

# Effects of Google Classroom on Academic Performance and Retention of Senior Secondary School Chemistry Students in Nigeria

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## ABSTRACT

The study investigated the effects of Google Classroom on Academic Performance and Retention of Senior Secondary School Chemistry Students in Nigeria. The study employed a pre-test-post-test, control quasi-experimental research design. The sample for the study was 96 students offering Chemistry at the Senior Secondary School level in Nigeria. The instrument administered to the sample was a Chemistry Achievement Test (CAT) extracted from the West Africa Senior Secondary Certificate Examination (WASSCE). Four research hypotheses were formulated to guide the study. The study's findings revealed that using Google Classroom improves students' performance in Chemistry and enhances their retention abilities. Based on the findings, it was recommended that Chemistry teachers should be encouraged to employ the use of Google Classroom in teaching the subject.

**Keywords:** Google Classroom, Chemistry, Performance, retention, Senior Secondary School

## INTRODUCTION

The rapid development of computer and internet technologies has encouraged research into the effects of the use of these technologies on the academic performance of students. In light of this unprecedented growth and the potential utilization of mobile devices for educational programs, a plethora of educational applications have been developed for the enhancement of learning, including the development of learning management systems (Ajayi, 2020). The current research concentrated on evaluating the effectiveness and retention rates of students utilizing a mobile learning management system referred to as Google Classroom, which is designed to provide a student-centered educational experience.

Today, technology shapes and changes how the world accesses and engages in information. To this effect, many such aspects have impacted avenues for learning and, therefore, would influence the way we teach and learn. The classroom has just become digital with the influence of mobile technology. Mobile phones, which students can access, are designed to serve as tools for communication, entertainment avenues, and means of attaining digital knowledge that could help in their development into self-sufficient individuals.

Despite the great progress already made in pursuing education goals and the dedication of many professional educators, the consensus is that education in Nigeria is not yet quite effective. This is because the standard form of class is characterized by a teacher-centered approach that focuses on subject-centered content. However, individual learners have different needs that are not effectively catered for. Lectures are often complemented by homework assignments designed to reinforce the material dealt with in the class session.

Chemistry is a branch of physical science concerned with investigating substance composition, their properties, and the reactions they undergo, including the uses of these reactions in the synthesis of new substances. It also tends to study the relationship between atoms and the reactions in which they engage. This is possible by observing practical phenomena in materials. In addition, chemistry also plays a vital role in developing new materials and in technological development. Likewise, human beings show strong dependence upon natural resources; as a matter of fact, the science of chemistry serves as the basis for their manufacture and extraction. Moreover, chemistry enables the understanding of all processes in terms of matter and energy associated with

the motion of atoms. It is within the domain of energy that the various proposed pedagogical models engage with the most advanced and diverse technologies, which are essential in the present context.

In the modern context, there have been increasing varieties of tools in instructional technology that were purposed to enhance the efficiency of teaching and learning Chemistry. However, along its long history, the field of Chemistry has undergone many changes. These relate to the methods used in teaching Chemistry. Thus, there have been shifts from personality-centered methods to rational structures, and from process-type methods to eventually shift from traditional classroom settings to the online environment (Olaniyi and Ajayi, 2020; Okeke et al, 2022). For instance, the embodiment of ICT in teaching and learning in science subjects has become a necessary tool in imparting meaningful scientific literacy to young adults.

Chemistry is a discipline of considerable significance in Nigeria, holding a central role within the scientific domain and its practical implementations. It can be pursued as an independent subject or in conjunction with other scientific disciplines. Furthermore, it serves as a requisite for entry into tertiary educational institutions in the nation. This subject is made available at both the senior secondary level and within higher education frameworks in the country.

Google Classroom allows teachers to create assignments, quizzes, questions, and short-answer or multiple-choice questions (Ajayi, 2020; Okeke et al, 2022). Each uploaded activity can include an instructional video, Google Slides presentation, Google Books, a worksheet, or any document uploaded to Google Drive. Google Classroom allows students of all diversified backgrounds a greater opportunity to use technology to enhance academic performance throughout the curriculum. Since the study focuses on the effect of Google Classroom on the learners' academic performance and persistence in Chemistry, it was utilized as the facilitating framework for exploring the management of learning variables. Data regarding the students' academic performance were collected before and after the explanation of the Chemistry topics using this framework. The data obtained were analyzed using hypothesis testing methods.

