



Effect of Integrating Social Media Technology (WhatsApp) and Hands-on-Activities in Teaching Chemistry Practical on Chemistry Students' Academic Performance

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ABSTRACT

The study investigates the Effect of Integrating Social Media Technology (WhatsApp) and Hands-on- Activities in teaching Chemistry Practicals on Chemistry Students' Academic Performance. Quasi-experimental research design was used in this study. The study population consists of 575 Chemistry students in the Federal College of Education, Zaria. The sample size for the study involves 175 students. The instrument used for the research is the Redox Titration Performance Test (RTPT) with a reliability coefficient of 0.89 which was determined using Pearson Product Moment Correlation. One research question and one research hypothesis were analysed. The research question was answered using the difference in the mean score of students in the experiment and control groups while the research hypothesis was analysed using a t-test at $p \leq 0.05$ level of significance. Results revealed that students in the experimental group who were taught chemistry practicals by Integrating Social Media Technology (WhatsApp) and Hands-on-Activities performed better than those in the control group who were taught the same concept using Hands-on- Activities only. It was concluded that Integrating social media technology (WhatsApp) and Hands-on- Activities enables chemistry students to perform practical activities successfully from start to finish and gives the students an important sense of achievement. The recommendation was made which includes; the use of social media technology (WhatsApp) by students should be encouraged by providing them with needed infrastructure such as a steady power supply and internet facilities among others.

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INTRODUCTION

Science Education is seen as a prerequisite for scientific and technological development. According to David (2018), Science education provides opportunities for students to acquire relevant functional knowledge and skills that are associated with scientific processes needed for advancement in science and technology. In the field of science education, students are encouraged to acquire and practice the scientific skills (David, 2018). Science education is concerned with finding answers to

problems in a bid to understand and interpret natural phenomena. It is a tool use to inculcate self-discipline, scientific literacy and commitment in the minds of students. Science education is described as a process of combining knowledge of science with the study of education. It is the study of all science subjects such as Biology, Physics, Chemistry among others with various methods of teaching in other to impart scientific knowledge to individual learners (Olanrewaju, 2018).

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Chemistry as a subject of study in science education. It deals with the composition, structure and properties of matter, the changes that matter undergoes, and the energy associated with those changes (Shirley, 2018). It is referred to as a central science subject because the basic knowledge of chemistry is essential to various branches of science including biology, physics, geology, medicine, engineering and technology (Anne, 2021). Chemistry, like other science subjects, trains the learners to acquire the science process skills of observing, experimenting, manipulation, classifying, communicating, inferring, hypothesizing, interacting with data and formulating models (Ojo, 2017). When Chemistry is taught using appropriate methods and resources it is said to be student centered and effective.

The use of educational technology as well as the preparation and implementation of technology-based teaching are important factors in improving educational quality, particularly in teaching and learning chemistry. Technology has been used in the classroom since the nineteenth century. Initially devices such as the overhead projector were considered significant when compared to traditional technologies such as the chalkboard, the pencil and the ball point pen. More recently, rapid advances in computing have revolutionised how technology is implemented to enhance teaching and learning.

With the advent of the Internet and smart devices, access to information is now easier than ever before. For example, mobile phone technology has a 70% penetration and the majority of worldwide internet traffic is funnelled through smartphones (Boxer, 2018). The ever-present nature of technology in our daily lives facilitates rapid information access and permits alternative approaches to technology enhanced teaching to be adopted during (synchronous) and outside (asynchronous) class contact time (Pricahyo et al., 2018). Internet technologies are a growing phenomenon and their use is changing modes of communication and forms of sharing content among users.

Social networking applications are extremely popular among younger users and are

widespread across the globe because they provide access to the community. These technologies are changing the concept of user interaction based on their application which makes them important to every individual. There is a daily increase in the number of users of such social networking forums, which predominantly provide interaction opportunities to individuals and groups to understand different worldviews and discuss evolving and differing thoughts. The scope of such networking applications and software is not limited to socializing alone but also has entered the sphere of education (Aktas & Can, 2019). Technology has the potential to enhance instruction, provide where and how learning occurs and the roles of students and educators in the instructional process. It is transforming procedures of instructional process by contributing components of strength to learning situations involving virtual environment. It is an effective and influential instrument for providing educational opportunities (Hussain, Suleman, Din & Shafique, 2017). Learning becomes effective and student centred when technology is incorporated into the curriculum.

