

**CHEMISTRY TEACHERS' AWARENESS AND USAGE OF ELECTRONIC
RESOURCES IN INTERACTIVE – ENGAGEMENT AND ANALOGY –
ENHANCEMENT INSTRUCTIONAL STRATEGIES**

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2017/3/69253BE**

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**A PROJECT SUBMITTED TO THE DEPARTMENT OF SCIENCE
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ABSTRACT

The study investigated the Chemistry Teachers' Awareness and Usage of Electronic Resources in Interactive – Engagement and Analogy – Enhancement Instructional Strategies. The population of this study comprises of all chemistry teachers in Senior Secondary Schools in Minna metropolis. Five public secondary and private secondary school will be considered. The findings of the study also disclosed the level of usage of electronic resources by chemistry teacher in interactive – engagement and analogy – enhancement instructional strategies. From the outcome of the analysis the respondent agreed upon the fact that, they neither often use electronic resources in interactive – engagement and analogy – enhancement instructional strategies, not find ease in usage of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies. The implication of this is that there is inadequate or no use of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies. p-value of 0.89, therefore the null hypothesis; which is no difference between male and female Chemistry Teacher response on the level of awareness of on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies was not rejected. Hence, there was no statistical significant different between male and female chemistry teachers' responses on awareness of on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies. Based on the conclusion above the following recommendations were made; More awareness program should be organized to sensitize chemistry teachers on the integration on electronic resource in interactive – engagement and analogy – enhancement instructional strategies, The teachers as well as secondary school management should be encourage on adequate integration electronic resource in interactive – engagement and analogy – enhancement instructional strategies, Challenges and factor affecting adequate integration electronic resource in interactive – engagement and analogy – enhancement instructional strategies cited in the study should be looked into, in order improve teaching and learning, Regular training and re-training of Chemistry Teachers should organize to improve their knowledge on usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies cited in the study should be looked into, in order improve teaching and learning.

CONTENTS TABLE

Contents	Page
Cover Page	i
Title Page	ii
Declaration	iii
Certification	iv
Dedication	v
Acknowledgments	vi
Abstract	viii
Table of Contents	ix
List of Tables	xii
CHAPTER ONE	
1.0 INTRODUCTION	
1.1 Background to the Study	1
1.2 Statement of the Problem	5
1.3 Aim and Objectives of the Study	7
1.4 Research Questions	8
1.5 Research hypotheses	8
1.6 Significance of the Study	9
1.8 Operational Definition of Major Terms	10
CHAPTER TWO	
2.0 LITERATURE REVIEW	11
2.1 Conceptual Framework	12
2.1.1 Objectives and content of the Nigerian senior curriculum secondary school chemistry	12
2.1.2 Instructional strategy	15
2.1.2 Interactive – engagement instructional strategies	18

2.1.3 Analogy enhancement instructional strategies	19
2.1.2 Instructional resources for teaching and learning of science	22
2.1.4 Awareness of electronic instructional resources in Nigeria	24
2.2 Theoretical Framework	26
2.2.1 Constructivism and learning	28
2.2.2 Learning theories on instructional materials	29
2.4 Related Empirical Studies	32
CHAPTER THREE	
3.0 RESEARCH METHODOLOGY	
3.1 Research Design	36
3.2 Population of the Study	36
3.3 Sample Size and Sampling Techniques	36
3.4 Research Instrument	37
3.5 Validity of the Instrument	37
3.6 Reliability of the Instrument	38
3.7 Method of Data Collection	39
3.8 Method of Data Analysis	39
CHAPTER FOUR	
4.0 RESULTLS AND DISCUSSION	
4.1 Analysis of Research Questions	40
4.2 Analysis of Research Hypothesis	47
4.3 Summary of Findings	50
4.4 Discussion of Findings	52

CHAPTER FIVE	
5.0 CONCLUSION AND RECOMMENDATIONS	54
5.1 Summary	54
5.2 Conclusion	54
5.3 Recommendations	55
5.4 Contribution to Knowledge	56
5.5 Limitation of the Study	56
5.6 Suggestion for Further Study	56
REFERENCES	57
APPENDICES	64

LIST OF TABLE

Table	Page
3.1 population and Sampling	36
4.1 Level of awareness Chemistry Teacher on integration of electronic resources in interactive – engagement and analogy – enhancement instructional Strategies	40
4.2 Level of usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.	42
4.3 Factors affecting the usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.	44
4.4 Strategies needed to enhance the integration of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.	45
4.5 t-Test analysis for difference between male and female Chemistry Teacher response on the level of awareness of on integration of electronic resources in interactive – engagement and analogy – enhancement instructional Strategies	48
4.6 t-Test analysis for difference between male and female Chemistry Teacher response on level of usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.	48
4.7 t-Test analysis for difference between male and female Chemistry Teacher response on the factors affecting the usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.	49
4.8 t-Test analysis for difference between male and female Chemistry Teacher response on strategies needed to enhance the integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies	50

CHAPTER ONE

INTRODUCTION

1.0

1.1 Background to the Study

The importance of chemistry in the development of any nation cannot be underrated especially in Nigeria where the national income rest on petroleum and petrochemical industries (Adesoji & Olatunbosun, 2017). Chemistry has often proven to be a difficult subject for many students (Johnstone & Otis, 2015), containing many abstract concepts which are central to further learning in both chemistry and other sciences (Taber, 2014). These abstract concepts are important because further chemistry concept or theories cannot be easily understood if these underpinning concepts are not sufficiently grasped by students. Concepts such as dissolution, particulate nature of matter, periodicity, formulae and equations, chemical bonding are fundamental to learning chemistry. The root of many difficulties that students have in learning chemistry is traceable to inadequate understanding of these underlying topics such as the chemical bonding, periodicity and son on. The chief examiner's report of the West Africa Examination Council (WAEC 2014 - 2017) shows that most chemistry candidates displayed inability to accurately define and understand some basic term in chemistry.

In the case of Nigeria, chemistry is one of the compulsory science subjects offered at Ordinary Secondary Level (O-level). The O-level is a four-year study after primary seven and it is at this level that chemistry is first introduced as a separate subject. For over a decade, learners have performed poorly in chemistry in the so called 'O-level' examination SSCE (NFR, 2014). Hence, the need for adequate instructional strategies alongside incorporated learning using advance technological tools for learning.

The students' inability to conceptualize basic principles of chemistry as a subject, especially the one involving tedious aspect of the subject such as chemical bonding, metal and nonmetal, qualitative and volumetric analysis has been observed by the researcher

for almost over twenty years of teaching chemistry in secondary schools. One wonders whether the use of alternative teaching approach like electronic resource may be a tool towards solving these problems. Obomanu and Adaramola (2016) observed that chemical representation of symbols and molecules are not only difficult for students to understand, but are also abstract and cannot be understood by intuition.

The poor performance may partly be due to the manner in which chemistry is taught. Many learners experience difficulties when learning abstract chemistry concepts because the concepts are taught at a theoretical level with no visual mental representations (Taber, 2014). Consequently, learners fail to cognate concepts and therefore develop a negative attitude towards chemistry. These attitudes may account for the reduced number of learners studying chemistry after the mandatory O-level, when compared to other subjects. posited that teaching strategies can influence students' academic performance either positively or negatively. They noted that when students are taught in such a way that their confidence in their capability in the subject is increased, they are motivated to put more effort in attaining higher level of achievement in the subject. They advocated that teaching practices that would enhance students' academic performance should include; Personalization element, Social interaction within groups, Collaborative learning, Peer instruction, Engaging students in comfortable and creative activities and the use of Electronic or any other instant feedback application. It is in the light of this that this study was conducted to look in the significance of two innovative instructional strategies (interactive-engagement strategy and analogy-enhanced instructional strategy) alongside the integration of electronic resources.

