

## Social Media Usage by Chemistry Teachers for Instructional Delivery in Anambra State Secondary Schools: Affordances and Challenges

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### Abstract

*The technological advancement in information and communication technology has impacted on the ways teachers and learners learn. The traditional approach has gradually given way to technologically-based teaching. This paper therefore is a descriptive survey designed to assess the mean responses of Chemistry teachers and students on the extent to which social media are utilized in instructional delivery. The study was carried out in two education zones (Nnewi and Onitsha) out of six education zones in Anambra State. Four objectives, research questions and four hypotheses guided the study. The sample sizes for the study were 30 secondary schools, 90 Chemistry teachers (38 and 52) for Nnewi and Onitsha respectively. The instrument for data collection was researchers structured questionnaire. The reliability coefficient of the instrument was determined to be; 0.81, 0.78, 0.82 and 0.79. The instrument was validated by 2 experts from the Department of Science Education, Nnamdi Azikiwe University, Awka and two from Measurement and Evaluation, University of Port Harcourt, Rivers State. The research questions were answered using mean and standard deviation while the hypotheses were tested at 0.05 level of significance using the independent samples t-test. The findings revealed that Chemistry teachers were utilizing social media to a low extent; both teachers and students agreed that social media offered great affordances to them. Some of the challenges showed lack of staff development, lack of steady power supply and lack of internet connectivities. However, one of the mechanisms for improved usage of social media was providing*

*steady power supply and providing money for data subscriptions. The recommendations were that Chemistry teachers should be trained in the use of social media and provisions of steady supply of electricity or automatic power supply in alternative should be given priority attention.*

**Keywords:** Social Media Usage, Chemistry Teachers, Anambra State Secondary Schools

## INTRODUCTION

The unprecedented rise and interest in social media usage (SMU) are indications that these technologies are very crucial in our daily lives even in teaching and learning. The advancement in information and communication technology has expanded the ways teachers teach and how learners learn. It has provided ways to increased use, affordability of internet services and the rapid growth of information technology (Said & Ibrahim, 2012). Consequently, one could attest to the fact that the new wave of computer technologies has impacted positively in our education system by ushering in alternative ways of teaching like using computers and its related gadgets, internet connectivity, video, simulations, television and social media technologies. In support to the aforementioned fact, Ugwu and Anekwe (2018) made a submission that technological knowledge acquired by teachers enable them to interact and partner with other schools internationally even in class teaching. The global awareness therefore demands that the teaching of Chemistry should be based on global trends.

Chemistry is viewed as the study of nature, composition and properties of matter and the changes it undergoes (Ojokuku, 2010). The Science Teachers Association of Nigeria (STAN, 2016) gave a broader definition of Chemistry as, “a branch of science that studies the properties of matter in terms of compositions, structures, transformations, interactions and energy implications of chemical changes. Contributing to this definition is that stated in Achimugu (2017) who opined that, “Chemistry could be defined as the constitution, properties and uses of matter and the changes it

undergoes as a consequence of alterations in the composition of their molecules.

No doubt, the relevance of science education and Chemistry in particular should not be over-emphasized. In this technological era, every nation whether developed or developing country needs more scientists so as to achieve additional scientific and technological developments and to maintain future economic standards of living among the citizenry (EC High Level Group on Science Education, 2007).

Again, the relevance of Chemistry readily comes to mind as it helps in maintaining the economic wealth of modern societies, thereby, justifying science skills among the young generations as essential for continued prosperity in our future (Bradley, 2005). Some literatures have emphasized that scientific literacy is needed for all future citizens in order to influence techno-scientific development in a democratic society for more sustainability (Buremeister, Rauch & Eilks, 2012) and to enable all citizens to actively and intelligently participate in societal debates about any controversial socio-scientific issues (Roth & Lee, 2004). In all, there is no doubt that Chemistry is economically and ecologically very important for sustaining our world and for every developed or less developed societies (Bradley, 2005).

Based on the relevance of Chemistry discussed above, there is need for Chemistry teachers at the senior secondary education in Anambra State to be using social media (SM) for instructional delivery. Social media are technologies that facilitate social interactions, make possible collaborations, and enable deliberations by people of the same interest across borders, time and space (Sanusi, Gambo & Bashir, 2014). In line with the just stated definition, Merriam (2016) cited in Anekwe and Anyanwu (2017) also defined social media as, “forms of electronic communication” (such as web sites) through which people create online communities to share information, ideas, personal messages. Joining in this parade of definitions are authors like Aichner and Jacob (2015) who affirmed that social media are blogs, business networks, enterprise social networks, microblogs, photo sharing and virtual worlds.

Anekwe and Anyanwu (2017) had noted some special characteristics of social media which in their views use web-based and mobile technologies on gadgets such as smart phones and tablet

computers to facilitate desired platforms. Further, they noted that in these platforms, individuals communities and various organizations can share, create together, discuss ideas as well as the contents that are posted in the internet. Viewed from another angle, social media have redesigned the various ways individuals think and interact which result in a cordial inter-relationships of one another and societies at large.

