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ASSESSING THE IMPACT OF USING INSTANT GROUP MESSENGER AS CLASSROOM EXTENSION FOR TEACHING AND LEARNING BIOLOGY

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Abstract

The COVID-19 pandemic significantly disrupted conventional classroom instruction due to restrictions such as social distancing and limited physical interaction. Consequently, educators were compelled to explore alternative instructional approaches that extend learning beyond the physical classroom. This study assessed the impact of using WhatsApp as a classroom-extension tool among tertiary-institution students during the COVID-19 pandemic. A quasi-experimental design was adopted to compare students taught with the support of a WhatsApp group with those taught using the traditional face-to-face lecture method. Fifty-six students enrolled in a third-year Cell Biology course were randomly assigned to experimental and control groups. The experimental group received course materials and participated in academic discussions through a WhatsApp group, while the control group received instruction through conventional classroom lectures. Academic achievement was measured using pre-test and post-test multiple-choice assessments. Data were analysed using descriptive statistics and the Welch t-test, with Cohen's d computed to estimate effect size. Findings revealed a statistically significant difference in mean achievement scores between the two groups, with the WhatsApp-supported group outperforming the traditional lecture group by a moderate margin at pre-test and a substantial margin at post-test. The results suggest that mobile instant-messaging platforms such as WhatsApp can effectively extend classroom learning, promote collaborative learning, and improve academic performance. The study recommends the integration of mobile-learning platforms into higher-education curricula to enhance instructional delivery during emergencies and beyond.

Keywords: WhatsApp, COVID-19, instant messaging, mobile learning, collaborative learning, classroom extension

Introduction

The coronavirus disease 2019 (COVID-19) pandemic created an unprecedented disruption to educational systems worldwide. The disease, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was declared a global pandemic by the World Health Organization on 11 March 2020 (WHO, 2020). Owing to its airborne transmission and high rate of human-to-human spread, governments introduced several preventive measures, including social distancing,

restrictions on gatherings, and the temporary closure of educational institutions (Centers for Disease Control and Prevention [CDC], 2020). These measures had a profound impact on classroom teaching and learning. Traditional classroom instruction, which depends largely on physical interaction between teachers and students, became difficult to sustain. In Nigeria and many other developing countries, large class sizes and extended lecture periods increased the risk of virus transmission. Consequently, educational institutions were compelled to explore alternative methods of instruction capable of supporting learning while minimising physical contact.

One viable alternative is the integration of digital communication technologies into instructional practice. Social-networking applications and mobile-messaging platforms provide opportunities for continuous interaction between students and instructors beyond the classroom environment. Among these tools, WhatsApp has emerged as one of the most widely used instant-messaging applications globally. The platform supports the sharing of text messages, audio recordings, images, videos, and documents, enabling both synchronous and asynchronous communication. Research has shown that mobile-messaging platforms can enhance collaborative learning, increase student engagement, and foster a sense of community among learners (Bouhnik & Deshen, 2014; Cifuentes & Lents, 2011; Rambe & Bere, 2013). WhatsApp has gained popularity among students because of its accessibility, affordability, and ease of use. Studies have demonstrated that the application can facilitate academic discussions, improve student participation, and promote continuous learning outside the classroom (Church & de Oliveira, 2013; Nguyen & Fussell, 2016). Furthermore, mobile-supported learning aligns with the principles of connectivism and collaborative-learning theories, which emphasise interaction, knowledge sharing, and learning through networks (Siemens, 2005). Through WhatsApp group chats, students can ask questions, share learning resources, and engage in peer discussions at any time and from any location. Despite these potential benefits, the integration of instant-messaging platforms into formal educational settings remains relatively underexplored in many Nigerian tertiary institutions. The present study, therefore, investigated the effectiveness of using a WhatsApp group as a classroom-extension tool for teaching and learning Biology.

Literature Review

The integration of instant-messaging (IM) platforms such as WhatsApp and Telegram into educational contexts has transformed how teaching and learning extend beyond the traditional classroom. These platforms enable continuous interaction, immediate feedback, and flexible access to learning resources, thereby supporting ubiquitous and student-centred learning environments (Bates, 2019). Research indicates that IM tools enhance student engagement and participation by promoting real-time communication between students and instructors. According to Garrison (2017), online interaction fosters a sense of community and improves learning outcomes when effectively structured. Similarly, studies have shown that IM platforms facilitate collaborative learning, allowing students to share ideas, discuss concepts, and co-construct knowledge outside formal class hours (Johnson et al., 2014).