The interactive-engagement strategy stems from the constructivist theory of learning by discovery in a sociocultural context, in which the teacher is a facilitator (Taber, 2014).

Interactive engagement instructional strategy is designed to promote conceptual understanding through minds-on and sometimes hands-on activities which yield immediate feedback through discussions with peers and instructors. Previous studies have indicated that an interactive approach to teaching has a number of positive effects on students' motivation and learning (Okezie and Onyekweodiri, 2014; Ezrailson, Kamon, Loving and McIntyre, 2016; Nbina and Viko, 2016).

Moreover, according to Ezrailson, *et al.* (2016), a model of interactive-engagement instructional strategy involves a pre-class assignment on concept to be taught, which is a significant shift from post class assignment usually given as homework. This instructional strategy also incorporates concept testing and an instant Student-Response System which in the study was flashcard response system. This according to Okezie and Onyekweodiri (2014) enhances self-efficacy and stimulates minds-on activities. The concept questions are carefully crafted multiple choice questions on the pre-class assignment previously given to the class. The students then engage in class-wide discussion in small groups of three to five (depending on the class size), this fosters collaboration and emphasizes conceptual learning (Lorenzo, Crouch and Mazur, 2013). Analogy-enhanced instructional strategy is another teaching instructional strategies considered in this study.

Analogy-enhanced instructional strategy adapts the concept of storytelling into teaching which according to Isaac (2016) creates interest and reduces anxiety. This instructional strategy uses concepts that students are familiar with to provide an analogical bridge to an unfamiliar concept thus motivating and provoking the interest of students (Orgil and Thomas, 2007, as cited in Agummuoh, 2015). Analogy-enhanced instructional strategy has been found to significantly improve students' achievement and comprehension in the teaching of biology, environmental education and physical chemistry. Not much has been

done on the use of analogy to teach chemistry and especially on its effect on self-efficacy of students.

The analogy-enhanced instructional strategy is grounded in the structure-mapping theory for analogy, propounded by (Apostolos & Panagiotis, 2013). Analogy-enhanced instruction is basically a teaching strategy that involves a mapping mechanism which helps a learner construct new knowledge on the basis of his or her identification of similarities between different concepts (Govende and Maistry, 2016). Analogical thinking extracts useful structural and relational information from a repertoire of familiar instances or events (the analogue or base domain) and maps it on to the unfamiliar science concept (which is called the target). Despite the significance impact of both instructional strategies, the advancement in technology as given rise to the need for the use of electronic resources in teaching and learning in order to enhance instructional strategies. Electronic resource is digitized information, facilitated by computers, network connectivity, electricity, other peripheral components and most importantly human beings. It comes in different formats including text, videos, audio, maps, graphics, tables, pictures, and so on.

Govende and Maistry (2016) indicate that electronic resources include full text documents, CDROMs, resources available on the internet such as Ejournals, Online Public Access Catalogues (OPACs) and other computer based electronic networks. For the purposes of this study, electronic resources refer to OPAC, Dspace and academic databases subscribed to by University of Cape Coast (UCC) (Franklina, 2017).

The UCC Sam Jonah Library subscribe to a wide range of electronic databases that make available full-text articles to support teaching, learning and research activities. The application of Information and Communication Technologies (ICTs) has changed the way the researchers and faculty access and utilise information resources. As a result, e-

resources have become an integral part of the information resources for academicians and researchers and can substitute print resources (Ayodele, 2014). The access to the internet by the users unfolds the utilisation of e-resources (Tripathi, Sonkarand Rajbanshi., 2016). Generally, it is apparent that the print age is paving way to electronic information resources. Since the early 1990s, several initiatives aimed to increase the availability of e-resources have resulted in a significant increase in the number of African institutions subscribing to these e-resources for teaching and learning.

1.2 Statement of the Problem

In recent times, the standard of education in Nigeria has been a major concern and has attracted comment from stakeholders involved. Education, expectedly is aimed at helping the child to acquire the appropriate skills, abilities and competencies required to live in and contribute to the development of the society they belong (FRN, 2014).

Science Education is said to be the most appropriate and fastest vehicle for the planned transformation of any society (Jegede, 2016). Despite its importance to mankind, the efforts of researchers to improve its teaching and learning is said to be too low and educators are incessantly concerned about the need to improve students' performance especially in the sciences which remains low.

Furthermore, it has been observed based on previous studies that the present methods used in teaching science in general and Chemistry in particular in Nigeria secondary schools do not produce maximum result (Ibe & Nwosu, 2013). Obiekwe and Adegoke (2016) reported that all is not well with science teaching in Nigerian secondary schools, and noted that science teaching lays more emphasis on content and the use of "chalk and talk" method neglecting the practical activity methods which enhance teaching and learning. This negligence and shy-away attitude from activity oriented method of teaching

has led to abstraction which makes the student less active in class and more prone to rote memorization.

The senior school students' performance in Chemistry for the past years has not been encouraging. The West African Senior School Certificate Examination (WASSCE) chemistry result as indicated that during 2010, 2011, 2012, 2013 and 2014 students' performance were below average with the percentages as 45.92, 44.47, 45.97, 49.54 and 43.13 respectively and also between 2015, 2016 and 2017 the result increased slightly above average with the percentages as 50.91, 55.34 and 50.70 respectively, while their performance increased between 2018 and 2019 with the percentages of 72.34 and 62.49 respectively. Despite the increase in the students' percentage, the results are still not satisfactory enough, and this can be improved upon. school chemistry program and technology should not be seen as a replacement for laboratory but rather as an enhancement.

The electronic instructional resources contain series of medium passing and impacting knowledge, which teachers could use to enhance their teaching and improve students' performance in chemistry. Hence, it is important to find out whether chemistry teachers are aware of these resources and whether they use them. Onasanya, Shehu, Ogunlade and Adefuye (2011) in their study of teacher's awareness and extent of utilization of information communication technologies for effective science and health education in Oyo state, Nigeria. Their study focuses on the use of ICTs tools such as online self-learning packages, interactive CDS, Radio, Video, etc for effective science and health education as compared to this study which was specifically on the online instructional resources for chemistry teachers.

The low ebb performance of science students especially chemistry in public examinations in Nigeria has attracted public concern (Umoren & Ogong, 2014). There are had been a

lot of studies to improve science teaching especially chemistry in secondary schools in Nigeria and in spite of all the efforts the performances of the students is still not encouraging. This situation has given room for the need to change the methodology and traditional mode of delivery of instructions. Therefore, it is based on these views that the research sought to find out the chemistry teachers' awareness and usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

1.3 Aim and Objectives of the Study

The aim of the study is to investigate into the chemistry teachers' awareness and usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies. Specifically, the objectives of the study are to:

1. Find out the level of awareness Chemistry Teacher on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.
2. Find out the level of usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.
3. Determine the factors affecting the usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.
4. Determine the strategies needed to enhance the integration of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

1.4 Research Questions

The following research questions will guide the study:

1. What is the level of awareness of Chemistry Teacher on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.
2. What is the level of usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.
3. What are the factors affecting the usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.
4. What are the strategies needed to enhance the integration of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

1.5 Research hypotheses

The following research hypothesis for the study:

1. There is no significance difference between male and female Chemistry Teacher response on the level of awareness of on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.
2. There is no significance difference between male and female Chemistry Teacher response on level of usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.
3. There is no significance difference between male and female Chemistry Teacher response on the usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

4. There is no significance difference between male and female Chemistry Teacher response on strategies needed to enhance the integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

1.6 Significance of the Study

The findings from this study were expected to be of a great value to the following stakeholders: students, teachers, school authorities, State and Federal Ministries of Education, Science Teachers' Association of Nigeria (STAN), Nigerian Educational Research Development Council (NERDC) and researchers in the field of education.

