



## Assessment of the Impact of Whatsapp Usage on Chemistry Education in Tertiary

### Institution: A Case Study of Federal College of Education, Zaria

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#### Abstract

*This study assessed the impact of WhatsApp usage on chemistry education in tertiary institutions: A case study of Federal College of Education, Zaria. The study employed survey design as the research methodology. Its study population was 734 respondents, comprised of lecturers, undergraduate and NCE chemistry students. 300 respondents were drawn as sample size, 20 lecturers, 80 B.Ed and 200 NCE students. A Questionnaire was the instrument used for data collection. Validity and reliability of the instrument were established. Descriptive statistics of means and standard deviation were used to answer research questions, while inferential statistics of independent sample t-test statistics was used to test the study hypotheses. The finding of this study revealed no significant difference at 0.05% level of significance on WhatsApp's usage and students' engagement and lecturer's effectiveness in teaching and learning Chemistry. The second finding revealed no significant difference between the perception of students and lecturers on the use of WhatsApp application for teaching and learning Chemistry in FCE Zaria. The study also revealed a significant difference between the effects of WhatsApp application usage and teaching/learning of Chemistry in tertiary institution. Therefore, it is recommended among others that: Lecturers should develop specific, measurable, achievable, relevant, and time-bound clear objectives for WhatsApp-based chemistry education, towards improvement in student learning outcomes, science process skills in chemistry and facilitate learning outside the classroom.*

**Keywords:** Chemistry, Education, Learning, Students, Teaching, WhatsApp.

#### Introduction

Chemistry as a science discipline deals with the study of composition, properties and the uses of matter. It describes how one or two substances interact with one another to give rise to different substances. Chemistry is a science subject offered in Senior Secondary Schools in Nigeria as a core subject [1]. To be given an admission to study courses like Medicine, pharmacy, Nursing,

Engineering and many other physical science courses, credit in chemistry is required. Learning of chemistry is concerned with students' disposition to a given task to enhance their level of interest towards every activity on imbedded in the subject. A few studies have revealed positive attitude towards practical including Qualitative analysis [2].

The discipline of chemistry is complex and multifaceted encompassing various branches including organic, inorganic, physical and analytical chemistry. Ahmad [1] sees Chemistry as a systematic investigation of nature with a view to understanding and harnessing them to serve human needs. Research showed that Chemistry involves reasoning and problem solving which require both cognitive and technical skill [3]. However, teaching and learning chemistry pose unique challenges which include; abstract concepts, complex formulas and laboratory experiments which require a deep understanding of theoretical and practical aspects. Several efforts had been made by Science Teachers Association of Nigeria in providing solutions to students' poor performance in chemistry [4].

Unfortunately, the problem persists. This may be due to poor teaching pedagogies, lack of motivation, poor reasoning level, and learning styles [3]. Poor students' achievement and motivation in chemistry are quite alarming and these require immediate attention to avoid production of inexperienced manpower in the teaching of chemistry and its related disciplines [5].

Tertiary institutions face the additional challenge of catering to a large students' population with a varying learning needs and preferences. In Nigerian universities today, undergraduates taking chemistry are few in number and their performances are quite discouraging [3]. The traditional lecture-based approach often struggles to engage students, promote understanding and foster critical thinking

leading to a need for innovative teaching methods and technologies that can enhance student learning outcomes in chemistry or accommodate different learning needs. For instance, some students may benefit from visual aids while others may prefer hands-on experiments or interactive simulations [6].

The rapid growth of technology and social media has transformed the education landscape around the world, presenting both opportunities and challenges for teaching and learning. The widespread adoption of social media platforms such as WhatsApp, Instagram and Facebook has redefined how people communicate, interact and share information. WhatsApp application with its vast users and user-friendly interface has become an integral part of daily life, making it an attractive platform for educational purposes. The use of WhatsApp grew up rapidly: it gained over 350 million users, between 2010 and 2013. By late 2017, WhatsApp had reported around 1.5 billion active users of the application around the globe [6].