Empirical studies focused on WhatsApp have reported positive effects on academic performance, motivation, and learner autonomy. For instance, Bouhnik and Deshen (2014) found that WhatsApp groups supported continuous learning and improved communication between lecturers and students. Likewise, Barhoumi (2015) demonstrated that mobile learning through IM applications significantly enhanced student achievement in higher-education contexts.

Despite these advantages, some challenges have been identified. Instant-messaging environments may lead to distractions, off-task behaviour, and information overload, particularly when instructional activities are not well structured (Kirschner et al., 2006). Additionally, unequal participation among students and the informal nature of IM communication may limit its effectiveness for academic purposes (Roberts & McInnerney, 2007). Overall, the literature suggests that instant-messaging platforms are valuable tools for classroom extension and instructional support, especially when integrated with clear pedagogical strategies. Their effectiveness depends largely on guided facilitation, structured interaction, and alignment with learning objectives, highlighting the need for further empirical research in specific disciplines such as Biology.

Purpose of the Study

The study aimed to examine the impact of using a WhatsApp group as a classroom extension on students' academic achievement in tertiary education.

Research Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

$H0_1$: There is no significant difference between the mean achievement scores of students taught using a WhatsApp group and those taught using the traditional face-to-face lecture method.

$H0_2$: There is no meaningful effect (negligible effect size) of instructional method on students' academic achievement; that is, Cohen's $d \approx 0$.

Method

Research Design

The study adopted a quasi-experimental design to compare the academic performance of students exposed to two different instructional methods: WhatsApp-supported learning and the traditional face-to-face lecture method. Two groups were formed as outlined in Table 1.

Table 1

Instructional Group Descriptions

Group	Symbol	Description
Control group	X_1	Face-to-face lecture method
Experimental group	X_2	WhatsApp group chat method

Note. X_1 = control condition; X_2 = experimental condition.

Sample and Sampling Technique

The study sample consisted of 56 undergraduate students enrolled in a science-related course at the Federal College of Education (Technical), Akoka, Lagos. Simple random sampling was used to assign students to the experimental and control groups. The experimental group comprised 30 students, and the control group comprised 26 students.

Research Instruments and Procedure

The course used for the study was Cell Biology (AEB 322), a compulsory third-year course with three credit units. Both groups received the same course outline and instructional content; however, the mode of content delivery differed. The experimental group received course materials shared electronically through a WhatsApp group, where students engaged in discussions and collaborative learning. The control group received materials in printed format, delivered through conventional classroom lectures. Instruction for both groups lasted two hours per session over the same duration.

Students were assessed using a pre-test and a post-test, each comprising multiple-choice questions. The validity of the instruments was established through expert review by specialists in the field, who confirmed their adequacy, clarity, and relevance. The reliability of the assessment instrument was determined using Cronbach's alpha for internal consistency, with a reliability coefficient of $\alpha \geq .85$.

Method of Data Analysis

Descriptive statistics, including means and standard deviations, were used to summarise the data. Inferential analysis was conducted using the Welch t-test to determine whether significant differences existed between the two groups, given the unequal sample sizes and variances. Cohen's d was computed as a measure of effect size.

Results

This section presents the findings of the study using descriptive and inferential analyses. Pre-test and post-test mean achievement scores for both instructional groups are reported, followed by the results of the Welch t-test and effect-size analysis.

Table 2

Students' Achievement Scores by Instructional Group

Group	n	Pre-test M	SD	Post-test M	SD	Gain
Face-to-face (Control)	26	27.5	2.33	32.6	9.34	+5.1
WhatsApp (Experimental)	30	28.3	1.88	44.5	2.73	+16.2

Table 2 shows that the two groups had comparable pre-test scores (Control: M = 27.5, SD = 2.33; Experimental: M = 28.3, SD = 1.88), indicating similar baseline achievement levels. However, the post-test mean score of the experimental group (M = 44.5, SD = 2.73) was substantially higher than that of the control group (M = 32.6, SD = 9.34), representing a gain of 16.2 points compared with 5.1 points for the control group. Figure 1 illustrates these score comparisons visually.

Test of Hypothesis 1

Table 3

Independent-Samples Welch t-Test for Students' Post-test Achievement Scores

Comparison	Mean diff.	SD	t^{cal}	t^{crit}	df	p
Experimental vs. Control	11.89	8.88	6.27	2.005	54	.004

Note. SD = standard deviation of the score difference; t^{cal} = calculated t-value; t^{crit} = critical t-value at $\alpha = .05$ (two-tailed); df = degrees of freedom; p = exact p-value.