Through the use of online chemistry instructional resources by chemistry teachers to teach their students, it is believed that students will assimilate more and light will be thrown to the grey area. Therefore, students will benefit more from this study.

Specifically, it is envisaged that the findings from the study would be of great help to chemistry teachers to have up-to-date information about electronic chemistry instructional resources in in interactive – engagement and analogy – enhancement instructional strategies. This knowledge will assist the chemistry teachers to improve their teaching methods by utilizing available online resources, which could lead to maximum chemistry learning outcomes and also it will help the chemistry teacher to teach the subject effectively and efficiently which will later improve learning outcomes.

The data obtained from the study would provide school authorities with information the extent of teachers' awareness and utilization of electronic chemistry resources in the use of interactive – engagement and analogy – enhancement instructional strategies, with a view to facilitating in service training in this area.

Science Teachers Association of Nigeria (STAN), State and Federal Ministries of Education and Nigerian Education Research Development Council (NERDC) would find this study very useful in identifying the necessary areas where there is need for an upgrade

in the curriculum so that chemistry teachers in training and in-service teachers on training can be exposed to the use of online chemistry instructional resources. It could also act as a good set-out point for educational researchers who would want to undertake further research in this particular area.

1.7 Scope of the Study

This study sought to find out awareness and utilization of online chemistry electronic resources by Chemistry Teachers in the interactive – engagement and analogy – enhancement instructional strategies for teaching Chemistry in Minna metropolis. The study was restricted to all the Chemistry teachers in both the public and private schools in Minna. The research explored if teachers gender significantly affected their awareness and utilization of electronic resources in the interactive – engagement and analogy – enhancement instructional strategies for teaching chemistry. The study lasted for four weeks.

1.8 Operational Definition of Major Terms

Achievement: this refers to student doing well academically, obtaining good grades or excellent performance in Mathematics.

Awareness: Chemistry teachers' knowledge on the existence of the online chemistry instructional resources.

Utilization: The act of putting online chemistry instructional resources to use in the teaching and learning of chemistry.

Instructional Strategies: these are techniques chemistry teachers use to help students become independent, strategic learners.

Instructional Resources: These are resources that make teaching and learning easier for both teachers and the learners.

Electronic Chemistry Instructional Resources: These are chemistry resources that are available on electronic format which make delivery of instruction easier for the teachers.

Interactive – Engagement: this is an instructional strategy which involve questioning of students or challenging them to think or to do something that requires thought. Students interact with each other, with the instructor as a coach or guide, or with guided materials created by the instructor (on paper or computer).

Analogy – Enhancement: is an instructional strategy which involves establishing similarities between a familiar. concept (analogue) and a new concept (target) of chemistry.

CHAPTER TWO

2.0 LITERATURE REVIEW

The review of relevant literature is organized under the following sub-headings:

Conceptual Framework

Objectives and Content of the Nigerian Senior Secondary School Chemistry Curriculum

Concept of Instructional Strategies

Concept of Interactive – Engagement Instructional Strategies

Concept Analogy – Enhancement Instructional Strategies

Concept of Instructional Resources

Concept of Electronic Instructional Resources

Theoretical Framework

Constructivism and Learning

Learning Theories on Instructional Resources

Related Empirical Studies

Summary of Literature Review

2.1 Conceptual Framework

2.1.1 Objectives and Content of the Nigerian Senior Secondary School Chemistry Curriculum

The term curriculum has been diversely defined by numerous scholars at each different time. Olorundare (2013) believed that the word curriculum has been used in varieties ways depending on the perspective from which the authors views it. Curriculum is a concept and one of the elements of any educational system which may be formal, non-formal, or informal. The term is however more prominently used in formal education.

Yusuf (2012) is of the view that curriculum is the totality of all planned and unplanned, guided and unguided learning experience learners are exposed to in a school setting for the purpose of attaining its educational objectives. Aggarwal (2016) Summarized that curriculum was considered as a tool in the hands of the artist (the teacher) to mould his material (the pupils) in accordance with his idea in his studio (the school). He sees curriculum as an aid in the process of adjusting the child to the environment in which he will have to organize his activities later, and programmes should be made on the needs of the society and the interests of the pupils.

Olorundare (2013) defined curriculum as the design of a particular social group for the educational experience of its citizens, but included in this design is the subject content and the educative experiences that extend beyond the boundaries of the study and the study skills. These experiences, according to the submission, include provision for understanding social functions and for individual's academic, emotional, physical and social needs in a democratic society. The curriculum is thus prepared specially to cater for every need and interest of the child putting into the consideration societal needs.

The subject content of what is studied in schools consists of a vital part of the school curriculum. In Nigeria, several bodies/agencies are co-operatively involved in determining what is actually taught in school. These include State and Federal Ministries of Education, Nigeria Educational Research and Development Council (NERDC), Joint Admissions and Matriculation Board (JAMB), West African Examinations Council (WAEC), and the National Examination Council (NECO). All these do in one way or the other determines the curriculum content of all subjects including Chemistry.-

In selecting the contents, three major issues shaping the development of nations worldwide, and influencing the world of knowledge today were identified as globalization, information/communication technology and entrepreneurship. The desire for Nigeria to be identified with development worldwide has called for the organization of the contents of the curriculum around four themes of: The chemical world, Chemistry and environment, chemistry and industry, Chemistry and life. The content was organized to fit the three years of senior secondary school of 9-3-4 system of education in Nigeria (NERDC, 2016). The curriculum guides chemistry teachers to know the syllabus in operation, its content, organization and set objectives as the knowledge acquired would assist in planning their lesson.

The National Curriculum for Senior Secondary Schools Science stated specific objectives to be achieved by chemistry curriculum, which includes;

1. Facilitate a transition in the use of scientific concepts and techniques acquired in integrated science to chemistry.
2. Provide the students with basic knowledge in chemical concepts and principles through efficient selection of content and sequencing.
3. Show chemistry in its inter-relationships with other subjects.
4. Show chemistry and its link with industry, everyday life, benefits and hazards

5. Provide a course, which is complete for students not proceeding to higher education while it is at the same time a reasonably adequate foundation for post-secondary chemistry course.

All these objectives whether generals or specifics are only achieved by the teacher through giving the right types of instructions to the chemistry students, no matter how well-developed and comprehensive a curriculum is, its success is dependent on the quality of the teachers implementing it (Onwuka, 1985, as cited Umoren & Ogong, 2014; Ughamadu, 2015).

However, the adoption of online chemistry instructional resources for teaching and learning chemistry can be of great benefit to effective implementation of the curriculum.

2.1.2 Instructional Strategy

According to Richardson (2011), besides the studies of early progressivism, Lev Vygotsky, Jean Piaget, Jerome Bruner and Albert Bandura studied on instructional strategies and they had created new theories. Cognitive psychology and constructivist approaches placed instructional strategies in the center of the curriculum such as exploration and research-based teaching activities.

Instructional strategies point the ways and approaches followed by the teachers, to achieve the fundamental aims of instruction. Strategies are defined in various ways in the related literature. Sources called them as “teaching strategies” or “instruction strategies.” In fact, it’s hard to say flatly, that there is the existence of a concept of unity about the strategies. Nevertheless, because of our view about the concept of instruction, as mentioned previous section (Nature of Instruction), we named them as “instructional strategies”.