Some examples of social media tools type and applications in Bates (2011: 25):

<b>Tools Type</b>	<b>Examples</b>	<b>Applications</b>
Multimedia archives	YouTube podcasts	Allows end user to access, store, download and share audio recordings, photographs and videos.
	Flickr	Free online images hosting and photo sharing through peer to peer networkings.
	e-portfolios	These are forms of authentic assessments with formative function that include showcasing and sharing learning artifacts, documenting reflective learning processes, connecting learning across various stages and enabling frequent feedbacks for improvements.
	MIT Open Course Ware	These are online Textbooks. They are considered free online course materials. The page is indexed to the online textbook in MIT Open Course Ware. Lecturers can use these to teach almost all the subject.
Virtual Worlds	Second Life	A virtual world is a computer – simulated environment which might be overwhelmed by many people who can create a personal avatar, and at the same time and independently explore the virtual world, participate in its activities and communicate with other people. One can equally look at it as a computer-based online community environment that is designed and shared by individuals who have the same interest and shared same ideas. It is communication with virtual sites and individuals.
Mobile learning	Mobile Phones and Apps	These enable the users to access multiple information formats (voice, text, and video) at any time and place.

Adapted from Bates, T. (2011)

The list of social media are not limited to the ones stated above, there are emerging ones that keep adding on the list day by day. Anekwe and Anyanwu (2017) made an observation that social media are diverse although they have one oline operation. The online could come in diverse forms like blogs, micro blogs, forum, wikis, YouTube, twitter,

WhatsApp, google+, Instagram, Facebook, Snapchat and flickr. In support of the just stated assertion, Sanusi, Gambo and Bashir (2014) opined that social media have the capabilities of educating, informing, entertaining and inflaming the target audience. Again, they possess a contagious and outreaching impacts which the traditional approach to teaching Chemistry do not have. There is therefore need to ascertain the extent to which the secondary school teachers use social media for instructional delivery.

There are some affordances which are accruable from social media usage (SMU) for Chemistry instruction for both teachers and students. The concept of affordances was always being used when discussing about social media. Writing on the concept of affordances, McLoughlin and Lee (2011) opined that affordances are terms associated with social media. In the writer's views, affordances depict what social media can offer to both teachers and students for effective teaching and learning of Chemistry. Affordances of Social Media to Chemistry Teachers:

- Social media provide great opportunities for the Chemistry teachers to maintain good relationships with their students. The Chemistry teachers and their students could interact in a cordial way in problem solving and interpersonal relationship.
- SMU would help Chemistry teachers to provide class facebook, google classroom, zoom and google meet account for effective teaching and learning. The Chemistry teacher could use social media apps to post class assignments any some vital information for the students.
- SMU could help provide video conferences in Chemistry classroom. For instance, google plus could allow to provide class sections where students can collaborate through video at the same time.
- Chemistry teachers would be more exposed to the challenges posed by the usage of social media technology in instructional delivery.
- SMU offer access to very rich, multimedia content available in the internet at any time based on internet connectivity.
- Effective and efficient use of social media leads to skills development of the Chemistry teachers in areas like; digital

literacy, independent and self directed teaching, knowledge creation and dissemination.

- SMU can help Chemistry teachers to set online group assignments, based on projects, students could collect data in the field using mobile phones or ipads.

Contributing to the affordances of SMU to the teachers, scholars like, Conole and Dyke (2004) made submission on Web 2.0 research and practice and provided some examples of the affordances of the social software tools as; connectivities and social rapport, collaborative information discoveries and sharing, content creation, knowledge and information aggregations and content modifications. They made an argument that, social software tools such as blogs, wiki, social networking sites, media sharing applications and social bookmarking utilities are also pedagogical tools that spring from their affordances of sharing, communication and information discovery.

## **AFFORDANCES TO THE STUDENTS**

- SMU offer platforms for connections and interactions
- help in students collaborative information discovering and sharing for team works
- provides platforms for networked multi-media communication between self-organising groups of learners
- enable students to generate multi-media materials
- SMU offer opportunities for the student to post media – rich assignments either as a group or individually and
- SMU provide opportunities for students to take more responsibility of their own learning as stipulated in one of the principles of constructivist approach to teaching and learning of Chemistry.

The above affordances of social media notwithstanding, there are some possible challenges that might hinder the social media usage (SMU) for Chemistry instruction. Airing his views on the challenges of SMU, Saleh (2015) noted that the use of SMU for learning minimize the active participation of the students in the classroom. Further, the author pointed that these technologies were developed to enable any student work, irrespective of that student's ability. At times, the money for data

subscription, lack of steady power supply are some of the challenges. Saleh (2015) added the fact that some teachers and students who were not media and information literate would be militating against effective utilization of social media for Chemistry instructional delivery. Joining in this discussion, Rachel; Alina and Fun (2017) made a contribution that the main challenge of implementing Instagram and Snapchat as supplementary teaching tools is the possibility of distraction. This is because students are also connected with their friends somewhere through apps, they might be visiting their friends' Instagram profile or sending messages during classroom instruction instead of listening to their lecturers.

Nevertheless, there are certain mechanisms that if adopted would help to improve the use of social media in Chemistry instruction. Achimugu (2017) noted that the training of Chemistry teachers should be reviewed to include emphasis on knowledge and skills related to emerging technologies like use of social media in teaching. There has to be internet connectivities in school and steady power supply without which technology-based teaching and learning will be a mirage.

So far, this paper has attempted to determine the extent to which Chemistry teachers utilize social media for instructional media, the affordances of social media for both teachers and students, the challenges militating against effective use of social media and the mechanisms to be adopted for improved usage of social media for Chemistry instruction. Based on the above backdrops, the study has set out to investigate the above objectives and the findings therein.