There are different forms of e-learning technologies, but this research focused only on one type of e-learning technology, which is the use of Google Classroom. It is a free web-based educational tool offered by Google, intended for educational institutions to help organize integrated communication between teachers and students, distribute assignments and submissions, grade using Google Drive, ensure effective file organization, and allow students to access educational resources from any device. According to Okeke et al, 2022. Google Classroom is an environment that creates an e-learning experience among students. Through the use of Google Classroom, flexible and free modes of information dissemination enable the promotion of interaction among students and lecturers. According to Leshner 2018, there are technology standards set for classrooms to ensure educators understand measures used by campus administrators and technical support staff while determining the level of support for diverse online educational technologies.

### **Statement of the problem**

Students' academic performance in Chemistry has been a major concern to researchers and parents. Despite several efforts by researchers to ensure better performance in Chemistry, an appreciable improvement is yet to be recorded in the learning output in Nigeria secondary schools. Diverse teaching methods and strategies have been employed by the Chemistry teachers with the hope of changing the scenario but the situation is still far from the expectation. Recently, a discovery was made in the area of lesson delivery strategies being employed by teachers in Nigerian classrooms. Most methods did not take into consideration individual differences among the students in the area of their learning rate. Some students require reading, hearing or practicing repetitively several times before any concept can be assimilated. Several methods and strategies currently being used only pass information and lessons once to the student during the classroom teaching and make no provision for lesson recast outside the class. Students are left with the notes copied during the short classroom. This current prevailing situation prompted this research intending to introduce an online classroom to the teaching of Chemistry to avail the students the opportunities to record and replay the lesson or revisit the Google Classroom at any time to replay the lesson of choice. Google Classroom could also give privileges to students who are not able to attend the physical classroom as they can connect from whatever location they are during the period of classroom teaching. This research therefore was embarked upon to investigate the

effectiveness of Google Classroom on Academic Performance and retention of Senior Secondary School Chemistry Students in Nigeria.

## Research Hypotheses

The following research hypotheses were formulated and analyzed in this study

- 1) There is no significant difference in the pretest mean scores of Chemistry students in experimental and control groups
- 2) There is no significant difference in the posttest mean scores of Chemistry students in experimental and control groups
- 3) There is no significant difference in the retention mean scores of Chemistry students in experimental and control groups
- 4) There is no significant difference between the posttest mean scores of male and female students when taught Chemistry using Google Classroom

## METHODOLOGY

This research adopted a pre-test-post-test control quasi-experimental research design. The population for the research comprised all Senior Secondary School two students offering Chemistry as part of their compulsory subjects in Nigerian schools. The sample consisted of 96 Senior Secondary School two students offering Chemistry as part of their subject from two schools in Ondo State, Nigeria. Multistage sampling techniques were employed in selecting the two schools and two classes used in this work. Stage one, a Local Government Area was randomly selected out of the 18 Local Government Areas in Ondo State. In stage two, two schools were randomly chosen from the one Local Government Area earlier selected. In stage three, an intact class was selected from each of the two schools chosen using a simple random sampling technique. Finally, in stage four, a simple random sampling technique was used to determine the experimental group while the second class automatically became the control group.

The instrument used for this study was a Chemistry Achievement Test (CAT) extracted from the West African Senior Secondary School Certificate Examination (WASSSCE) questions covering four recent years. The instrument comprises 20 multiple-choice items. Each correct item chosen by the students attracted 1 mark while the wrong choice attracted 0 marks. The test items were subjected to face and content validity by some experts in Chemistry Education and Test, Measurement, and evaluation. The reliability was determined using Kuder-Richardson 20 which gave a reliability coefficient of 0.87 which shows that the instrument was suitable of this work.

The instrument was administered on the students during the first week of the exercise to obtain the pretest for the two groups. Thereafter, the treatment was carried out on the experimental group. The students in the experimental group were introduced to Google Classroom through the available internet-ready devices provided for the purpose. They were given orientation on the use of Google Classroom for academic purpose. The lesson for the day began by introducing the students to where they could retrieve and make use of the learning materials both in the classroom and at their leisure for continuous study. The treatment lasted for four weeks. During the four weeks, the control group was left to their regular Chemistry teacher without any interference from the researcher nor introduction of the treatment to this group. At the end of the treatment on the experimental group, the instrument was administered to the two groups again to obtain the post-test performance scores. The entire exercise lasted six weeks. To obtain the retention scores for the two groups, the instrument was readministered on the students after two weeks from the posttest week.