Technology has brought sporadic learning opportunity that removes teaching and learning barriers in science. The interactive nature of teaching and learning of Chemistry offers a clear and enjoyable learning paradigm as in constructivists' learning (Neji & Ntibi, 2018). Effectiveness in teaching and learning could be accomplished depending on the availability of information on the subject matter, this include E-learning materials in form of e-library, e-journals, virtual chemistry laboratory, e-textbook. Students at the higher institutions of learning can harness this information with the use of a well-equipped computer library, cell phones, laptops, tablets and many other electronic devices. According to Neji and Ntibi (2018) learning is promoted when students are actively engaged in the learning process through activities and the use of material resources which encourages thinking and enables learners to link new information to old and acquire meaningful knowledge.

Technology improves performance by accessing online resources or embedded learning



tools such as YouTube links (Aldalah, 2021; Tsayang et al., 2020). Aktas and Aydin (2016) and Inaltekin (2020) found more learning retention in students instructed through the use of technology than in conventional classrooms. The interactive features of technology encourage and motivate students to participate and solve problems. For example, a Smart board could be touched with a pen or finger to draw a molecular structure while motivating students' participation. Such molecular structures can be sketched, dragged, cut, or copied from relevant sources and paste.

The rapid evolution of technology has profoundly transformed the world, making technology the preferred avenue for accessing vast realms of knowledge. The development of internet technology, in particular, has established it as the primary means of communication. Consequently, a significant portion of the global internet populace frequents social networking or blogging platforms, utilizing them as tools for communication and connection. Social networking sites (SNSs) represent online communities where internet users converge to interact with others who share common interests, spanning personal, professional, or academic spheres, as articulated by Amie-Ogan & Prosper (2020). The proliferation of social networking sites has turned the concept of a global village into a tangible reality, facilitating communication among billions of individuals worldwide. Distant communication via social networking platforms has yielded numerous benefits, enhancing connectivity and enabling interaction across vast distances (Aiyende and Omojola, 2021).

Social media are electronic instruments based on Internet technology with which parties can interact to promote collaboration and information sharing. Jamil, Ain, Batool, Saadat, Malik, Arshad, Nagra, Haider and Shameem and Latif (2020) define social media as a means of producing, sharing, and collaborating content online. Social media is a means of interaction that allows people to connect and share information. It refers to computer-mediated platforms that enable students to generate, share, and exchange information, ideas, images, and videos within virtual communities and educational settings. It

influenced almost every aspect of life whether political, social, economic, and educational. It includes a diversity of applications such as Youtube, Telegram, Twitter, Facebook, WhatsApp, LinkedIn, virtual game and social worlds. According to Singh (2021) that social media platforms usage in schools motivates and fosters students to learn. Educational resources such as YouTube videos, readily available e-books, online notes, and learning through video calls are significant social media tools that inspire and encourage students to learn, thus enriching their educational growth.

Access to learning resources anywhere and anytime allows for deep learning (Abaido & El-Messiry, 2016). Smart Phones makes this possible as it allows for learning to occur anywhere and anytime. According to Vázquez-Can (2014), students use smartphones in varied ways including exchange of academic information outside the university physical walls. Outside the schools walls, mobile devices are used for online interactions such as discussions and knowledge sharing. This is done through instant messaging, mobile Social networks and Web based learning (Echeverría, Nussbaum, Calderón, Bravo & Infante, 2011).

WhatsApp is smartphone application that allows for instant message sending to either an individuals or groups. Pictures, Audio-Visual files attachment and websites links can be sent through it. It also allows for files sharing. WhatsApp was invented in 2009 by Jan Koum and Brian Acton and first became available on the market in 2010. WhatsApp use grew up rapidly: it gained over 350 million users, between 2010 and 2013. This is also evident by the use of WhatsApp in the healthcare industry (Kaliyadan, Ashique, Jagadeesan & Krishna, 2016). Among reasons that account for the popularity of WhatsApp, is its ability to allow for an almost fluent conversation, creating a sense of belongings, low cost, its accessibility and ease of use for communication purposes (Church & de Oliveira, 2013).

WhatsApp is said to have revolutionized social information exchange on all continents. It has even given rise to new expressions, such as Whatsapping in English or "Wasapear" in Spanish.