WhatsApp platform is increasingly becoming a major social media tool used by university students in Nigeria, yet its acceptance for pedagogical use may be pervasive in some sub-Saharan African [7]. Its features, such as group chat, file sharing, and multimedia support, provide a collaborative and interactive environment for students to engage with course material, ask questions and receive feedback. Moreover, students may have different levels of prior knowledge and skills requiring tailored support and scaffolding to ensure equitable

access to learning. By acknowledging and addressing these differences, teachers can create a more inclusive and effective learning environment that caters for the diverse needs of their students through WhatsApp.

The WhatsApp provides communication opportunity for anyone who installed the application on a smartphone with Internet connection. Although few researchers focus on the detailed usage of WhatsApp as a mobile educational tool that promotes learning through connection, communication and collaboration [8]. One of the advantages of WhatsApp application is enhancing communication. WhatsApp application can provide a tool for more consistent and smoother communication between students and teachers, thus creating new venues of education.

Teachers are often pressured to cover materials that might be disproportional to the time allocated for each class (arguably owing to the fact that some poorly-performing students need more time for each individual task, which makes the teacher rush to do the rest of tasks under time pressure). WhatsApp network is not only used for social interaction, but also it is used as an instructional and educational material or as a platform [9]. WhatsApp application also enables immediate synchronous communication, and it is easily accessible by people, including school students and teachers. The application is different from other social networks in that it maintains the privacy of the people involved, and things they exchange do not go public as in the case of Facebook for

example. Despite the potential benefits, there is a need for systematic investigation into the impact of WhatsApp application on teaching and learning chemistry in tertiary institutions. Previous studies have primarily focused on the use of social media in education, but few have specifically explored the effectiveness of WhatsApp in chemistry education.

### **Statement of the Problem**

The social constructivist approach to learning emphasizes the importance of social interaction in the learning process. Thus, for efficient learning to take place, individuals are engaged in activities so that they can create meaning and have in-depth understanding of the concept taught through their interaction with each other and their immediate environment. This approach to learning is especially suited for Tertiary institution students. However, chemistry education in tertiary institutions faces significant challenges including poor student achievement and inadequate teacher training. This is highly reflected in the poor achievement in chemistry by students at all levels of education [4].

Despite its relevance to various scientific fields, chemistry learning is often hindered by limited interactivity between teachers and students, as well as students themselves. This can lead to a lack of understanding, poor retention, and ultimately poor academic performance.

The widespread use of social media among students among and teachers presents an opportunity to develop innovative instructional and learning

strategies. Specifically, WhatsApp, a popular social media tool can be leveraged to enhance chemistry learning by facilitating group discussion, collaborative learning and instant feedback. However, the potential benefits and challenges of using WhatsApp in chemistry education remain unexplored.

Therefore, this study aims to investigate the impact of WhatsApp on chemistry teaching and learning in tertiary institutions including its effects on students' engagements, understanding, and academic performance, as well as the challenges faced by educators and students in using this tool.

### **Objectives of the Study**

The Objectives of the study are to;

1. Investigate the impact of WhatsApp application usage on students' engagement and lecturer's effectiveness in teaching and learning chemistry in FCE Zaria.
2. Examine the perceptions of students and lecturers on the use of WhatsApp application for teaching and learning chemistry in FCE Zaria.
3. Ascertain the effects of WhatsApp usage in teaching and learning chemistry in tertiary institutions.

### **Research Questions**

The following research questions will guide the study:

1. How does WhatsApp application usage affect students' and lecturers' engagements and

effectiveness in teaching and learning chemistry in FCE Zaria?

2. What are the perceptions of students and lecturers on the use of WhatsApp application for teaching and learning chemistry in FCE Zaria?
3. What are the effects of WhatsApp application usage on the teaching and learning of chemistry in tertiary institutions

### **Research Hypothesis**

The following null hypotheses was formulated to guide the study at  $p \leq 0.05$  level of significance

1. There is no significant relationship of WhatsApp application usage between students' engagement and lecturers' effectiveness in teaching and learning chemistry in FCE Zaria.
2. There is no significant difference between the perception of students and lecturers on the use of WhatsApp application for teaching and learning chemistry in FCE Zaria?
3. There is no significant relationship between the effects of WhatsApp application usage and teaching/learning of chemistry in tertiary institution.

