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Analtsis of Online and Offline Instruction in Students Academic Achievement in Biology at Denis Osadebe University Asaba, Delta State

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Keywords

Abstract

This study investigated the effects of online and offline instructional methods on students academic achievement in Biology at Denis Osadebe University Asaba, Delta state. Using quasi-experimental design, two groups of students (online and offline), each consisting of 30 participants were exposed to the same Biology content over a set period . A 30 -item Biology Achievement Test (BAT), with a reliability coefficient of 0.82, was administered to measure learning outcomes. The result showed a mean score of 61.57 with a standard deviation of 2.40 for the online group and a mean score of 71.90 with a standard deviation of 1.90 for the offline group. An independent sample t-test revealed a statistically significant difference in achievement between the two groups with a t-value of 18.15 favoring the offline instruction. The finding suggest that offline instruction leads to higher academic performance in Biology compared to online method within the study context. The study recommends enhancing the structure and delivery of online instruction to bridge the performance gap. Also blended instruction is recommended since it employs the strength of both offline and online instructions.

Introduction

The evolution of instructional methods has redefined education delivery worldwide. With digital technology's emergence and global crises like COVID-19, online learning rapidly emerged as an alternative to traditional in-person instruction (Olumorin et al., 2020). Online instruction has it's strength in accessibility and flexibility over offline which anchors more on interaction and hands- on laboratory activities. Despite its flexibility, scholars question its effectiveness in science education (Adebayo & Onyenemezu, 2021). Biology, as an interactive and practical subject, may be affected by the absence of physical interaction in online settings. According to Eze et al. (2021), students often learn biology better in a tactile and collaborative environment.Biology being a core subject in study of medicine,pharmacy,agriculture, biotechnology,nursing etc, requires effective teaching method that will promote conceptual understanding and practical application .In Nigeria particularly in Delta state students continue to face challenges in mastering biological concepts as reflected in the poor performance in national examinations. In a similar findings, Mbah and Ezekannagha (2022), emphasized that visual and auditory cues improve retention in traditional classrooms. The present study seeks to evaluate how these two instructional formats influence students achievements in Biology at Denis Osadebe University Asaba Delta state.

Statement of the Problem

Despite efforts to improve science education in Nigeria, students achievement in Biology

remains relatively low. It is believed that instructional method used plays a critical role in students understanding and academic success. As more institutions adopt online learning, concerns persist about its ability to deliver practical, engagement-driven instruction typical of science courses (Okeke & Adediran, 2020). The difficulty in simulating lab activities, real-time feedback, and peer collaboration online could negatively impact students understanding (Chukwuemeka, 2019). Furthermore, studies like that of Yusuf and Alabi (2021) indicate that learning mode directly influences learning outcomes. Inadequate technological infrastructure and low digital literacy further exacerbate performance gaps in online environments (Akinola & Iroegbu, 2021).

At Denis Osadebe University, students have experienced both online (virtual classes, digital resources) and offline (face-face lectures and laboratory) teaching approaches. Understanding the comparative effects of these methods on academic achievements of students will inform future instructional planning, particularly in the post –pandemic educational environment. This study addresses whether such factors affect biology students academic performance based on instructional mode. No study in this area known to the researcher, has been carried out at Denis Osadebe University Asaba . As a major concern therefore this study intends to find out the influence of instructional mode in the academic achievement of students in biology at Denis Osadebe University Delta state,

Objectives of the Study;

1. To determine the mean achievement scores of students taught Biology using online instruction.
2. To determine the mean achievement scores of students taught Biology using offline (face-to-face)instruction.
3. To assess the statistical significance of any difference in performance between the two groups.

Research Questions

1. What is the mean achievement score of students taught Biology through online instruction?
2. What is the mean achievement score of students taught Biology through offline instruction?
3. Is there a statistically significant difference in the performance of the two groups?

Research Hypothesis;

Ho: There is no significant difference in achievement scores between students taught Biology using online and offline instructional methods.

Methodology

Design:A quasi-experimental pre-test/post-test control group design was adopted.

Population: 300-level Biology Education students at Denis Osadeba University Asaba, were used for the study.

Sample: 30 students each for the online and offline instruction groups (total = 60), randomly selected were used for the study

Instrument: A 30-item Biology Achievement Test (BAT),was used for the study Reliability coefficient = 0.82 (KR-21).

Duration: 4 weeks of instruction using identical content delivered either online (via Google Classroom & Zoom) or offline (traditional classroom).

Data Analysis: Mean, standard deviation, and independent samples t-test were used to analize the data.

Results

Achievement Scores Summary (n = 30 each group):

Online Group:

- Mean Score: 61.57

- Standard Deviation: 2.40

Offline Group:
- Mean Score: 71.90
- Standard Deviation: 1.99

T-**Test Analysis:**
- t-statistic = 18.15
- p-value = 0.0000

Interpretation: Since $p < 0.05$, there is a statistically significant difference in achievement scores favoring the offline instruction method.

Discussion of Findings:

This study revealed a significant performance advantage for students taught Biology via traditional (offline) instruction. This aligns with Adebiyi et al. (2020), who found that interactive classroom environments enhance student motivation and academic outcomes. Similarly, Iroanya and Uche (2019) emphasized the role of teacher presence and classroom dynamics in science learning effectiveness. Ugwoke et al. (2022) also noted that virtual platforms, while efficient, often limit students' ability to ask spontaneous questions or perform guided experiments. The data further supports conclusions by Nwankwo and Eze (2023), who asserted that online environments must be redesigned with more interactivity to rival traditional modes.

Overall, this study corroborates that instructional delivery mode significantly affects biology learning outcomes.

Recommendations:

1. Investing in blended learning models that combines strengths of both methods will greatly enhance their performance. .
2 Government should Improve internet infrastructure and digital tools for science education.
3. Government should train educators in interactive online teaching methods.
4.Educators should ensure practical components of science courses are preserved online using simulations and virtual labs.

Conclusion

Offline instruction significantly enhances student performance in Biology compared to online instruction.

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Raw Data for Online and Offline Instruction Analysis
Online Instruction Group (Mean ~ 61.57, SD ~ 2.40)
60, 63, 59, 64, 60, 62, 61, 61, 63, 59
60, 64, 60, 63, 61, 61, 60, 62, 63, 59
64, 62, 61, 60, 59, 63, 62, 60, 61, 60
Offline Instruction Group (Mean ~ 71.90, SD ~ 1.90)
70, 73, 72, 70, 71, 74, 70, 72, 71, 73
72, 70, 71, 71, 70, 73, 71, 72, 70, 74
72, 70, 73, 71, 72, 70, 71, 73, 72, 70
T-Test Result
T-statistic ~ 18.15