## **STATEMENT OF PROBLEM**

The high failure rate of senior secondary schools in both internal and West African Examination Council has become a cause for serious concern. Observation has also shown that the high failure rate may have been as a result of traditional teaching approach which might still be in use in secondary schools in Anambra State not minding the unprecedented advent of technologically-based teaching and learning. It therefore goes without argument that alternative approach to teaching Chemistry should be tried. The problem of this study posed in question form is; would the social media usage and their affordances in Chemistry instructional delivery be able to arouse students' interest in

learning for optimal performance? Providing answer to this question is the thrust of this paper.

### **Theoretical Backings**

There are some theories that support the usage of social media in teaching. Two of such theories are briefly discussed below:

#### **Connectivism Theory**

The connectivism is also known as the digital age learning theory. It came as the product of two publications by Siemens in 2005. The theory deals with the capacity of the internet technologies to provide novel opportunity for users to share ideas, disseminate information, learn using the World Wide Web. Among such technologies are Web 2.0, email, YouTube and Snapchat. Connectivism theory concerns itself with how people access and share information when connected to the internet via the World Wide Web. Connectivism has offered an opportunity in educational sector that plays an important role in the development and emergence of new pedagogies which emphases have shifted from the teacher to independent learners. Students now participate actively in the teaching process while teachers remain facilitators and guide. People now learn through different sources such as blogs, twitter and WhatsApp.

Connectivism drew its strength via using web-based activity as an example. For instance, Kerr (2007) cited in Ndu-Johnson (2019) made an observation that connectivism transfers understanding, build understanding and instill internal processes that lead to deep critical thinking in the creating of understanding. No doubt, the students therefore are engaged in solving a task through the application of metacognition to the evaluation of the elements in the network.

Connectivism theory focus on internet learning where the students normally interact with computer, people of the same interest and online learning. Therefore, this theory relates to the present write-up in that the students gain the following:

- Students are offered the opportunity of surfing the internet for more revision of the lessons done in class.
- Both the teachers and students do have opportunities to interact with other network users



- Samples of Chemistry lessons in class and Chemistry practicals will be downloaded from YouTube for enhanced teaching and learning.
- The Chemistry teacher can teach an online lesson and give assignments and expect students to do and submit same via online.
- Both teachers and students are allowed to search for new information, collaborate and communicate with the community of friends when connected to the internet in both national and international arena.

### **Engagement Theory**

Kearsley and Schneiderman were the theorists who propounded the engagement theory in 1999. The theory offers technologically-based teaching and learning. The principle of engagement theory is based on the need for meaningful interaction of teachers with content and other individuals in a digital environment for creative, meaningful and authentic teaching and learning experiences. Kearsley and Schneiderman (1999) posited that three principles are to be applied so as to accomplish a task. These principles are; creativeness, meaningfulness and authentic learning. These should be achieved through; (1) collaborative efforts among persons involved in the process (2) the use of project-based teaching method and (3) realistic and authentic projects which should be the main focus.

The engagement theory in this 21<sup>st</sup> century education system implies that teaching has shifted from teacher-centered to student-centered. This theory helps in improving the ways learners learn, think, relate and react to questions during classroom learning. These would help to facilitate interactions between teachers and students so that learning activities could be productive. Engagement theory inspires students to be actively engaged in their learning tasks hence motivating the learners to learn which actually helps to enhance their academic performance. The theory is bordered on an individual student's self-determination, direct participation and collaborative efforts in problem solving and mutual dialogue among students. The theory also emphasizes on the intrinsic motivation of learners due to the meaningful learning environment and the activities that take place during learning. Kearsley, G. & Schneiderman (1998) strongly affirmed

that engagement can occur through the use of technology-based teaching and learning.

The engagement theory relates to this present study in that the Chemistry teacher can give some chemistry practicals tasks to solve. The students can collaborate together in problem solving. YouTube could be downloaded to have a view of samples of the Chemistry practicals to be done. In doing that, learners would actively and meaningfully engage in solving the tasks. The usage of social media in teaching offers students the opportunity to be meaningfully engaged and interacted in the learning process as they work collaboratively together with others inside and outside the classrooms.

Therefore, the connectivism and engagement theories discussed are deemed appropriate for theoretical support of this study.

## **AIM AND OBJECTIVES OF THE STUDY**

The aim of this study is to ascertain the extent to which Chemistry teachers utilize social media for instructional delivery in Anambra State secondary schools. Specifically, the study sought to:

1. determine the extent to which social media are utilized by Chemistry teachers for instructional delivery in Anambra State secondary schools
2. identify the affordances accruable from the usage of social media for instructional delivery for both teachers and students
3. ascertain the challenges that hinder the usage of social media in Anambra State secondary schools for Chemistry instructional delivery
4. verify the strategies to be adopted for improved usage of social media for Chemistry instructional delivery in Anambra State secondary schools.

## **RESEARCH QUESTIONS**

Four research questions guided the study:

1. To what extent do the secondary school Chemistry teachers utilize social media for instructional delivery?
2. What are the affordances accruable from the use of social media in Chemistry instructional delivery for both teachers and students?

3. What are the challenges militating against effective utilization of social media for instructional delivery?
4. What are the strategies to be adopted for improved usage of social media for Chemistry instructional delivery?