## RESULTS AND DISCUSSION

Data collated from the field were subjected to statistical analysis and the results were as presented. All the hypotheses were tested at 0.05 level of significance using t-test

**Ho1:** There is no significant difference in the pretest mean scores of Chemistry students in experimental and control groups

Table 1: t-test analysis on the pretest mean scores of experimental and control groups

Group	N	Mean	SD	df	T	P
Experimental	42	9.62	2.13	94	0.11	0.92
Control	54	9.57	1.83			

$p > 0.05$

Table 1 showed that  $p$  (0.92) > than the  $\alpha$  (0.05). This indicates that there was no significant difference between the academic performance of both experimental and control groups before the treatment. Therefore, the hypothesis was not rejected. Both groups performed equally. Hence, they were homogeneous.

**Ho2:** There is no significant difference in the posttest mean scores of Chemistry students in experimental and control groups

Table 2: t-test analysis on post-test mean scores of students in both experimental and control group

Group	N	Mean	SD	df	T	P
Experimental	42	14.57	2.47	94	10.35	0.00*
Control	54	9.62	2.13			

\* $P < 0.05$

Table 2 revealed that  $p$  (0.00) <  $\alpha$  (0.05). This indicates that there was a significant difference between the academic performance of both experimental and control groups after the treatment. Therefore, the hypothesis was rejected. The experimental group performed better than the control group

**Ho3:** There is no significant difference in the retention mean scores of Chemistry students in experimental and control groups after the treatment

Table 3: t-test analysis on the retention mean scores of Chemistry students in experimental and control groups

Group	N	Mean	SD	df	t	P
Experimental	42	13.33	1.84	94	14.34	0.00*
Control	54	8.67	1.35			

\* $P < 0.05$

In Table 3, it can be seen that  $p$  (0.00) <  $\alpha$  (0.05). This indicates that there was a significant difference between the retention mean scores of students in both experimental and control groups. Therefore, the hypothesis was rejected. The experimental group performed better than the control group

**Ho4:** There is no significant difference between the posttest mean scores of male and female students when taught Chemistry using Google Classroom

Table 4: t-test analysis on the post-test mean scores of male and female students when taught Chemistry using Google Classroom

Group	N	Mean	SD	df	T	P
Male	20	15.90	1.62	40	1.13	0.27
Female	22	15.36	1.47			

$p > 0.05$

Table 4 revealed that  $p (0.27) > \alpha (0.05)$ . This indicates that there was no significant difference between the posttest mean scores of male and female students when taught Chemistry using Google Classroom. Therefore, the hypothesis was not rejected. Male and Female students in the experimental group performed equally.

## DISCUSSION

The findings of this study revealed that there was a significant difference between the post-test performance of students in the experimental and the control groups. The experimental group that was treated with Google Classroom had a better academic performance than the control group that was not treated with Google Classroom. This indicated that Google Classroom which is one of the online teaching strategies has a better potential to enhance students' academic performance. This is supported by Olaniyi and Ajayi (2020) who in their work revealed that the use of online and computer-based teaching strategies enhances students' performance in science subjects. This might be attributed to the fact that learning through digital devices makes students stay glued to what they learned as they were originally used to interacting with digital devices for socialization.

The study further showed that there was a significant difference between the retention mean scores of the experimental and control groups. The experimental group has higher retention mean scores when compared with the control group. This was in agreement with Okeke et al 2022 who discovered that the use of Google Classroom enhances students' academic achievement in Mathematics.

## CONCLUSION AND RECOMMENDATIONS

The findings of the study discovered that the use of Google Classroom has the potential to improve students' academic performance in Chemistry and also enhance their retention abilities.

Based on the findings, it was recommended that the use of Google Classroom should be incorporated into the teachers' and students' pedagogical process in Chemistry classrooms in Nigeria. Also, all Chemistry teachers should be encouraged to use Google Classroom by ensuring that they are all digitally literate and equipped.

## REFERENCES

1. Ajayi, P. O. (2020). Influence of WhatsApp Group Learning Platform on undergraduate' Study Habits in Basic Science Education in Nigerian Universities. *EKSU Journal of Education* 9 (2) 70-75.
2. Okeke, A. M., Aneshie-Otakpa, V. O. & et al (2022). Effect of Google Classroom on Secondary School Students' Engagement and Achievement in Mathematics. *AJSTME* 8(1) 411-417 <https://www.ajstme.com.ng>
3. Olaniyi, I. T. & Ajayi, P. O. (2020) towards computer-based intervention strategy in learning Computer Studies in Nigeria secondary schools. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 25(7) 18-21