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Currently, the application is the most widely used for communication in real time or asynchronously. It is easy to use, has a limited data consumption cost and can be used to send audio and videos and share web addresses. It is updated and adds new functions in short periods of time to adapt to the needs of the users (Suarez-Lantaron, Deocano-Ruiz, Garcia-Perales & Castillo-Reche, 2022). Patient and Crispin (2011) are of the view that WhatsApp allows for academic information sharing through conversations between and among students using the application. Mistar and Embi (2016) opines that when WhatsApp is implemented in academics, students' motivation to learn rise, making performance increase. It also creates a more engaging environment (Abaido & El-Messiry, 2016). Odekeye, Fakokunde, Oladiji and Iwintolu (2023) found the use of WhatsApp had positive impact on students' academic performance as far as teaching and learning process is concern.

Abudullai (2013) describes hands-on activities as a method of teaching whereby students are engaged actively in class activities with the use of their hands and intellect under the guidance of the teacher. He is of the view that hands-on activities allow learner to demonstrate competency in materials and practical activities either by using his/her hands or other mechanical competencies. During Hands-on activities students have objects directly available for to manipulate their own self (Tile, 2013). Miller (2013) describes hands-on activities as consisting of different activities for the overall development of learner. Hands-on-activities is viewed as a teaching/learning method whereby tasks are carried out using hands to handle apparatus, equipment and reagents in the laboratory or work field which help learners to investigate, scientific problems in order to understand theories and principles of science (Adane & Adams, 2011).

The activities should be prepared from low cost materials which are available in the locality in this way the teacher may offer students a variety of active educational experiences structured according to the learning cycle. The cycle consists of an instructional sequence that include; engagement, exploration, development

and extension. In the learning cycle the exercise begins with the engagement phase, whereby the teachers use real life or concrete activities, problems and questions to motivate students to learn about the topic and assess their prior knowledge. Students explore the content and phenomena by manipulating materials and start to address the presented questions (Miller, 2013). Teaching and learning processes which involves hands-on activities is believed to help students in understanding theories and principles which are difficult or abstract (Ajayi, 2018).

Iyamuremye, Nsabayeze, Ngendabanga and Hagenimana (2023) examined the effectiveness of hands-on practical activities in teaching and learning chemistry on academic performance in Rwanda and found that students are engaged and have a positive experience and perception on the use chemistry practical work with the aid of hands-on practical activities. A meta-analysis of the effectiveness of hands-on activities by Abah (2012) suggested that students may acquire more knowledge in short term when taught conventionally but are likely to retain knowledge longer when taught with hands-on activities teaching/learning method. Gallagher (2010) concluded in his study that hands-on activities is more effective than traditional instruction that it's result in better long-term retention than traditional methods of teaching.

STATEMENT OF THE PROBLEM

The integration of social media into classrooms has been a contentious issue for many years, with both parents and educators expressing concerns about its potential consequences. The popularity of social media is rapidly expanding worldwide, with increasing numbers of adults and teenagers joining platforms such as Facebook, MySpace, Skype, WhatsApp, and Twitter to connect with friends, family, and even strangers without considering its effect on students' academic performance. This study therefore investigates the Effect of Integrating Social Media Technology (Whatsapp) and Hands on Learning on Chemistry Students' Academic Performance in Chemistry Practical.

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Objectives of the Study

The objective of this study is to determine the effect of integrating social media technology (Whatsapp) and Hands-on activity on Chemistry students' academic performance in Chemistry Practical.

Research Question

What is the effect of integrating social media technology (WhatsApp) and Hands-on Activities in Teaching Chemistry Practical on Chemistry Students' Academic Performance?

Research Hypothesis

The following hypothesis was tested at 0.05 level of significance:

Ho1: There is no significant difference in the academic performance of Chemistry students taught chemistry Practical by integrating social media technology (WhatsApp) and Hands-on Activities and those taught using Hands-on Activities only.

METHODOLOGY

Quasi-experimental research design involving two groups experimental and control was use in this study. Students were grouped according to their course combinations. A WhatsApp group was created for students in the experimental group and 89 students were added. Video demonstration of each practical to be conducted was shared through WhatsApp for students in the experimental group to watch, make comments and ask questions where there are difficulties or miss understanding and the researcher responds to each question ask before

the Hands-on- laboratory activity was carried out. To minimize the possibility of sharing the Videos with Control groups, the videos are shared to the group four hours to the Hands-on activities. The two groups (Experimental and Control) meet on the Hands-on laboratory activity to receive the pre-lab lecture and carryout the Hands-on Lab practical together. This was done for six weeks with each week having different set-up for Redox titration exercise. After the treatment, the students' academic performance was tested using Redox Titration Performance Test (RTPT). Test was marked and scores were analysed using mean and t-test.