When the related literature is examined, it is seen that many researchers try to create a conceptual framework for instructional strategies. It could be stated that the conceptual

frameworks include instructional organizers and arrangers as well as instructional strategies and tactics. Instructional organizers put forward practical ideas regarding the application of instructional activities. For instance, instructional organizers could be said to be carried out to organize instructional goals of Bloom's taxonomy or Gardner's theory of multiple intelligence. The instructional behavior that instructors have long tended to apply could also be regarded as instructional tactics. These are essential activities which are most common in the instructional process and which limit the instructional strategies of instructors. Behaviors such as directing an appropriate question, checking learners' understanding, giving examples, making visual presentations or contributing to both parties of a discussion could be given as examples of instructional tactics. Tactics have resulted from experienced instructors' practices (Richardson 2011).

Marzano (2013) states that instructional strategies influence learners' achievement and let teachers diversify the instructional applications. According to Marzano, the effectiveness of instruction can be achieved mainly by preventing the random or mysterious occurrence of this process. The instructional process should be structured, applied and evaluated in a purposeful, planned, and systematic way.

According to another aspect of the strategies; instructional strategies are instructional methods that include specialized instructional phases in line with the particular purposes of the subject and the features of the content area so that learners can gain the target behavior (Okwuduba et al. 2018). Instructional strategies include activities that help create the classroom environment for good-quality learning to occur. These activities should consider instructional goals as well as the content of the curriculum. Instructional strategies pointing out the components that will influence target learning are factors which have a significant impact on the quality of learning; that determine which instructional activities will be carried out in the instructional process and which instructional methods

and techniques will be employed in the process (Baker and Dwyer 2005). The underlying determinants in choosing the instructional strategies and using them in the instructional process include the instructional approach, the instructional theory, and the related models that the teacher has adopted (Joyce and Marsha 2000; Richardson 2001).

Modern understandings regarding instructional strategies acknowledge that instructional goals are complex and sophisticated and that instructors are supposed to have a variety of approaches to the educational needs of students from different socio-cultural environments and to help them achieve effective learning. In this respect, it could be stated that today, instructors should prefer among various instructional strategies to help learners gain active learning experiences in cognitive, affective and kinetic fields (Williams 2014).

Instructional strategies are mostly used to apply learning theories in a useful way and to obtain the target learning outcomes. Besides, one of the related questions discussed in academic contexts in recent years is the question of which learning theory can be effectively used with which instructional strategies (Miller and Veatch 2016). Discussions between educators and community are collected at the point of the effectiveness of the method of expression or discussion, direct instruction or research-based instruction. It is not possible to say that this debate can reach a conclusion because of the instructional strategies are not implemented in the same effectiveness.

It can be said that learning environment may be effective the use of instructional strategies. Classrooms give the teachers and students interaction each other. At certain times, some types of classes can appropriate for instruction than other types. Both formal and informal learning are ensured using effective instructional strategies in certain environments created by instructors. For example; In the quite distinctly structured learning environment that lecture method was applied, learners are expected to observe,

listening and take notes. In another example; if instructor separates the learners for collaborative/cooperative learning activities, learners are supposed to identify the interaction's direction and limit and to express themselves effectively. For the purpose of this study we shall be looking into the interactive – engagement and analogy – enhancement instructional strategies.

2.1.2 Interactive – Engagement Instructional Strategies

In seeking to understand what is meant by “engagement”, some authors have considered its antithesis – if a student is not engaged, then what are they? Mann (2011) contrasted engagement with alienation, proposing the engagementalienation dyad as a more useful framework to understand students’ relationships to their learning than the surface-strategic-deep triad (Marton and Saljo 2016), since both “surface” and “strategic” approaches to learning are responses to alienation from the content and the process of study.

Dimensions of Engagement:

Engagement is more than involvement or participation – it requires feelings and sense-making as well as activity. Acting without feeling engaged is just involvement or even compliance; feeling engaged without acting is dissociation. Although focusing on engagement at a school level, usefully identify three dimensions to student engagement, as discussed below:

Behavioural Engagement: Students who are behaviourally engaged would typically comply with behavioural norms, such as attendance and involvement, and would demonstrate the absence of disruptive or negative behaviour.

Emotional Engagement: Students who engage emotionally would experience affective reactions such as interest, enjoyment, or a sense of belonging.

Cognitive Engagement: Cognitively engaged students would be invested in their learning, would seek to go beyond the requirements, and would relish challenge.

It was proposed that each of these dimensions can have both a “positive” and a “negative” pole, each of which represents a form of engagement, separated by a gulf of non-engagement (withdrawal, or apathy). (The terms “positive” and “negative” are used here not to denote value judgment, but rather to reflect the attitude implied in much of the literature that compliance with expectations and norms indicates internalisation and approval, and is thus seen to be productive, whereas behavior that challenges, confronts or rejects can be disruptive, delaying or obstructive, thus seen to be counter-productive. This is not to deny that, for individual academics, evidence of critical engagement among their students is viewed as a positive indicator of success.)

2.1.3 Analogy Enhancement Instructional Strategies

There are many definitions about analogies. Genter (2013) describe analogy as a type of reasoning where knowledge is transferred from one situation (called source or base) to another one (called target) on the basis of some kind of similarity between both situations, on the basis of the judgment that the two situations are essentially identical with respect to the task at hand. According to Hofstadter (2015) analogy can also be viewed as a kind of high-level perception, where one situation is perceived as (in terms of) another one. Vosniadou and Ortony (2010) describe analogy as “a move from one-place predicates that work on object attributes, to deep two-place predicates that involve object relations.” Stepich and Newby (2014) describe analogy as an explicit, no literal comparison between two objects, or sets of objects that describes their structural, functional, and/or casual similarities. Some researchers contended that analogical problem solving may be an appropriate approach for generating solutions to problems which are often apparent within the domain of teaching (Dunn and Shriner, 2016). In fact, the concept of analogy

goes back to the ancient Greeks. According to Esper (2014), the word analogy derives from the Greek “analogia” in which “ana” means collection of words or items and “logos” means reason.

When learners are confronted with unfamiliar material, provision of advance organizers and analogies are thought to enhance learning. Analogies promote learning by “concretizing” abstract concepts for the learner, promoting the assimilations of ambiguous or intangible concept (Newly and Stepich, 2016).

When the first theories of analogical reasoning were developed during the twentieth century, the theorist believed that analogical reasoning ability was a late appearing skill. Piaget’s structural theory had the onset of analogical reasoning ability appearing between the ages of 12 and 15. Perhaps as a consequence, the use of analogies with younger children has tended to be ignored. But there was evidence to show that Piaget was wrong. Gelman and Markman (1987) had stated simple analogical reasoning amongst three and four years old. Children as young as five years used the needs of people as an analogy for the needs of plants (Hatano & Inagaki, 1994). According to Lynn (1993) analogy appears to be one of the most important mechanisms underlying human thought, at least from the age of about one year. He described the analogy as “a mapping from one structure, which is already known (the base or the source), to another structure that is to be inferred or discovered (the target). (Hofstadter, 2015)”

consider that the combination of both structure and function is particularly effective in that it is easier to match the components and that makes it easier to see parallels in the way they function. True and consistent analogical reasoning, according to Piaget, required specific cognitive abilities. One was the child’s ability to comprehend both lower and higher order relations between the object in a classical analogy. Another requirement for true analogical thinking for Piaget was that the child be certain of and consistent in the

given response and resist the experimenter's counter suggestion. Although psychology and many scientific disciplines use analogies as illustrative device within the discipline, even process of scientific research involves analogical process (Oppenheimer, 2011). Many theorists support the importance of relating new knowledge to established, meaningful knowledge.