### **Methodology**

This study employed the use of survey research method in finding solution to the research questions. This design was chosen because it allows for the collection of data from large number of

participants and provides a snapshot of their perceptions and experiences.

The population of this study consists of all students and lecturers of chemistry at FCE Zaria which include students enrolled in chemistry programs

(NCE and B. Ed), and the lecturers teaching chemistry in the college There are 43 chemistry lecturers, 121 B.Ed students and 570 NCE chemistry students across the federal college of education Zaria as obtained from chemistry examination office.

**Table 1: Population of the study**

S/N	Category	Population
1.	Lecturers	43
2.	400L	28
3.	300L	57
4.	200L	36
5.	NCE III	180
6.	NCE II	270
7.	NCE I	120
	<b>Total</b>	<b>734</b>

Source: Field work 2024, chemistry examination office

### **Sample and Sampling Procedure**

With a targeted population of 734 participants in the study area, there is a confidence level of 95% and margin error of 5%. From the foregoing, the required sample size for the study based on The Research Advisors' table is 280. In order to address 5% margin error, 20 copies of the questionnaire will

be added. Therefore, 300 questionnaires were administered in the study area.

The study used two sampling techniques stratified random sampling and proportionate simple random sampling techniques.

Table 2 shows the sample distribution in proportion to population.

**Table 2: Sample of the study by population**

Categories of respondents	Population	Sample
Lecturers	43	20
B.Ed Students	121	80
NCE Students	570	200
<b>Total</b>	<b>734</b>	<b>300</b>

Source: Field work 2024

### Procedure for Data Collection

The method employed by the researchers for the collection of the data is questionnaire. The questions consist of six sections that is section A to F, the researchers used a level of frequency of the response ranges from daily, weekly, rarely, never, to once a day, somewhat, frequently. The entire questionnaire was administered personally to the respondents.

### Instrumentation

The data collection instrument for this study was self-developed structured questionnaire titled Teaching and Learning of Chemistry using WhatsApp (TALOCUW). The questionnaire was prepared based on modified Likert four-point scale. Likert style type of questionnaire is the

most frequently used in educational research, due to high degree of freedom it permits in choosing response.

### Pilot Study

For the purpose of ascertaining of the research instrument, pilot study will be carried out with some lecturers and students of chemistry in FCE Zaria.

### Statistical Analysis

Descriptive statistics of means and standard deviation were used to answer research questions, while inferential statistics of independent sample t-test statistics was used to test the study hypotheses at  $p \leq 0.05$  level of significance.

## Results

### Analysis of Respondents' Bio-Data

**Table 1: Gender of the respondents**

Gender	Frequency	Percentage
Male	190	63.33
Female	110	36.67
Total	300	100

Table1 revealed the gender of the respondents, 190 (63.33%) were males while 110 (36.67%) were females.

**Table 2: Age of the respondents**

Age	Frequency	Percentage
15-19	60	20
20-24	144	48
25-29	75	25
Above 29	21	7
Total	300	100

Table 2 revealed that 60 respondents representing 20% were within the age category of 15-19 years, 144 representing 48% within 20-24 years, 75 representing 25% within 25-29 years while 21 representing 7% were above 29 years.

**Table 3: Students level of study**

Level	Frequency	Percentage
NCE	200	71.43
Bed	80	28.57
Total	280	100

Table 3 revealed that 200 respondents representing 71.43% were NCE holders while 80 representing 28.57% were B.Ed holders.

**Table 4: Lecturers' teaching experience**

Experience	Frequency	Percentage
< 5 years	-	-
5-10 years	14	70
Above 10 years	6	30
Total	20	100

Table 4 revealed that 14 respondents representing 70% had teaching experience of 5-10 years while 6 respondents representing 30% had experience of above 10 years.

### **Answers to Research Questions**

**Research Question One:** How does WhatsApp communication usage affect students' engagements and lecturers effectiveness in

teaching and learning Chemistry in F.C.E, Zaria? This Research Question was answered using means and standard deviations as summarized in Table 5.