## **HYPOTHESES**

Four hypotheses were tested at 0.05 level of significance.

1. There is no significant difference in the mean ratings of Chemistry teachers and students on the extent to which social media are used for instructional delivery in Anambra State secondary schools.
2. There is no significant difference in the mean ratings of Chemistry teachers and students on the affordances accruable from the usage of social media to them.
3. The mean ratings of Chemistry teachers and students in Anambra State secondary schools on the challenges that hinder the usage of social media for instructional delivery will not differ significantly.
4. The mean ratings of Chemistry teachers and students on the strategies to be adopted for improved usage of social media for instructional delivery will not differ significantly.

## **METHODOLOGY**

The study was a descriptive survey research which assessed the mean responses of secondary schools Chemistry teachers and students on the extent to which social media are utilized in Chemistry instructional delivery. The study was carried out in the two education zones (Nnewi and Onitsha) out of the six education zones (Aghamelum, Awka, Nnewi, Ogidi, Onitsha and Otuocha) identified under the State Education Commission, Awka in Anambra State.

The target population consisted of all the secondary schools' Chemistry teachers (110) and SS II secondary school students (1,556) in all the 51 secondary school identified in Nnewi Education Zone. In Onitsha Education Zone, 118 Chemistry teachers and 1,636 SS II secondary schools in all the 32 secondary schools in Onitsha Education Zone. In all, the population of the study is 228 Chemistry teachers and

2,254 SS II students in the two Education Zones identified in Anambra State.

Simple random sampling technique was used to select two education zones and the same simple random sampling technique based on balloting without replacement was also used to select 15 secondary schools which gives 30 secondary schools. The 90 Chemistry teachers (38 and 52) were all used based on individual consent. It is worth mentioning here that all of them were used because their number is small, so, it might be one of the reasons for all of them to give their consent. Individual consent was also used to select 309 SS II students for the study. In all, two education zones (Nnewi and Onitsha), 30 secondary schools, 90 Chemistry teacher (38 and 52) formed the sample size for the study.

The instrument for data collection was a researcher who structured 44 item questionnaire titled “Social Media Usage for Instructional Delivery (SMUFID)”. The respondents were expected to indicate the name of their schools, subjects taught and their education zones. There are four sections: Section A sought to elicit information on the extent of social media usage (SMU). Section B elicited information on the affordances accruable from SMU. Section C was based on the challenges hindering SMU while Section 4 sought information on strategies for improved SMU.

The response options for research question 1 are; Very High Extent (VHE) = 4 points, High Extent (HE) = 3 points, Low Extent (LE) = 2 points and Very Low Extent (VLE) = 1 point. The research questions 2, 3 and 4 were answered using the modified Likert Scale of; Strongly Agree (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points and Strong Disagree (SD) = 1 point. For the ease of analysis, the High Extent (HE) and Low Extent (LE) were collapsed so as to use only, High Extent (HE) and Low Extent (LE). Again, the response options of research questions 2, 3 and 4 were also collapsed to use only Agree (A) and Disagree (D). To get the acceptable mean, the response options were added thus;  $4 + 3 + 2 + 1 = 10$  which then was divided  $4 = 10/4 = 2.50$ . The acceptable mean therefore is 2.50.

Two experts from the Department of Science Education, Nnamdi Azikiwe University, Anambra State and two experts from Science Education in the Department of Curriculum Studies and Educational Technology, University of Port Harcourt, Rivers State

were used. These experts were expected to examine the instruments in terms of their relevance to the objectives, research questions and hypotheses and whether they measure what they ought to measure. However, their comments and suggestions were used to review the instrument in order to ensure their content validity.

Twenty copies of the questionnaire were trial tested on 20 Chemistry students from two secondary schools in each of the two Education Zones that were not part of the study in Anambra State. Their mean ratings of the items were collated using Cronbach Alpha Coefficient which gave values viz; Section A = 0.81, B = 91, C = 86 and D = 0.83. The instrument were administered with the aide of two research assistants and collected back 100% on the same day. The data were analysed using mean, standard deviation and frequencies to answer the research questions while the independent sample t-test was used to test the hypotheses at 0.05 level of significance.

## RESULTS

The results of this study were presented in Tables 1, 2, 3, 4, 5, 6, 7 and 8.

**Research Question One:** To what extent do the secondary school Chemistry teachers in Nnewi and Onitsha Education Zones in Anambra State utilize social media for instructional delivery?

**Table 1: Mean (x) and standard deviation on the responses of Chemistry teachers in Nnewi and Onitsha Educational Zones in Anambra State utilize social media.**

S/N	Extent of Chemistry teachers use of social media for instructional delivery	Teachers			Students		
		Mean	SD	Remarks	Mean	SD	Remarks
1.	Facebook	1.94	0.61	VLE	1.72	0.95	VLE
2.	WhatsApp	2.53	0.70	HE	2.07	1.03	LE
3.	YouTube	1.83	0.81	VLE	1.51	1.07	VLE
4.	Google Plus	1.03	0.69	VLE	1.45	1.10	VLE
5.	Instagram	1.48	0.91	VLE	1.39	0.78	VLE
6.	Snapchat	1.51	0.77	VLE	1.56	1.11	VLE
7.	Telegram	1.67	0.56	VLE	1.60	0.95	VLE
8.	Twitter	1.76	0.72	VLE	1.58	1.03	VLE
9.	Google Meet	1.54	0.84	VLE	1.64	0.84	VLE
10.	Blog	1.24	0.79	VLE	1.36	0.77	VLE
11.	Zoom	1.97	0.91	VLE	1.66	0.73	VLE
12.	LinkedIn	1.40	0.72	VLE	1.32	0.91	VLE
	Total	1.66	0.75	VLE	1.57	0.93	VLE

