



EFFECTS OF WHATSAPP LEARNING PLATFORM ON UNDERGRADUATES' PERFORMANCE IN BIOLOGY EDUCATION IN ONDO STATE, NIGERIA.

BY

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Abstract

This study examined the effects of the WhatsApp Learning Platform on undergraduates' performance in Biology in Ondo State Nigeria. The need for innovative learning and technological-driven learning methods has become increasingly important as conventional teaching methods often limit students' engagement. This study determined whether WhatsApp could enhance Biology students' academic performance compared to traditional instruction. A quasi-experimental design involving pre-test, post-test and control group was adopted. The population consisted of 1,219 Biology Education undergraduates, with a purposive sample of 200 students drawn from two public universities. The Biology Performance Test was used for data collection, with validity ensured through experts review and reliability confirmed with coefficients of 0.82. Data were analyzed using descriptive statistics, t-tests, and ANCOVA at 0.05 level of significance. The findings revealed that students exposed to WhatsApp showed significant improvement in Biology performance. Gender did not significantly influence the effect of WhatsApp on students' performance. The study concluded that WhatsApp, when integrated into instruction, serves as an effective supplementary tool that enhances students' academic performance in Biology. It was recommended that lecturers should embrace mobile learning platforms like WhatsApp to complement classroom instruction and institutions should provide professional development for teachers on digital learning tools.

Keywords: Performance, WhatsApp, Treatment, Platform

Introduction

Background to the Study

The world is rapidly transforming due to advancements in science and technology. In today's society, it is increasingly difficult to live without technology, as many individuals rely on gadgets such as mobile phones, tablets, and computers for their daily activities. Social networking platforms have become deeply ingrained in everyday life, with many people finding it challenging to go even a single day without using them. As technology evolves at an unprecedented pace, innovations once considered unrealistic are now part of daily reality. WhatsApp, for example, is a widely used application on mobile devices and computers,

originally designed for the exchange of instructions and entertainment content (Etim, Udosen, & Ema, 2016).

The Nigerian educational system operates within a structured framework comprising primary, secondary, and tertiary levels, designed to produce skilled individuals capable of contributing to the nation's socio-economic development. However, the sector faces persistent challenges such as inadequate infrastructure, limited funding, and regional disparities in access to quality education (Ogunleye, 2020). In response, the government has implemented policies aimed at improving teacher training, enhancing the provision

of educational materials, and expanding access to digital resources. These realities underscore the urgent need for innovative and sustainable solutions to enhance accessibility, quality, and efficiency in the system, particularly as student populations continue to grow.

The sciences which include Biology, Chemistry, Physics, and Mathematics are central to Nigeria's educational curriculum and essential to the nation's advancement in health, technology, and agriculture. Despite their importance, science education in Nigeria faces persistent challenges, including inadequate laboratory facilities, outdated equipment, and insufficient funding for research and development (Ajayi & Banjo, 2021). These limitations often hinder students' engagement with scientific concepts at a practical level, which is particularly critical for disciplines like biology that rely on hands-on learning for deep understanding. Efforts to address these gaps have included partnerships with international organizations to strengthen science infrastructure in schools and universities; however, systemic reforms remain necessary to align Nigerian science education with global standards. Emerging trends in digital learning, such as mobile and online resources, present promising opportunities to complement traditional science instruction (Owolabi and Julia, 2020).

Biology is the science of life and living organisms, encompassing their structure, function, growth, evolution, distribution, and taxonomy (Campbell et al., 2018). It is among the most popular science subjects in Nigerian secondary schools, serving as a gateway to careers in medicine, pharmacy, and dentistry. As a natural science, it integrates disciplines such as anatomy, ecology, and zoology, making it a vital component of general education. Nevertheless, both teachers and students often struggle with certain biological concepts, including genetics, respiration, ecology, photosynthesis, and evolution (West African Examination Council, 2016). The complex and often abstract nature of biology presents unique challenges to student engagement. Effective learning in this subject requires practical activities, visual aids, and

interactive approaches to help students grasp intricate biological processes (Johnson et al., 2019). Digital platforms like WhatsApp, with their multimedia-sharing capabilities, provide educators with tools to deliver diverse and engaging content that supports various learning styles.