Analogy is commonly used as a teaching method in many areas like as physics, chemistry, biology, mathematics and etc. for teaching procedures and principles. It can be defined as "analogy is an assertion that a relational structure that normally applies in one domain can be applied in another domain" (Gentner, 2015). Analogies are perceived as having a worthwhile role in understanding unfamiliar knowledge by the association to the familiar ones. Analogies are made motivate students to the subject and help students learning by providing visualization of abstract concept.

Teachers can use analogies to introduce concepts in ways that are concrete, meaningful, and relevant to the students.

The role of analogy in learning has been extensively researched in science education. The core purpose of the use of analogy as a strategy deployed in teaching is that of developing understanding of abstract phenomena from concrete reference (Haywood, 2002). The use of analogy in developing understanding of phenomena is not restricted to science education. When teachers help students relate their background experience to new science concepts, they often use analogies, which is a similarity between concepts. For instance, the wing of a bird is analogous to the wing of an airplane. A human eye is analogous to the operation of a camera.

It is commonly accepted that children's subject like chemistry, physics and mathematics learning is an active construction process based on recognizing similarities between new and existing ideas). For children to construct the appropriate links to new learnings, they

need to focus on the common relational structures of situations, rather than on their superficial details. This is where analogical reasoning comes into play that is, children have to map the relational properties of a known construct (the base or the source) onto the corresponding properties of a new construct (the target).

2.1.2 Instructional Resources for Teaching and Learning of Science

Instructional resources are those varieties of resources in any format which influence the student's learning and the instructor's teaching. They include but not limited to, textbooks, library books, periodicals, pamphlets, art prints, study prints, pictures, transparencies, films, filmstrips, slides, internet materials such as e-lesson notes, virtual laboratory, simulations, experimental demonstration, online instructional resources (Ekundayo, 2015).

Instructional resources are those resources used to improve students' knowledge, abilities, and skills, to monitor their assimilation of information, and to contribute to their overall development and upbringing (Encyclopedia, 2021). Instructional resources also mean any print materials, non-print or electronic medium of instruction designed to assist students. Similarly, Scanlan (2016) indicates that instructional media encompasses all the materials and physical means an instructor might use to implement instruction and facilitate students' achievement of instructional objectives. This may include traditional materials such as chalkboards, handouts, charts, slides, overheads, real objects, and videotape or film, as well as newer materials and methods such as computers, DVDs, CD-ROMs, the Internet, and interactive video conferencing.

In the opinion of Ajelabi (2013) and Akinlaye (2016) many educational technologists see instructional materials as devices and resources used in learning situations to supplement written or spoken words in the transmission of knowledge, attitude, ideas or concepts and values. Akinlaye (2016) further states that instructional materials have been defined as

things or objects brought into play to emphasize, clarify, strengthen, vitalize the teacher's instruction. Ajelabi (2013) subtly puts instructional materials as teaching-learning materials that constitute an integral component of the classroom instructional process which are utilized in delivering educational information to the learner. He further states that it makes lesson real, concrete and effective. Learners are motivated to learn at their own pace, rate and convenience.

According to Bajah (1992) the followings were some of the reasons for using the instructional resources:

- (i) A good instructional material can supplement spoken or written words.
- (ii) It can bring teaching to life in a way which word cannot.
- (iii) Words can describe people, places and objects but a picture immediately brings reality.
- (iv) A teaching aid can simplify and clarify what is complex and difficult to express in words.
- (v) Instructional materials have motivational value for them to develop the interest of the student.
- (vi) Instructional materials can also promote retention as we can understand from the Chinese proverb that says “what I hear I forget, what I see I remember, what I do I understand”.
- (vii) They save time, and energy what you will explain in ten minutes, will be possible in less time with the use of instructional materials.

The role that instructional resources play on teaching and learning needs not be over emphasized. It is through instructional materials that the teacher drives home his or her point during lesson. In the process of using instructional materials, students can see, feel and touch the materials and this aids retention. Ikonta (2016) views the media as having

a vital role to play towards teaching and learning. He refers to the media here as the television, radio, journals, newspaper and magazines. All these help to educate students and help them gather educative information through listening, reading speaking and thereby increasing and widening the horizon of their knowledge.

2.1.4 Awareness of Electronic Instructional Resources in Nigeria

Awareness is knowledge about particular information and manifested through a particular behavior. Awareness is paramount if postgraduate students are to effectively and efficiently use electronic resources. Abinew and Vuda (2013) survey on acceptance and use of electronic library services in universities respondents were asked about their awareness of the available e-library services to indicate their answers by way of saying “Yes”, “No” and “To some extent”. Majority of the respondents (57.97%) responded “To some extent” to indicate that they have only limited awareness about the existence of e-libraries resources and didn’t know well and in detail. 20.65% of respondents do not know anything about the existence of the e-library services at all. Only 21.38% of the respondents were well aware of the existence of the e-library services. They also found in the same study that there is no significant difference in awareness of e-library services that existed between universities, academic staffs and postgraduate students, and among streams (faculties/colleges/institutions).

Obuh (2015) believe that awareness of electronic information resources has been a major concern for academia, postgraduate students’ and researchers in recent days. He further conclude that often it is in college that users become aware of libraries’ electronic resources, usually while having to write research papers. Assuming that on average most students face the same number and type of papers and assignments during their college career, it is critical to understand what makes one student use the library's electronic resources while another will not think of the library as a place to find specialized resources

for their papers. Ekenna and Ukpebor (2012) asserted that electronic resources are highly accepted in the Netherlands especially by scientists and social scientists. Vakkari (2013) argued that the high patronage enjoyed by e-resources is because it is readily accessible and functional, not necessarily because of its rich contents. Dilek-Kayaoglu (2018) revealed that one of the barriers to the use of e-resources as reported by 42.7% of respondents in his study is lack of awareness of e-resources services in their library.

Igbeka and Okpala (2014) posited that since the 1995 introduction of CD-ROM literature search into the University of Ibadan library system, the number of users of the CD-ROM facility was still very small as against the number of registered library users. This they revealed might be due to lack of current awareness or dissatisfaction of users. Ali (2005) cited by Bashorun, Isah and Adisa (2011) use of electronic information services (EIS) among the users of Indian Institute of Technology (IIT) library in Delhi, India and revealed that 95 percent of users have awareness about EIS provided by the library. Dafioghor (2012) survey on problems and prospects of electronic resources usage in Nigerian academic libraries found that 57% of students sampled could not use a computer, that the use of database was poor, due to lack of awareness.

) report on a survey on convenient access to, and use of electronic databases (CD-ROM and online) including full text journals and their effect on information seeking behavior of health sciences faculty at the college of health sciences of the University of Ghana Medical School. The study documented preference between print and electronic resource use, and the specific databases and full text journals that faculty found useful. The findings reveal faculty lack of awareness and use of the two most resourceful full text journals databases available at the library (HINARI and PERI), hence they resorted to PUBMED as their source of access to full text journals to the traditional print indexes and abstracts, and hard copy publications; and paucity of time and distance from the library's

Internet facilities have made the faculty members conducted their searches through intermediaries at the library. This finding is in line with the findings of Ogunyade and Oyibo (2014) in their study which examined the use of Medline – the database of life sciences and biomedical bibliographic information – by medical students at the University of Lagos. The study found that the use of the database was poor, due to lack of awareness. Prangya and Rabindra (2013) shows 12(52%) postgraduate students are aware about the e-facilities and e-resources, 11(48%) are not aware about the facilities, similarly 12(52%) research scholars were aware about the e-resources, 11(48%) research scholars are not aware.

survey on use and awareness of electronic information sources at IIT Roorkee, India found that users have knowledge about the availability of electronic journals, but many use them as the supplementary way to use information. Many users need to be aware of the complete potential of the electronic journals. However, the preference for the electronic format is related to the discipline and age of the respondents and is higher among academic status. The present survey reflects a growing interest in online journals among the user at IIT Roorkee. The study also revealed that most users are aware about the availability of online journals through the library, and they can make maximum use of it for various purposes. Dolo-ndlwana (2013) use and value of library's electronic resources by academic and postgraduate student at Cape Peninsula University of Technology found that the majority of the respondents used electronic resources, but a few respondents did not use e-resources because they were not aware of them. Ahmad and Panda (2013) survey on awareness and use of electronic information resources by the faculty members of Indian Institutes in Dubai International Academic City revealed that majority of the faculty members were aware of and used e-resources. They study further

confirmed lack of knowledge and use of library specific resources such as e-theses, patents and CD-ROM databases.