From the result displayed in Table 1, the mean ratings of teachers and students on the extent of utilization of social media for instructional delivery in senior secondary schools in Anambra State were presented. Based on the obtained result, it was shown that the most utilized social media for instructional delivery was WhatsApp with a mean rating of 2.53 (SD = 0.70), while the least utilized social media tool for instructional delivery was Google Plus with a mean rating of 1.03 (SD = 0.69) according to the result obtained for teachers. Similarly, it was shown for students that the most utilized social media tool for instructional delivery was WhatsApp with a mean value of 2.07 (SD = 1.03), while the least utilized tool was LinkedIn with a mean rating of 1.32 (SD = 0.91). Generally, the result revealed that teachers reported a total mean value of 1.66 (SD = 0.75), while students had a mean value of 1.57 (SD = 0.93). On the basis of the total mean values, it is revealed that both teachers and students indicated that social media was used to a very low extent for chemistry instructional delivery in Anambra State.

**Research Question Two:** What are the affordances accruable from the use of social media for chemistry instructional delivery as perceived by teachers and students in Anambra State?

**Table 2: Mean and standard deviation on the affordances of using social media in chemistry instructional delivery as perceived by teachers and students.**

S/N	Affordances of using social media for chemistry instructional delivery	Teachers			Students		
		Mean	SD	Remarks	Mean	SD	Remarks
TO THE TEACHERS:							
1.	Social media usage provide interaction between technology and pedagogical practice that affords possibilities for better teachings	3.28	0.81	Agreed	2.9	0.97	Agreed
2.	They provide opportunity for chemistry teachers of the same interest to be exchanging ideas based on chemistry principles	3.02	0.85	Agreed	2.98	1.01	Agreed
3.	They create opportunities for cordial relationship with the chemistry teachers and their students	2.94	0.86	Agreed	3.09	1.09	Agreed
4.	They offer avenues for teachers to inform parents about the strengths and weaknesses of their children	2.53	0.68	Agreed	3.19	1.01	Agreed
5.	Chemistry teachers could learn some chemistry practicals through using social media app like YouTube	3.54	0.91	Agreed	3.11	0.97	Agreed

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6.	Chemistry teachers could learn some chemistry practical through using social media app like YouTube	2.71	0.93	Agreed	2.94	1.09	Agreed
7.	WhatsApp could be beneficial for class information between teachers and students			Agreed			Agreed
AFFORDANCES TO CHEMISTRY STUDENTS							
8.	They help in increased collaboration with students in other schools	2.92	0.72	Agreed	1.05	1.05	Agreed
9.	Help chemistry students in connections and interactions among themselves even in class	3.25	0.94	Agreed	1.07	1.07	Agreed
10.	Encourages more participation in chemistry class	3.01	0.9	Agreed	3.26	1.12	Agreed
11.	Help the students in solving their academic problems	3.01	0.89	Agreed	3.06	1.11	Agreed
12.	Social media provide avenue for entrepreneurship which lead to self-reliance	2.78	1.03	Agreed	3.05	1.01	Agreed
13.	Help to make it easier to make connections between the theory and practical aspects from laboratory experimental teaching	2.87	0.86	Agreed	3.31	1.03	Agreed
14.	Social media help in increasing students' retention of knowledge when used in laboratory teaching	2.79	0.91	Agreed	3.18	1.02	Agreed
15.	Offers opportunity for the students to be more digitally literate	3.05	1.02	Agreed	2.93	1.06	Disagreed
16.	Reduces the active participation of students during classroom	2.63	1.03	Agreed	2.29	0.9	Agreed
17.	Prepares students to be international scholars	2.93	0.89	Agreed	3.01	1.02	Agreed

From the result presented in Table 2 which shows the extent to which teachers and students perceived the affordance of social media, it is revealed that teachers agreed to all the items as being positive affordance of social media utilization in the chemistry instructional delivery. Similar result was obtained when the perception of students were analyzed. However, students disagreed with item 15 (reduces the active participation of students during classroom) with a mean value of 2.29 (SD = 0.90) which was lesser than the criterion mean of 2.50. On the basis of the mean ratings of the above items, it was shown that the greatest affordance of social media utilization for instructional delivery in chemistry according to teachers was from item 5 (Chemistry teachers could learn some chemistry practical through social media) with a mean rating of 3.54 (SD = 0.91). For students, the greatest affordance of social media was obtained from item 12 (Help to make it easier to make connections between the theory and practical aspects of laboratory teaching) with a mean value of 3.31 (SD = 1.03). From the grand mean values of 2.93 (SD = 0.89) and 3.01 (SD = 1.02) obtained

for teachers and students' respectively, it therefore indicates that both teachers and students agreed that social media has positive affordance for chemistry instructional delivery in senior secondary schools in Anambra State.

**Research Question Three:** What are the challenges militating against the effective utilization of social media for chemistry instructional delivery in senior secondary schools in Anambra State?

