. } 2.49$; $p\text{-value } 0.081 > 0.05$) in the academic performance of students when taught Biology concepts using simulation strategy and playway method was accepted. This result therefore indicates that the mean scores of students in the simulation strategy are similar to the playway method mean scores of students. This view was supported by Adesoji (2016) who believed that learning by discovery via simulation and playway tends to capture the attention of the learners and sustain their interest for a long period in science classrooms. This is because, students remember things they learn through simulation, discovery, and play in science longer and can recall the result faster through the association of facilities used in doing the demonstration and play.

Lastly, hypothesis four in Table 4 showed that there is a significant difference ($F\text{-ratio } 2.68 > F\text{-Crit. } 1.07$; $p\text{-value } 0.03 < 0.05$) in the academic performance of biology students across the 3 groups (traditional teaching method, simulation strategy, and playway method). However, differences are observed within groups. Okereke and Uwa (2018) opined that the playway method is a teaching strategy that concretizes instructions. Not only does it pave the way for imparting effective and enduring education; it helps in realizing the broader aims of education. Similarly, Umoke and Nwafor (2019) and Ezeudu and Ezinwanne (2018) observed that the use of simulations to teach science gives positive results over time and permits the learner to manipulate variables or parameters and then observe the consequences of their actions.

CONCLUSION AND RECOMMENDATIONS

The study shows that using playway and simulation methods in teaching biology improves student performance, compared to traditional methods. While there's no significant difference between playway and simulation methods, combining both methods shows a significant positive impact on student performance. Therefore, teachers are recommended to use playway and simulation methods to enhance biology teaching in secondary schools. Also;

- i. Textbook writers should include instructions and illustrations on using playway and simulation methods.
- ii. Teachers should move beyond traditional lectures and adopt diverse teaching methods.
- iii. The government and schools should provide teaching aids and materials for play and simulation methods.
- iv. Also, Government and professional associations should organize regular training workshops for teachers on innovative teaching strategies.

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