Dange, Girish, Savitha, Sushma and Veenakumari (2013) study on awareness and usage of digital information sources and services by postgraduate students of Kuvempu University revealed that there is significant difference between previous and final year students of digital information sources awareness, digital information services awareness, and digital information sources usage. Also, there is significant difference between arts, science and education postgraduate student's digital information sources awareness, digital information services awareness, digital information sources usage and digital information services usage. But there is no significant difference between previous and final year students' digital information services usage, digital information sources awareness. There is no significant difference between digital information sources usage, digital information services awareness, and digital information services usages of male and female postgraduate students.

Aina (2014) survey on awareness, accessibility and use of electronic databases among academic staff of Babcock University found that majority of respondents were aware of Academic Journal 59 (69.4%), followed by JSTOR 48 (56.5%) as well as Dissertation and Theses and Ebscohost with 46 (54.1) and 43(50.6) respectively. The analysis also revealed that majority of respondents were not aware of Bookboon, World Bank Open Knowledge Repository and National Virtual Library with 22(25.9%), 28 (32.9%) and 25(29.4) respectively. He further concludes that nine out of thirteen databases under consideration were averagely aware by respondents. This implies that there is need to increase awareness to cover all electronic resources the library subscribed to.

2.2 Theoretical Framework

This study is guided by the constructivist theory of learning and Learning Theories on Instructional Resources.

2.2.1 Constructivism and Learning

Constructivism is basically a theory based on observation and scientific study about how people learn. It says that people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experiences. When people encounter something new, they tend to reconcile it with previous ideas and experience, may be changing what they believe, or may be discarding the new information as irrelevant. In any case, people are active creators of our self-knowledge. To do this, people must ask questions, explore, and assess what they know (Johnstone and Otis, 2014).

One of the first and most vocal proponents of the use of technology to promote meaningful teaching and learning was Papert (1980, 1994) who believed that the Internet and computer as a tools could provide powerful tools for teaching and learning. He also noted that schools frequently ignored the broad capacities computers have for instructional support, isolating them from the learning process rather than integrating them into all areas of the curriculum (Jacobson, 2013).

When constructivism is used effectively, teachers incorporate the ideas of students to prepare the lessons that they will teach in their classrooms. Teachers are beginning to use technology as a tool to promote students' ability to reason and solve authentic problems. "Teachers use existing technology to transform classrooms into dynamic centres of purposeful and experiential learning that intuitively move students from awareness to authentic action". The appropriate use of technology can reinforce higher cognitive skill

development and complex thinking skills such as problem solving, reasoning, decision making, and scientific inquiry (Moersch, 2013). When teachers thoroughly integrate technology into the classroom, constructivist learning environments can evolve.

A constructivist learning environment is a place in which learners work together and support each other as they use a variety of tools and information resources in their guided pursuit of learning goals and problem-solving activities. Constructivist learning environments frequently encompass many different applications of media and technology (Hausfather, 2011). Such environments create active classrooms that combine the tools of constructivism with communication and visualization tools that enable communication and collaboration among learners in a sociocultural context. Such environments create active classrooms that combine the tools of constructivism with communication and visualization tools that enable communication and collaboration among learners in a sociocultural context. Increased in student achievement can result because of the synergy created through dynamic interactions

There is wide consensus in education that learning is no longer seen simply as the result of a transmission of knowledge. Nowadays pedagogical strategies employed in the current ICT- based learning are linked to constructivism paradigm. According to constructivism, knowledge is considered to be socially and individually constructed; learning is the acquisition of meaningful competences in a realistic context; learning is advanced through interactive and authentic experiences that dovetail with the interests of the student and through active learning.

So the focus is on the development of a suitable environment for constructing knowledge rather than for its transfer. In such an environment the use of ICT can trigger constructivist innovation in the classroom contributing to the realisation of meaningful authentic,

active-reflective and problem-based learning, a method that challenges students to "learn how to learn"; students seek solutions to real world problems, which, based on an ICT framework, are used to engage their curiosity and initiate learning, leading to critical and analytical thinking. The constructivist education philosophy aims at a school where students learn how to learn, in a learner-centered environment with emphasis on learning through discovery and exploration and on experiences in the development of problem-solving strategies (Hay, 2014).

ICT-enhanced constructivist classroom practices, however, it demanded that teachers play a new role. This means that opportunities, like exposure to a number of critical examples and experience in designing ICT-based activities and integrating them in their classroom practice in constructivist ways are of great priority. The aim is to convince teachers for the potentiality of ICT as constructivist learning tool through their own personal experience. For this reason the development and implementation of appropriate courses is very important for the teachers' professional development and crucial for the success of innovative approaches using ICT (Dimitris, 2007).

Teachers need to go beyond traditional approaches and become acquainted with new methods in order to get a clear understanding of the educational functionality of technological tools in their educational practices. In order for technology to positively affect teaching methods and therefore student learning, teachers must possess the technology-related skills needed to use technology and must actively use these tools in their classrooms (Ashforth, 2013). Increasing in technology use can create a vehicle through which educators can address teaching and learning opportunities for all students.

2.2.2 Learning Theories on Instructional Materials

Chemistry Instructional resources are animated or inanimate objects that assist the teacher in making chemistry concept skill more meaningful and understandable to the learner

Piaget (1973) as an educational psychologist and child development in learning, in his own theory of learning stated that, “subjectivity of representation in child development is encouraging the use of concrete models in teaching and learning of chemistry from Secondary school level”. Piaget further said that learning goes well from concrete to abstract. According to Jean proper use of concrete model could promote the broad goals alluded in chemistry learning. He made coherent rationale for the use of concrete models in the learning of chemistry. Secondary school pupils who were mainly at age of concrete operational stage according to Piaget need to learn more with instructional materials.

Bruner (2013) in his constructivist theory, stated that learning is an active process in which learner constructs new ideas or concepts based on their current or past knowledge. Bruner who said that, “instructional materials are used to provide the meaning and organization to experiences and allow the individual to go beyond the information given”. According to Bruner, the teacher should try and encourage pupils to construct hypotheses, make decisions and discover principles by themselves. Bruner (2013) stated that, a theory of instruction should address the following aspects:

1. The most effective sequences in which to present materials
2. The ways in which a body of knowledge can be instructed so that it can be most readily grasped by the learner, i.e. through instructional resources.

Gagne (2014) in his theory on instructional resources was particularly influenced in the training and the implementation of electronic instructional resources in teaching and learning. According to Gagne (2010), “a variety of learning activities should enforce effective learning”. Gagne further said that instructional designer should anticipate and

accommodate alternate learning styles by systematically varying teaching and assessment methods to reach every pupil to achieve Gagne's theory instructional resources are to be used in chemistry teaching and learning.