**Table 3: Mean and standard deviation on the challenges militating against effective utilization of social media in chemistry instructional delivery as perceived by teachers and students.**

S/N	Challenges militating against effective utilization of social media for instructional delivery	Mean	Teachers			Students		
			SD	Remarks	Mean	SD	Remarks	
1.	High cost of social media technologies	2.83	0.93	Agreed	3.37	0.94	Agreed	
2.	Lack of professional development in SMU for instructional delivery	2.63	1.07	Agreed	2.77	0.93	Agreed	
3.	Lack of internet – connectivity in some secondary schools in Anambra State	2.86	1.05	Agreed	2.81	0.84	Agreed	
4.	Unsteady power supply	<b>2.90</b>	<b>0.69</b>	Agreed	3.09	0.87	Agreed	
5.	Poor network that causes interruption	2.92	0.85	Agreed	2.71	0.92	Agreed	
6.	Lack of adequate chemistry laboratory for SMU during instruction	3.01	0.91	Agreed	3.05	1.05	Agreed	
7.	Some chemistry teachers do not have appropriate devices for chemistry instructional delivery	2.71	0.95	Agreed	<b>2.84</b>	<b>1.00</b>	Agreed	
8.	Expensive cost of data subscription	2.58	1.03	Agreed	2.83	0.86	Agreed	
	Total	2.81	0.94	Agreed	2.94	0.92	Agreed	

Result on the challenges militating against the effective utilization of social media for chemistry instructional delivery showed that the greatest challenge militating against teachers was from item 6 (lack of adequate laboratory for social media utilization in instructional delivery) with a mean rating of 3.01 (SD = 0.91), while the least was item 8 (expensive cost of data subscription) with a mean rating of 2.58 (SD = 1.03). On the other hand, the result showed that in students' opinion, the greatest challenge against the effective utilization of social media for instructional delivery was from item 4 with a mean rating of 3.09 (SD = 0.87), while the least was from item 5 with a mean rating of 2.71 (SD = 0.92). On the basis of the grand mean rating obtained, it is shown that teachers and students had values of 2.81 (SD = 0.94) and 2.94 (SD = 0.92). This therefore indicates that these challenges are significant.



**Research Question Four:** What are the mechanisms to be adopted for improved usage of social media for chemistry instructional delivery in senior secondary schools in Anambra State?

S/N	Strategies to be adopted for improved utilization of social media for chemistry instructional delivery	Teachers			Students		
		Mean	SD	Remarks	Mean	SD	Remarks
1.	Staff development through conferences, seminars/workshops	3.06	1.01	Agreed	3.32	0.86	Agreed
2.	Provision of internet connectivities in all the secondary schools in Anambra State	2.99	1.04	Agreed	2.53	0.68	Agreed
3.	Federal and state governments to subsidized the cost of social media for the staff	2.89	1.07	Agreed	3.28	0.91	Agreed
4.	Provision of steady electricity for functional teaching of chemistry	3.23	0.96	Agreed	2.71	0.93	Agreed
5.	Procurement of large bandwidth for improvement in the network	3.27	0.93	Agreed	2.92	0.72	Agreed
6.	The secondary school authority should be providing fund for data subscription to chemistry teachers	3.39	0.90	Agreed	3.45	0.94	Agreed
7.	Chemistry teachers should be specifically trained on the use of SMU for teaching experiments and other laboratory practicals	2.97	1.02	Agreed	3.26	0.90	Agreed
Total		3.11	0.99	Agreed	3.07	0.84	Agreed

Table 4 shows the mechanisms to be adopted for the effective utilization of social media for chemistry instructional delivery in senior secondary schools in Anambra State. From the result displayed, the major strategy to be adopted according to teachers was from item 6 which suggests that training of teachers must include the use of social media in teaching chemistry experiments. Similarly, it was revealed that the major strategy according to student was the use of training of teachers to include social media utilization for chemistry experiments. On the whole, the result indicates that a grand mean of 3.11 and 3.07 were obtained for both teachers and students which suggest that the mechanisms were accepted as effective for increased utilization of social media for instruction delivery.

**TEST OF HYPOTHESES**

**Hypothesis One:** There is no significant difference in the mean ratings of teachers and students on the extent of utilization of social media for instructional delivery in secondary schools in Anambra State.

**Table 5: Independence samples t-test of teachers and students mean ratings of the extent of utilization of social media for instructional delivery in chemistry**

Status	N	Mean	SD	Df	t-cal	p-value	Alpha	Decision
Teachers	90	1.66	0.75	397	0.84	0.40	0.05	Retain
Students	309	1.57	0.93					

From the result shown in Table 5, it is revealed that when the mean ratings of teachers and students on the extent of utilization of social media for instructional delivery were assessed for difference using independent samples t-test, a t-value of 0.84 was obtained with a p-value of 0.40 which was greater than the chosen alpha of 0.05 guiding the study. Since the obtained p-value was greater than the chosen alpha, it therefore indicates that there is no significant difference in the mean rating of teachers and students on the extent of utilization of social media for chemistry instructional delivery in Anambra State secondary schools. The null hypothesis was therefore retained.

**Hypothesis Two:** There is no significant difference in the mean ratings of teachers and students on the affordances of utilization of social media for instructional delivery in secondary schools in Anambra State.