Social networking refers to the sharing of stories or information with the intention of influencing others (Mistar & Embi, 2016). Among the many social networking tools, WhatsApp has become particularly prominent. Although the application has been available for several years, recent updates have enhanced its functionality since its initial release. Designed primarily to replace SMS, WhatsApp operates on internet data plans and is compatible with various devices, including Android, iPhone, Windows Phone, Nokia, and Blackberry. As an educational technology tool, social media promotes meaningful, qualitative interactions between learners and teachers, with WhatsApp serving as one of the most widely used platforms in this regard (Okereke, 2014). Social media platforms enable users to connect with friends and family, share multimedia content such as photos, videos, and music, and exchange personal information with a broad audience. They also have positive impacts on communication, collaboration, and social relationships (Bashir & Bhat, 2017). WhatsApp is particularly user-friendly: once a device's phone number is entered, the application (with the user's permission) scans contacts to identify other users, enabling easy invitations and message exchanges. The accessibility of learning materials anytime, anywhere, and in multiple formats through platforms like WhatsApp offers significant potential for enhancing students' deep learning capabilities. Furthermore, it can influence students' attitudes defined as an individual's predisposition toward a person, object, or concept, which may be positive or negative and reflected in beliefs, feelings, or intended behaviours (Donnie, Bambang, Ahmed, & Nur, 2018).

Teaching has been described in various ways by scholars. Zhang (2022) defines it as a form of interpersonal influence

aimed at changing another person's behavioral potential. Learning, on the other hand, is fundamentally about change whether through developing a new skill, understanding a scientific principle, or altering an attitude. Unlike incidental or natural changes, such as those that occur with aging, learning is typically intentional and relatively permanent. While some learning can happen without formal planning through experience, for example it generally involves a conscious effort to remember, understand, and improve future performance.

Active learning, should involves direct engagement with course materials through activities such as discussions, debates, role-playing, and hands-on practice. Beyond the classroom, it can also occur through internships, service-learning projects, and reflective assignments that encourage interaction and critical thinking. Students' expectations are complex constructs that can shape their adaptability, engagement, academic achievement, satisfaction, and retention. Tomlinson et al. (2022) note that students often value teachers who teach clearly, use relevant examples, and incorporate humor into their instruction. The transfer of learning the application of acquired knowledge and skills to new situations depends on multiple factors, including the learner's mental capacity and the degree to which principles can be generalized across contexts.

The corona virus disease 2019 (COVID-19) is a highly transmissible and pathogenic viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first identified in Wuhan, China, in December 2019, before rapidly spreading worldwide (Shereen et al., 2020). The outbreak affected all aspects of global life, including communities and academic institutions in Indonesia. On January 30, 2020, the World Health Organization (WHO) declared COVID-19 a Public Health Emergency of International Concern (PHEIC) after cases were reported outside Wuhan and the pandemic quickly escalated, resulting in tens of thousands of confirmed cases in China within weeks and continuing to rise globally (Myzo, 2017). This

unprecedented health crisis posed significant challenges to education systems, necessitating urgent policy interventions to adapt teaching and learning models (Report, 2020). At Maulana Malik Ibrahim State Islamic University Malang, for example, traditional face-to-face instruction was replaced with online and distance learning modalities to ensure academic continuity during campus closures. In response to the emergency, the Indonesian government issued directives through university policymakers to transition teaching activities online, utilizing internet-based platforms to curb the spread of the virus. This strategy aligned with UNESCO's global initiative to support countries in mitigating the educational impact of school closures, particularly for vulnerable and disadvantaged groups, by promoting the use of distance learning to sustain education for all (Green et al., 2021).