**Table 5: Means response Scores on how WhatsApp communication usage affects students' engagements and lecturers' effectiveness in teaching and learning Chemistry**

Variables	N	Mean	Std. Dev	Mean Difference
Lecturers	20	12.4	1.3917	0.1
Students	280	12.3	3.6114	

Result from table 5 revealed a mean response score of 12.4 and a standard deviation of 1.3917 was observed for lecturers on how WhatsApp communication usage affects students' engagements and lecturers' effectiveness in teaching and learning Chemistry while a mean response of 12.3 and a standard deviation of 3.6114 was recorded for students. A mean difference of 0.1 was observed.

**Research Question Two:** What is the perception of students and lecturers on the use of WhatsApp application for teaching and learning Chemistry F.C.E, Zaria. This Research Question was answered using means and standard deviations as summarized in table 6.

**Table 6: Means response scores on the perception of students and lecturers on the use of WhatsApp application for teaching and learning Chemistry**

Variables	N	Mean	Std. Dev	Mean Difference
Lecturers	20	9.3	0.979	0.4
Students	280	9.7	2.849	

Result from table 6 revealed a mean response score of 9.3 and a standard deviation of 0.979

was observed for lecturers on the perception of students and lecturers on the use of WhatsApp

application for teaching and learning Chemistry while a mean response of 9.7 and a standard deviation of 2.849 was recorded for students. A mean difference of 0.4 was observed.

**Research Question 3:** What are the effects of WhatsApp application usage on the teaching and learning of Chemistry in tertiary institutions? This Research Question was answered using means and standard deviations as summarized in Table 7.

**Table 7: Means response scores on the effects of WhatsApp application usage on the teaching and learning of Chemistry**

Variables	N	Mean	Std. Dev	Mean Difference
Lecturers	20	5.0	0.000	0.7
Students	280	5.7	2.457	

Result from Table7 revealed a mean response score of 5.0 and a standard deviation of 0.000 were observed for lecturers on the effects of WhatsApp application usage on the teaching and learning of Chemistry while a mean response of 5.7 and a standard deviation of 2.457 was recorded for students. A mean difference of 0.7 was observed.

### Hypotheses Testing

Three corresponding null hypotheses were formulated for testing in this study. The statistical tool used for testing these hypotheses was independent t-test statistics.

**Hypothesis 1:** There is no significant difference in the responses of lecturers and students on WhatsApp communication usage and students' engagement and lecturers' effectiveness in teaching and learning Chemistry in FCE, Zaria.

**Table 8: Result of t-test statistics on significant difference in the mean responses of lecturers and students on WhatsApp communication usage and student's engagement and lecturers' effectiveness in teaching and learning Chemistry**

Variables	N	Mean	SD	Df	t-cal	p-value
Lecturers	20	12.4	1.3917	298	0.264	0.793
Students	280	12.3	3.6114			
t-critical = 2.020						

The result presented in Table 8 revealed no significant difference in the mean responses of lecturers and students on WhatsApp communication usage and students' engagement and lecturers' effectiveness in teaching and learning Chemistry ( $t = 0.264$ ,  $p = 0.793$ ). Also, the t-calculated value of 0.264 is less than the t-critical value of 2.020. Therefore, the null hypothesis which states that there is no significant difference in the responses of

lecturers and students on WhatsApp communication usage and students' engagement and lecturers effectiveness in teaching and learning Chemistry in FCE, Zaria is accepted.

**Hypothesis 2:** There is no significant difference between the perception of students and lecturers on the use of WhatsApp application for teaching and learning Chemistry in FCE Zaria.

**Table 9: Result of t-test statistics on significant difference between the perception of students and lecturers on the use of WhatsApp application for teaching and learning Chemistry in FCE Zaria**

Variables	N	Mean	SD	df	t-cal	p-value
Lecturers	20	9.3	0.979	298	1.494	0.142
Students	280	9.7	2.849			
t-critical = 2.020						

The result presented in Table 9 revealed no significant difference between the perception of students and lecturers on the use of WhatsApp application for teaching and learning Chemistry in FCE Zaria ( $t = 1.494$ ,  $p = 0.142$ ). Also, the t-calculated value of 1.494 is less than the t-critical value of 2.020. Therefore, the null hypothesis which states that there is no significant difference between the perception of

students and lecturers on the use of WhatsApp application for teaching and learning Chemistry in FCE Zaria is accepted.