**Table 6: Independent samples t-test of teachers and students mean ratings of the affordances of utilization of social media for instructional delivery in chemistry**

Status	N	Mean	SD	Df	t-cal	p-value	Alpha	Decision
Teachers	90	2.93	0.89	397	0.67	0.51	0.05	Retain
Students	309	3.01	1.02					

From the result shown in Table 6, it is revealed that when the mean ratings of teachers and students on the affordances of social media utilization for instructional delivery were assessed for difference using independent samples t-test, a t-value of 0.67 was obtained with a p-value of 0.51 which was greater than the chosen alpha of 0.05 guiding the study. Since the obtained p-value was greater than the chosen alpha, it therefore indicates that there is no significant difference in the mean rating of teachers and students on the affordance of utilization of social media for chemistry instructional delivery in Anambra State secondary schools. The null hypothesis was therefore retained.

**Hypothesis Three:** There is no significant difference in the mean ratings of teachers and students on the extent of challenges militating against the effective utilization of social media for instructional delivery in secondary schools in Anambra State.

**Table 5: Independent samples t-test of teachers and students mean ratings of the challenges of utilization of social media for instructional delivery in chemistry**

Status	N	Mean	SD	Df	t-cal	p-value	Alpha	Decision
Teachers	90	2.81	0.94	397	1.18	0.24	0.05	Retain
Students	309	2.94	0.92					

From the result shown in Table 7, it is revealed that when the mean ratings of teachers and students on the challenges militating against the effective utilization of social media for instructional delivery were assessed for difference using independent samples t-test, a t-value of 1.18 was obtained with a p-value of 0.24 which was greater than the chosen alpha of 0.05 guiding the study. Since the obtained p-value was greater than the chosen alpha, it therefore indicates that there is no significant difference in the mean rating of teachers and students on the challenges militating against the effective utilization of social media for chemistry instructional delivery in Anambra State secondary schools. The null hypothesis was therefore retained.

**Hypothesis Four:** There is no significant difference in the mean ratings of teachers and students on the mechanisms to be adopted for effective utilization of social media for instructional delivery in secondary schools in Anambra State.

Status	N	Mean	SD	Df	t-cal	p-value	Alpha	Decision
Teachers	90	3.11	0.99	397	0.38	0.90	0.05	Retain
Students	309	3.07	0.84					

From the result shown in Table 8, it is revealed that when the mean ratings of teachers and students on the mechanisms to be adopted for the effective utilization of social media for instructional delivery were assessed for difference using independent samples t-test, a t-value of 0.38 was obtained with a p-value of 0.90 which was greater than the chosen alpha of 0.05 guiding the study. Since the obtained p-value was greater than the chosen alpha, it therefore indicates that there is no significant difference in the mean rating of teachers and students on

the mechanisms to be adopted for the effective utilization of social media for chemistry instructional delivery in Anambra State secondary schools. The null hypothesis was therefore retained.

## **DISCUSSION**

The finding of this study from Table 1 based on the obtained results of both teachers and students on the extent of utilization of social media for instructional delivery indicated that social media was used to a very low extent for Chemistry instructional delivery. Also, the independent sample t-test of teachers and students on the extent of utilization of social media for Chemistry instructional delivery indicated that there is no significant difference in the mean ratings of both independent respondents on the extent of utilization of social media for Chemistry instructional delivery. Therefore, the null hypothesis was retained. This study is in line with the result of the finding in the work of Alabdulkareem (2014) who submitted that teachers and students use WhatsApp as main tool, with 100% for the teachers and almost 73% for the students. Further, he acknowledged that both teachers and students are willing to use social media in education, and they believe it will enhance their educational experiences, but the practice is significantly low, in the meantime, and there are agreements that the use of social media is for socialization only. The implication of this assertion is that the usage of social media for instructional delivery is still in low level. In the works of Battrawi and Muhtaseb (2013: 2), affirmed that social networks could be employed in science education as virtual informal science learning settings. To the authors, such technologies would make exceptionally media for raising interests and cultures as they are being used for diverse educational purposes in the areas of peer-learning, teachers-students interactions and scientist-public interactions (Battrawi and Muhtaseb, 2013: 2).

The finding of the result in Table 2 revealed vividly that all the respondents (teachers and students) agreed that all the listed items on the teachers' side and those on the students' side are affordances of using social media for Chemistry instructional delivery. However, students disagreed with item No. 15 which stated that teaching with social media reduces the active participation of students during classroom instruction. This result from the students was not surprising

given the fact that some of them may not have the Android or iPad phones needed for active participation in the learning process. Although, some authors (Amal, 2017; Sanusi & Rashir, 2014 and Conole, 2004) agree that social media offer tremendous affordances to both the teachers and students. These authors pointed at those affordances as; providing collaborative information discovering and sharing, helping teachers to create content, help in the development of skills of digital literacy, creation and management of knowledge. On the other hand, those authors as stated above argued strongly that social media offer great affordance to the students in the following ways; social media offer platforms for connectivity and social interactions; provide access to rich materials through internet connectivity and Halverson and Smith (2009) in their study revealed that social media would extend communication networks, provide immediate access to information and facilitate new forms of creative expressions (Halverson and Smith, 2009). Nevertheless, the effectiveness of social media in assisting teaching and learning would depend very much on the teachers' to use the tools appropriately (Voogt, 2010).