As shown in Table 3, the Welch t-test revealed a statistically significant difference between the two groups, $t(54) = 6.27$, $p = .004$, with a mean score difference of 11.89 points. Because the calculated t-value (6.27) exceeded the critical t-value (2.005) and $p < .05$, the null hypothesis ($H0_1$) was rejected. These results confirm that students taught with WhatsApp-supported learning achieved significantly higher academic performance than those taught through the traditional face-to-face lecture method.

Test of Hypothesis 2

An effect-size analysis was conducted using Cohen's d to determine the standardised difference between the two groups at pre-test and post-test, computed with the pooled standard deviation.

At pre-test, the control group (M = 27.5, SD = 2.33) and the experimental group (M = 28.3, SD = 1.88) showed a small to moderate difference, $d = -0.38$, indicating that the experimental group performed marginally better than the control group prior to the intervention. At post-test, the control group (M = 32.6, SD = 9.34) and the experimental group (M = 44.5, SD = 2.73) demonstrated a very large difference, $d = -1.79$. This indicates a substantial improvement in performance for the experimental group compared with the control group following the intervention. Because $|d| > 0.80$ (Cohen's benchmark for a large effect), the null hypothesis ($H0_2$) was rejected. Overall, while the groups were relatively similar at pre-test, the post-test results indicate a marked effect of the WhatsApp-supported instructional intervention, with the experimental group outperforming the control group by a considerable margin.

Discussion

The findings revealed that students who participated in Instant messaging-supported learning performed significantly better than those taught using the traditional lecture method. The improved performance may be attributed to the flexibility and accessibility provided by the Instant messaging platform, which allowed students to engage in discussions and access learning materials beyond scheduled classroom hours. These findings align with earlier research reporting increased student engagement and interaction when instant messaging platforms are integrated into instructional practices (Cifuentes & Lents, 2011; Rambe & Bere, 2013). Instant messaging group discussions fostered collaborative learning, enabling students to share resources and clarify academic concepts in real time. The asynchronous nature of the platform allowed students to revisit discussions at their own pace, reinforcing comprehension and retention. Furthermore, instant messaging platforms help eliminate social barriers and create a sense of belonging among learners (Doering et al., 2008). The ability to access information anytime and from any location encourages

active participation and continuous learning, thereby improving academic outcomes. This is consistent with connectivist learning theory (Siemens, 2005), which posits that knowledge is distributed across networks and that learning occurs through connections and interactions. There was clustering of students score between 39-50 points for the students taught with instant messaging. This resulted in a low standard deviation can be attributed to factors such as group study habits or collaborative learning created through instant messaging group and ease of sharing learning resources such as academic content information in the instant messaging groups. Notably, the control group exhibited greater variability in post-test scores compared to the experimental group, suggesting that Instant messaging-mediated learning produced more consistent achievement outcomes. This uniformity may reflect the equalizing effect of shared digital resources accessible to all group members regardless of individual socioeconomic differences in access to printed materials.

Conclusion

This study demonstrated that integrating WhatsApp as a classroom-extension tool significantly improves students' academic achievement in tertiary education. The platform facilitates collaborative learning, enhances student engagement, and provides continuous access to learning resources beyond the physical classroom environment. The substantial mean-score gain observed in the experimental group (+16.2 points, compared with +5.1 points for the control group) underscores the pedagogical value of mobile instant-messaging platforms as supplements to conventional instruction. The findings carry relevance for institutions in developing nations where emergencies such as pandemics, natural disasters, or civil unrest may interrupt face-to-face instruction. Mobile-learning platforms such as WhatsApp represent low-cost, widely accessible solutions that can sustain continuity of education under such conditions.

Recommendations

Based on the findings, the following recommendations are made:

- Educational institutions should integrate mobile-learning technologies into their instructional-delivery frameworks.
- Lecturers should adopt WhatsApp and other Web 2.0 platforms to facilitate collaborative learning and extend classroom interaction.
- Government agencies and educational stakeholders should invest in ICT infrastructure to support sustainable digital-learning environments.
- Future studies should incorporate platforms such as Google Classroom, YouTube, and virtual laboratories to complement instant-messaging tools, and should employ randomised controlled designs to strengthen causal inference.

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