**Hypothesis 3:** There is no significant difference between the effects of WhatsApp application usage and teaching/learning of Chemistry in tertiary institution

**Table 10: Result of t-test statistics on significant difference between the effects of WhatsApp application usage and teaching/learning of Chemistry in tertiary institution**

Variables	N	Mean	SD	df	t-cal	p-value
Lecturers	20	5.0	0.000	298	4.499	0.000
Students	280	5.7	2.457			
t-critical = 2.020						

The result presented in table 10 revealed significant difference between the effects of WhatsApp application usage and teaching/learning of Chemistry in tertiary institution ( $t = 4.499$ ,  $p = 0.000$ ). Also, the t-calculated value of 4.499 is greater than the t-critical value of 2.020. Therefore, the null hypothesis which states that there is no significant difference between the effects of WhatsApp application usage and teaching/learning of Chemistry in tertiary institution is rejected.

### Summary of the Findings

1. The finding of this study revealed no significant difference in the mean responses of lecturers and students on WhatsApp communication usage and student's engagement and lecturers' effectiveness in teaching and learning Chemistry.
2. The second finding revealed no significant difference between the perception of students and lecturers on the use of WhatsApp application for teaching and learning Chemistry in FCE Zaria.

- 3 The third finding revealed significant difference between the effects of WhatsApp application usage and teaching/learning of Chemistry in tertiary institution.

### **Discussion of Findings**

The finding of this study revealed no significant difference in the mean responses of lecturers and students on WhatsApp communication usage and students' engagement and lecturers' effectiveness in teaching and learning Chemistry. This finding corroborates with that of [5] that WhatsApp is a mobile, educational tool that promotes teaching and learning through connection, communication and collaboration as well as cooperation. Also, this finding aligns with that of [6] who posited that WhatsApp represents a potentially useful tool in educational contexts. It provides a platform through which students can interact with one another, and allow students to create and send different content such as photographs, videos and links or websites to other texts or materials to one another.

The second finding revealed no significant difference between the perception of students and lecturers on the use of WhatsApp application for teaching and learning Chemistry in FCE Zaria. This finding is in line with that of [7] Who found that WhatsApp can be useful in language assessment. Students can use WhatsApp to record their speech and share their recordings with their teachers and other students. Similarly, [7] found that WhatsApp is a social network application that gives the opportunity of sending and receiving direct messages and feedback. It is reasonably a novel

educational tool which supports teachers and students' relationship by sharing learning activities.

The third finding revealed a significant difference between the effects of WhatsApp application usage and teaching/learning of Chemistry in tertiary institution. This finding agrees with that of [10] who examined the effect of the use of WhatsApp on English as Foreign Language (EFL) students in written vocabulary tasks in Saudi Arabia. The author found that WhatsApp had a positive effect on students' performances. [5] opined that the field of education has evolved to the extent that teachers can teach students with more depth and efficiency and also clear all their doubts with modern teaching strategies such as WhatsApp.

### **Conclusion**

Based on the summary findings, this study concludes that:

The finding of this study revealed no significant difference in the mean responses of lecturers and students on WhatsApp communication usage and students' engagement and lecturers' effectiveness in teaching and learning Chemistry.

The second finding revealed no significant difference between the perception of students and lecturers on the use of WhatsApp application for teaching and learning Chemistry in FCE Zaria.

The third finding revealed significant difference on impact of WhatsApp between lecturers teaching practice and students learning strategies in Chemistry.

The final finding revealed significant difference in the benefits and challenges between lecturers and students on the utilization of WhatsApp application for teaching/learning of Chemistry in tertiary institutions.

### Recommendations

In the light of the finding of this study, the following recommendations are made:

- Lecturers should develop a specific, measurable, achievable, relevant, and time-bound clear objectives for WhatsApp-based chemistry education

-Lecturers should establish clear guidelines and protocols on how their students can maximize the benefit of WhatsApp on academic purposes.

-Lecturers should design multimedia resources such as quizzes, polls to enhance student engagement and understanding

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