The finding from Table 3 showed that one of the greatest challenges militating against the Chemistry teachers' effective use of social media was lack of adequate laboratory in instructional delivery. On the other hand, the responses from the students' side showed that the greatest challenges to effective utilization of social media for instructional delivery was unsteady power supply. The results generally indicated that all the listed items scored up to the acceptable means therefore indicating that they were all challenges militating against the effective utilization of social media in Chemistry instructional delivery. The results of the independent samples t-test on the mean ratings of teachers and students showed that the t-value of 1.18 was obtained with a p-value of 0.24 which was greater than the chosen alpha of 0.05 guiding the study. Therefore, the obtained p-value was greater than the chosen alpha, it was indicated that there is difference in the mean rating of teachers and students on the challenges militating against the effective utilization of social media for Chemistry instructional delivery. The null hypothesis was therefore not rejected.

The above result is not surprising based on the fact that steady supply of electricity is the back bone of any successful implementation of any technology in the classroom. Without steady supply of electricity, the use of social media in Chemistry instructional delivery will be a mirage. This result is therefore in consonant with the finding in the works of Nachias (2000), Owo (2009) and Nwagbo and Ugwuanyi (2015) who observed that innovative pedagogical practices using technology enhance teachers' effectiveness and must include the supply of steady electricity to make it effective. In the finding of Rachel, Ang and Fun (2017), they revealed that the main challenge of implementing some social media like Instagram and Snapchat as supplementary teaching tools is the possibility of distraction. Since students also connected with their friends via these apps, they may visit their friends' Instagram profiles or send snaps to their friends, instead of viewing the lecturer's laboratory teaching. However, the effectiveness of ICT assisted learning is very much dependent on the ability of teachers to use the tools appropriately (Voogt, 2010).

The findings in Table 4 revealed that all the respondents (both teachers and students) were of the concensus that all the listed mechanisms were good to be adopted for the effective utilization of social media for Chemistry instructional delivery in senior secondary schools in Anambra State. Some of the strategies include; staff development through conferences and seminars, provision of internet connectivities and Chemistry teachers should be specifically trained on the use of SMU for teaching experiments and other laboratory practicals. This result is not surprising in that a teacher will not give out what he has not. A Chemistry teacher must first be grounded in technology before he does effective teaching with SMU.

The above fact was noted in the study carried out in Alabdulkareem (2014) who revealed that UNICCO Media and Information Literacy Curriculum for Teachers (MIL) that made a suggestion that one of the strategies for enhancing the appropriate use of media information among students implies that teachers themselves have to become media and information literate. This strategy would enhance capacities to empower students with their efforts in learning to learn, learning at individual pace and life-long learning should be pursued. Again, it was suggested that it would help in educating students to become media and information literates. By this approach,

teachers would be responding to changes in their roles as advocates of an informed and responsible citizens. Also, they would be responding to changes in their roles as twenty-first century teachers as instructional delivery moves from being instructor-centered to becoming more student-centered (Wilson, Grizzle, Tuazon, Akyempong and Cheung (2011).

No doubt, staff development, internet connectivity and supply of steady power supply are indispensable for effective utilization of social media for Chemistry instructional delivery.

## **SUMMARY AND CONCLUSION**

This study examined the extent of social media usage by Chemistry teachers for instructional delivery in Anambra State secondary schools. Four research questions guided the study which were; to what extent do Chemistry teachers utilize social media for instructional delivery; what are the affordances accruable from the use of social media for Chemistry instructional delivery as perceived by teachers and students; what are the challenges militating against the effective utilization of social media for effective Chemistry instructional delivery and what are the mechanisms to be adopted for improved usage of social media for Chemistry instructional delivery. Chemistry teachers and students were the respondents.

The results of the findings revealed generally that social media were used at a low extent from both respondents, some of the affordances accruable from use of social media offered the Chemistry teachers opportunities to open class facebook, google classroom, zoom and googlemeet for authentic teaching while students were provided opportunities for interaction and communication. In all, social media have proven to be effective and efficient in Chemistry instructional delivery.

Therefore, for continuity with the global trends in teaching Chemistry, teachers will always need to be updating themselves by way of self-development, attending international and local conferences. By Chemistry teachers being media and information literate, Anambra State Chemistry students would come out with the 21<sup>st</sup> century skills of critical, innovative, creative and communicative skills needed in today's world of works.

## **RECOMMENDATIONS**

Based on the findings of the study, the recommendations were:

1. The federal and state governments should be providing ICT training so that Chemistry teachers should be ICT complaints.
2. Social media affordances should be provided to both the Chemistry teachers and students for improved teaching and learning of Chemistry.
3. The federal, state and school authorities should join hands together to build adequate laboratory, provide steady power supply and internet connectivity to help in the use of social media for enhancement of Chemistry teaching and overall improvement of teaching in secondary schools in Anambra State.

## **CONTRIBUTIONS TO KNOWLEDGE**

1. The findings of this study have established the fact were reliable and authentic technological tools for overall improvement of Chemistry teaching if use in positive ways.
2. This study has further revealed the need for Chemistry teachers to be at home with technologically based teaching and learning. Teaching with technology demands that teachers would be trained specifically so as to meet up with the challenges of SMU.
3. The findings have shown vividly the need for the federal and state governments to provide the necessary technological tools for effective teaching and learning of Chemistry for functional education.

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