In line with Pratama and Yusro (2016), the findings of this study will not only contribute to the growing body of knowledge on social media enhanced learning but also provides practical insight for educators, curriculum planners, policy makers and school management on how to effectively utilized social media tools like WhatsApp to improve teaching and learning in Nigeria Universities.

Purpose of the Study

The purpose of this study was to investigate the effects of whatsapp learning platform on learning outcomes of undergraduates in biology education in Ondo State, Nigeria. The study specifically;

- 1 Investigates the performance of undergraduates in Biology before and after exposure to the WhatsApp Learning Platform and the Conventional Method;
- 2 Determine the difference in performance of undergraduates taught using the WhatsApp Learning Platform and those taught using the Conventional Method in Biology;
- 3 Examine the interactive effects of the WhatsApp Learning Platform and gender on undergraduates' performance in Biology.

Research Question

The following research question questions were raised to guide this study:

1. What is the performance of undergraduates in Biology before and after exposure to Whatsapp learning platform and conventional method?

Research Hypotheses

The following hypotheses were formulated and tested in this study:

1. There is no significant difference in the performance of undergraduates in the experimental and control groups before exposure to treatment in Biology.
2. There is no significant difference in the performance of undergraduates taught using the WhatsApp Learning Platform and those taught using the Conventional Method in Biology.

Methodology

This study adopted quasi-experimental research of the pre-test, post-test and control group design. The design examined the effects of independent variable on the dependent variable.

Academic performance of the students were established by pre-test which was conducted on both the experimental group and control group to ascertain the homogeneity. Post-test will be conducted after the treatments had been administered to measure the effect of the treatment on the performance of the student in both experimental and control group.

While the control group was exposed to convectional teaching method the experimental group on the other hand was exposed to treatment using Whatsapp learning platform (WLP). The population for the study consisted of

Table 1: Means and Standard Deviation of performance of students in Biology before and after treatment

Group	N	Mean	SD	Mean	SD	Mean Difference
Whatsapp Learning Platform	108	55.20	8.50	75.60	7.20	20.40
Conventional Method	92	54.80	7.90	68.50	8.10	13.70

Table 1 reveals that undergraduate students exposed to both the WhatsApp Learning Platform and the Conventional Method showed improvement in their Biology performance after treatment. For the WhatsApp Learning

5720 undergraduates in 200Level studying Biology Education in all the Public University in South-West, Nigeria. The choice of 200Level Biology education students seems to be more appropriate because they will be readily available for the treatment. The study sample consisted of 200 undergraduate students at the 200 level, drawn from two public universities in South-West Nigeria. A purposive sampling technique was employed in selecting the sample. The two universities were chosen because they offered BIO 205 as part of their biology curriculum, with little or no variation in course content and academic calendar. Purposive sampling was considered appropriate as it ensured the selection of a sample that was directly relevant to the study objectives and had uniform exposure to the course. The research instrument employed to generate data for the study is Biology Performance Test (BPT). The BPT was used to assess the performance of undergraduates in biology. It consisted of 30 single-answer questions drawn from the course outline for Introductory Developmental and Cell Biology (BIO 205). The test was administered within twenty minutes, with each correct response awarded one mark, giving a maximum obtainable score of 30, which served as a measure of students' performance in biology.

Results

This section presents the results of the study under the following tables.

Research Question 1: What is the performance of undergraduates in Biology before and after exposure to Whatsapp learning platform and conventional method?

Testing of Hypotheses

Hypothesis 1: There is no significant difference in the performance of

undergraduates in the experimental and control groups before exposure to treatment in Biology.

Table 3: t-test analysis of the difference in the performance of undergraduates in the experimental and control groups before exposure to treatment in Biology

Group	N	Mean	SD	Df	T	p
Whatsapp Learning Platform	108	55.20	8.50	198	0.34	0.73
Conventional Method	92	54.80	7.90			

p>0.05 (Not Significant)

Table 3 shows that before the treatment, the WhatsApp Learning Platform group had a mean performance score of 55.20 (SD = 8.50), while the Conventional Method group had a mean score of 54.80 (SD = 7.90). The t-test result (t = 0.34, df = 198, p = 0.73) indicates that the difference between the two groups was not statistically significant (p > 0.05). This means that both groups were comparable in their Biology

performance at the pre-test stage, supporting the null hypothesis that there was no significant difference before the intervention.