A review of literature indicates that many people emphasize the importance of instructional materials in promoting meaningful chemistry instruction. The use of instructional materials is not new (Grossman, 2010). Grossman further points out that because of the importance of instructional materials in teaching and learning, educationists have been advised in 1885 to employ manipulative materials in teaching concepts in Chemistry.

stated that for a chemistry teacher to achieve his objective in the classroom, he must find other devices for the students to see, touch, hear and make use of these devices, but the time allocated to chemistry, may at times, obstruct the seeing and using of these devices provided. Balogun (2015), observed that failure by teachers to use appropriate instructional materials, poor teaching methods, such as lecture and direct information dissemination method, make pupils loose interest and thus perform poorly in Chemistry. Some psychologists have studied the effects of the manipulative materials on achievement, retention, attitude and transfer of chemistry concepts. Their findings led scholars, such as Jean Piaget, Jerome, Brunner, Gagne, to draw conclusions on the effect of instructional resources on pupils' achievement in learning.

2.4 Related Empirical Studies

Onasanya, Shehu, Ogunlade and Adefuye (2011) in their study of teacher's awareness and extent of utilization of information communication technologies for effective science and health education in Oyo state, Nigeria. The research subjects were 240 science and health education teachers drawn from 40 secondary schools, randomly selected from 10 Local Government Areas of Oyo State. Their findings shows that the level of their utilization of ICT resources for teaching science and health education was found to be very low and there exists a significant difference between the male and female science teachers in their level of utilization of ICTs, with the male out-performing their female counterparts with higher mean scores. This implies that there is low utilization of ICTs resources for teaching science and health education in Oyo state, Nigeria.

The findings from the study were also substantiated by previous findings of Oladejo *et al.*, (2011). They worked on instructional materials and students achievement in physics. They observed` that instructional materials perform such functions as the extension of the range of experience available to learners, supplement and complement the teachers verbal explanations thereby making learning experience richer and providing the teacher with interest into a wide variety of learning activities.

Etuibon (2014) carried out an investigation on implications of innovative Chemistry teaching on students' achievement in chemistry. All Senior Secondary I (SS1) Chemistry students in Uyo Municipality of Akwa Ibom State constituted the population of about 2,109 for the study. One hundred students who formed the sample for the study were randomly selected. 2 out of 4 public secondary schools were randomly selected for the study. Results showed that there was a significant influence in academic achievement between the students utilizing ICT gadgets and those that did not utilize ICT gadgets. There was gender related differences in students' achievement in ICT utilization with

females out performing their male counterparts. This shows that if ICTs tool such as internet is used for teaching and learning, there will be improvement in the students' performance.

Ayodele (2014) investigated the effects of interactive-engagement and analogy enhanced instructional strategies on self-efficacy of senior secondary school chemistry students. The moderating effect of gender and educational level of parents were also explored. The study adapted a pretest-posttest, control group quasi-experimental design, with 3x2x2 factorial matrix. 492 participants were randomly drawn from six schools in two Local Government Area of Osun state. The instruments used for data collection are Teacher Instructional Guide; Self-efficacy Scale and Teachers' Assessment Sheet. Data were analysed using Analysis of Covariance and Scheffe post-hoc test. Treatment had significant effect on students' self-efficacy ($F_{2,479}=45.63$; $p < .05$). The highest self-efficacy posttest mean score ($x=54.71$) was obtained by students taught using analogy-enhanced instructional strategy followed by the group taught using interactive-engagement instructional strategy ($x= 53.81$). The least self-efficacy posttest mean score was obtained by the Control group ($x= 51.44$). Gender and educational level of parents had no significant main effect on students' self-efficacy. There were no interaction effects of treatment, gender and educational level of parents on self-efficacy. The analogy enhanced instructional strategy was most effective in enhancing the self-efficacy of chemistry students. It was therefore recommended as a teaching strategy in chemistry classes for improving performance through enhanced self-efficacy.

Ugwu and Ohimekpen (2015) carried out a study to assess the level of awareness and use of e-learning resources by secondary school teachers in Yobe state. The study adopted a survey method. A total of two hundred and forty (240) respondents were selected from two secondary schools in each of the three geo-political zones in the state. A self-

developed questionnaire was used to obtain response from the respondents. Three research assistants domiciled in each of the zones were used in the issuance and collection of the questionnaires. The result of the study showed that a number of the teachers are not computer literate and are not aware of e-learning resources. The few who are aware and could access e-learning resources are confronted with problems such as lack of Internet facilities, poor network, and high cost of e-learning facilities.

Omiko (2016) in his study focused on level of utilization of available instructional materials, teacher made instructional materials and the obstacles faced by the chemistry teachers during improvisation of the teacher made instructional materials in Ebonyi State secondary schools. 397 chemistry teachers from the 212 government owned secondary schools in Ebonyi State formed the population. The 3 research questions were answered using mean statistics while the hypothesis was tested at 0.05 level of significance using the z-test statistics. The findings revealed that teachers are not utilizing effectively the available instructional materials in their teaching, the chemistry teachers are not making enough efforts in improvisation of those instructional materials that are not available and that the teachers faced obstacles such as lack of fund and skill for the improvisation of instructional materials. Instructional resources encourage creativity and makes learning more concrete.

2.5 Summary of Literature Review

This chapter is reviewed under the conceptual framework of objectives and content of the Nigerian senior secondary school chemistry curriculum, concept of instructional strategies, concept of interactive – engagement instructional strategies, concept analogy – enhancement instructional strategies, concept of instructional resources and concept of

electronic instructional resources. Similarly, the study was theoretically reviewed framework under constructivism and learning, learning theories on instructional resources And finally the related empirical studies unveiled the need to assess the teacher awareness and usage of Electronic Resources in Interactive – Engagement and Analogy – Enhancement Instructional Strategies, in Niger State.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

The study adopted descriptive research survey design. According to Olayiwola (2015) descriptive research is concerned with the collection and analysis of data for the purpose of describing, evaluating or comparing current or prevailing practices, events or occurrences. The author also defined descriptive survey research design as a research method that describes a given state of affairs at a particular time. Hence, descriptive survey research design was appropriate for the current study.

3.2 Population of the Study

The population of this study comprises of all chemistry teachers in Senior Secondary Schools in Minna metropolis. Five public secondary and private secondary school was be considered.

3.3 Sample Size and Sampling Techniques

The sample size of twenty – three (23) chemistry teacher were considered. Since the population is of considerable size, no sampling techniques was adopted, as shown in Table 3.1

Table 3.1 population and Sampling

Public School	N	Private school	
Bahago Secondary School	2	Garima Academy	Standard 2
Government of Day Secondary	2	Abu-Turab School	2
Father O' Cornel	3	Asha Internal School	2
Bosso Secondary School	2	Model Secondary School	3
Girls Day Secondary	2	Mypa School	3
Total	11		12

3.4 Research Instrument

A well-constructed and Researcher-developed questionnaire titled “Questionnaire Assessment of Undergraduate Students Perception and Attitudes Towards Chemistry Learning Through Social Networking Sites in FUT Minna” was used to get the desired information from student. Part A was for collection of information on personal data of respondents while part B is divided into three sections based on the research questions. Section A contains item which addressed the level of awareness Chemistry Teacher on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies., Sections B contain items will address the level of usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies a and Sections C contain items which addressed the factors affecting the usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies and Sections D contain items which addressed the strategies needed to enhance the integration of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

3.4.1 Validity of the Instrument

Samples designed questionnaire were submitted to the project supervisor and two other lecturers in the Department of Science Education, Federal University of Technology Minna for vetting, correction and approval before distributing it to the respondents.