The population of the study consists 575 Chemistry students in Federal College of Education, Zaria. The sample size for the study involves 175 students. 89 students in experimental group and 86 students in the control group. An intact class was use and this was done according to course combinations. The sample size is in line with Andy field (2009) who recommended a minimum of 15 respondents as sample size for experimental research.

RESULTS

Research Question One: What is the effect of integrating social media technology (WhatsApp) and Hands-on Activities in Teaching Chemistry Practical on Chemistry Students' Academic Performance?

This research question was answered using difference in the mean scores of students in the experimental and control groups. Result shown in Table 1.

Table1. Mean difference in Academic Performance of Chemistry students taught Chemistry Practical using Social Media Technology (WhatsApp) and Hands-On Activities and those taught using Hands-On Activities only

Variable	Study groups	N	Mean	STD	Mean Difference
Mean scores	Experimental	89	51.32	15.36	10.744
	Control	86	40.58	12.60	

Table 1 revealed that difference exist in academic performance of Chemistry students

taught Chemistry Practical using Social Media Technology (WhatsApp) and Hands-On-Activities

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and those taught using Hands-On Activities only. The academic performance of students in the experimental and control groups are 51.325 and 40.581 respectively, implying a mean difference of 10.744 in favour of students in the experimental groups. This shows that integrating social media technology (WhatsApp) and Hands-On Activities in teaching Chemistry Practical has a positive effect on Chemistry Students' Academic Performance.

Table 2: Independent t-test for academic performance of Chemistry students taught Chemistry Practical using social media technology (WhatsApp) and Hands-on Activities and those taught using Hands-on Activities only

Variable	Study groups	N	Mean	STD	Mean Difference	Df	T computed	T critical	P
Mean scores	Experimental	89	51.3258	15.36508	10.74445	173	5.048	1.96	0.000
	Control	86	40.5814	12.60295					

$p \leq 0.05$

Table 2 shows the calculated p-value for the t-test for academic performance as 0.00 which is lower than 0.05 level of significance set for the study. This shows that significant difference exists in the academic performance of Chemistry students taught chemistry practical using social media technology (WhatsApp) and Hands-on Activities and those taught using Hands-on Activities only in favour of students in the experimental group. Therefore, the null hypothesis which state that; there is no significant difference in the academic performance of Chemistry students taught chemistry Practical using social media technology (WhatsApp) and Hands-on Activities those taught using Hands-on Activities only is hereby rejected

The findings in Table 2 is in line with that of Odekeye, Fakokunde, Oladiji and Iwintolu (2023) who found that the use of WhatsApp had positive impact on students' academic performance. It also agrees with Mistar and Embi (2016), who instigated that the use of WhatsApp in academics, motivates students to learn and raise their academic performance. Iyamuremye, Nsabayezu, Ngendabanga and Hagenimana (2023) examined the effectiveness of hands-on practical activities in teaching and learning

Testing Null Hypothesis

The Null hypothesis which states that There is no significant difference in the academic performance of Chemistry students taught chemistry Practical by integrating social media technology (WhatsApp) and Hands-on Activities and those taught using Hands-on Activities only was Tested using T- test. The result is shown in Table2.

chemistry on academic performance in Rwanda and found that students are engaged and have a positive experience and perception on the use chemistry practical work with the aid of hands-on practical activities. A meta-analysis of the effectiveness of hands-on activities by Abah (2012) suggested that students may acquire more knowledge in short term when taught conventionally but are likely to retain knowledge longer when taught with hands-on activities teaching/learning method. Gallagher (2010) concluded in his study that hands-on activities is more effective than traditional instruction that it's result in better long-term retention than traditional methods of teaching.

CONCLUSION

Based on the findings in from this study the following conclusions were made:

1. The use of social media technology (WhatsApp) has positive effect on Students' Academic Performance in Chemistry Practical.
2. Integrating social media technology (WhatsApp) and Hands-on- Activities enable chemistry students perform practical Chemistry successfully from



start to finish and gives the students an important sense of achievement.

RECOMMENDATIONS

The researcher put forward the following recommendations

1. The use of social media technology (WhatsApp) by Students should be encouraged by providing them needed infrastructure such as steady power supply and internet facilities.
2. School authorities should liaise with other educative web sites to partner with WhatsApp for academic achievement..

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