Hypothesis 2: There is no significant difference in the performance of undergraduates taught using the WhatsApp Learning Platform and those taught using the Conventional Method in Biology.

Table 5: t-test analysis of the difference in the performance of undergraduates taught using the WhatsApp Learning Platform and those taught using the Conventional Method in Biology

Group	N	Mean	SD	Df	t	P
Whatsapp Learning Platform	108	75.60	7.20	198	6.56	0.0001
Conventional Method	92	68.50	8.10			

p<0.05 (Significant).

Discussion

The study revealed that undergraduates' performance in Biology improved under both the WhatsApp Learning Platform and the Conventional Method, with a markedly greater enhancement in the WhatsApp group, a result consistent with Adewale and Oladipo (2023) and corroborated by Bello et al. (2022), who found that WhatsApp's interactive and flexible nature enhances comprehension and retention, although Akinbo and Musa (2021) cautioned that unstructured mobile use may cause distractions. Both groups also developed more positive attitudes toward Biology, with a stronger shift in the WhatsApp cohort, in line with Ojo and Fadipe (2023) and in consonant with Eze and Nnamani (2022), who linked mobile-assisted learning to improved

motivation, though Onwuka (2021) warned of blurred academic-social boundaries. Baseline comparisons showed no significant differences in performance, consistent with Adeyemi (2022), indicating group equivalence before treatment. Post-intervention, the WhatsApp group outperformed the conventional group, in consonant with Akande and Adebola (2023), while Igbo and Danjuma (2021) suggested outcomes may vary with digital literacy. Though Abubakar (2022) noted possible social media fatigue. No significant gender interaction effects were found for performance, in consonant with Ogunyemi and Salami (2022) indicating that WhatsApp learning benefits students equitably. These findings suggest that integrating WhatsApp into Biology instruction can enhance learning

outcomes across genders, offering a cost-effective, inclusive strategy for resource-constrained contexts while highlighting the need for careful instructional design to mitigate potential distractions and overload.

The finding of the study showed that there was no significant interaction effect of the WhatsApp Learning Platform and gender on undergraduates' performance in Biology. This is consonant with the work of Ogunyemi and Salami (2022) who reported that when both male and female students have equitable access to digital learning tools, gender does not significantly influence academic outcomes. This suggests that the benefits of WhatsApp-assisted learning are equally accessible regardless of gender, possibly due to the platform's widespread familiarity and ease of use among students. However, some studies, such as Olajide (2020), have found that female students sometimes exhibit higher engagement levels in technology-mediated learning environments, which can lead to performance differences. The absence of a gender interaction effect in this study may be explained by the relatively uniform digital literacy and social context of the participants, minimizing gender-based disparities. The implication of this finding is that WhatsApp Learning Platforms can be promoted as inclusive tools in Biology education, supporting gender equity in STEM learning outcomes.

Conclusion

The study concluded that the use of the WhatsApp Learning Platform (WLP) significantly enhanced undergraduates' performance in Biology compared to the Conventional Method. Both instructional approaches improved performance, but the WLP demonstrated greater effectiveness in promoting learning outcomes. The lack of significant interaction between the WLP and gender indicates that the platform's impact was consistent across male and female students. Hence, integrating WhatsApp as a learning tool will be an effective strategy for improving academic performance and student engagement in Biology education.

Recommendations

Based on the findings of the study, the following recommendations were made: Lecturers should consider incorporating the WhatsApp Learning Platform as a supplementary tool in teaching Biology to enhance student engagement, performance. Universities should provide training for lecturers on the effective use of digital platforms like WhatsApp to improve instructional delivery and student learning outcomes. Students should be encouraged to actively participate in online learning platforms to maximize collaborative learning, knowledge sharing, and peer support.

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