3.4.2 Reliability of the Instrument

The reliability of the research instrument was determined using a split half test using the odd and even numbered items to form the two halves. The two halves were administered to a sample of student which are not in the department where considered

for the study. The Cronbach alpha test was used to determine the reliability of the instrument. A co-efficient value of 0.92 must be obtained to indicate that the research instrument is reliable.

3.5 Method of Data Collection

The researcher collected the needed data through the administration questionnaire to the sampled chemistry teachers. The administration of the questionnaire was carried out by the researcher and two other researcher assistant. A total of twenty - three (23) of the questionnaire was distributed to elicit responses from the student were retrieved on the spot by the researcher.

3.6 Method of Data Analysis

Data obtain from the analyzed using the descriptive and inferential statistics of frequency counts and percentage, with mean and standard deviation and also t-test with the aid of Statistical Packages for Social Sciences (SPSS 25). Descriptive statistics of frequency counts and percentages were used in analyzing demographic variables, mean and standard deviation were used to analyzed the research questions while the t-test was used to test the stated hypotheses at 0.05 level of significance.

CHAPTER FOUR

4.0

RESULTS AND DISCUSSION

4.1 Analysis of Research Questions

Research Question One

What are the level of awareness Chemistry Teacher on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Table 4.1 Level of awareness Chemistry Teacher on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies

Statement	N	\bar{x}	SD	Remark
The chemistry teachers are fully aware of the significance importance of integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies	23	2.50	0.86	Agreed
Teacher are not aware integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies	23	2.34	0.38	Disagreed
I am only aware of the usage of integration of electronic resources in for ICT instructional delivery.	23	2.39	0.53	Disagreed
I have no idea on the use of integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.	23	1.78	0.14	Disagreed
It has never occurs to use integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.	23	3.17	0.11	Agreed
I believe integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies makes lesson efficient	23	3.06	0.15	Agreed
The use of electronic resources in interactive – engagement and analogy – enhancement instructional strategies enhance, classroom management	23	3.89	0.25	Agreed
Integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies makes lesson effective	23	2.53	0.30	Agreed
Integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies provides an Information Technology oriented cycle in the classroom	23	2.59	0.24	Agreed
Integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies give more avenue for student-teachers interactive session	23	2.95	0.28	Agreed
Grand Mean	23	2.71	0.32	Agreed

Decision mean 2.50

Table 4.1 shows the chemistry teacher responses on their awareness on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies. From the result it was agreed upon by the respondents that they are fully aware of the significance importance of integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies, though it never occurs to them to use integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies, it was believe integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies makes lesson efficient, enhance classroom management, makes lesson effective, provides an Information Technology oriented cycle in the classroom, give more avenue for student-teachers interactive session with mean value (\bar{x}) of 2.50, 3.17, 3.06, 3.89, 2.43, 2.59 and 2.95 respectively.

On the other hand, respondent disagree on the fact that; they are not aware integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies, only aware of the usage of integration of electronic resources in for ICT instructional delivery, having no idea on the use of integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies with mean value of 2.34, 2.39 and 1.78 respectively. The grand mean of 2.711 also indicate adequate chemistry teacher on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Research Question Two

What are the level of usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

Table 4.2 Level of usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies

Statement	N	\bar{x}	SD	Remark
Chemistry teacher often use electronic resources in interactive – engagement and analogy – enhancement instructional strategies	23	2.31	0.42	Disagreed
Teacher don't find ease in usage of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies.	23	2.93	0.36	Agreed
Teacher prefer the use of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies	23	2.78	0.43	Agreed
electronic resources help to teacher class efficient and effective they use it most often while adopting interactive – engagement and analogy – enhancement instructional strategies	23	2.69	0.43	Agreed
Most teachers don't find the ease use of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies	23	2.46	0.25	Agreed
The integration electronic resources in interactive – engagement and analogy – enhancement instructional strategies draw student attention to focus on the classes	23	3.75	0.13	Agreed
Teachers hardly integrate electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies	23	2.99	0.46	Agreed
Teachers perform all instructional activities with electronic resources	23	2.16	0.33	Disagreed
electronic resources technicality, makes it usage for engagement and analogy – enhancement instructional strategies dissatisfactory hence, teachers don't use it.	23	2.91	0.42	Agreed
Teachers found it hard to use electronic resources for engagement and analogy – enhancement instructional strategies dissatisfactory, as the student does not flow with me	23	2.83	0.36	Agreed
Teachers don't have access to electronic resources for engagement and analogy – enhancement instructional strategies, hence discourage it usage.	23	2.58	0.43	Agree
Grand Mean	23	2.61	0.37	Agreed
Decision mean 2.50				

Table 4.2 unveils the level of usage of electronic resources by chemistry teacher in interactive – engagement and analogy – enhancement instructional strategies. From the

outcome of the analysis the respondent agreed upon the fact that, they neither often use electronic resources in interactive – engagement and analogy – enhancement instructional strategies, not find ease in usage of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies. They prefer the use of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies, teachers hardly integrate electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies, electronic resources technicality, makes it usage for engagement and analogy – enhancement instructional strategies dissatisfactory hence, teachers don't use it, as the student does not flow with me, they don't have access to electronic resources for engagement and analogy – enhancement instructional strategies, hence discourage it usage, with mean value (\bar{x}) of 2.31, 2.93, 2.78, 2.99, 2.91, 2.83 and 2.58. it can be deduced that teacher hardly integrate electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies.

Research Question Three

What are the factors affecting the usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

Table 4.3 Factors affecting the usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

Statement	N	\bar{x}	SD	Remark
Inadequate availability of require electronic resources to Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies	23	2.57	0.54	Agreed
inadequate access to computer or laptops	23	2.82	0.79	Agreed
inadequate access to multimedia projector	23	3.32	0.67	Agreed
Insufficient power supply	23	3.49	0.31	Agreed
Lack of support by the school management on full integration of electronic resources while on interactive – engagement and analogy – enhancement instructional session with student	23	3.26	0.60	Agreed

Lack of fund to the school for full adoption of ICT in instructional delivery	23	3.48	0.71	Agreed
The curriculum does not support the use of electronic resource in instructional delivery	23	2.57	0.54	Agreed
Technical know – how of the teacher on use of electronic resources in instructional delivery	23	2.82	0.79	Agreed
Lack training and enlighten of teacher on the integration of electronic resources in instructional delivery	23	3.32	0.67	Agreed
Government policies on education and teaching convention	23	3.49	0.31	Agree
Grand mean	23	3.11	0.59	Agreed

Decision mean 2.50

Table 4.3 shows the respondents responses on factors affecting the usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies. The result unveils that; inadequate availability of require electronic resources to Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies, inadequate access to computer or laptops, inadequate access to multimedia projector, insufficient power supply, lack of support by the school management on full integration of electronic resources while on interactive – engagement and analogy – enhancement instructional session with student, lack of fund to the school for full adoption of ICT in instructional delivery, the curriculum does not support the use of electronic resource in instructional delivery, technical know – how of the teacher on use of electronic resources in instructional delivery, lack training and enlighten of teacher on the integration of electronic resources in instructional delivery and government policies on education and teaching convention are factor affecting the integration of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies with mean value (\bar{x}) of 2.57, 2.82, 3.32, 3.49, 3.26, 3.48, 2.57, 2.82, 3.32 and 3.49 respectively.

Research Question Four

What are the strategies needed to enhance the integration of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

Table 4.4 Strategies needed to enhance the integration of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

Statement	N	\bar{x}	SD	Remark
Provision require electronic resources to Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies	23	3.32	0.67	Agreed
provision access to computer or laptops	23	3.49	0.31	Agreed
Access to multimedia projector	23	3.26	0.60	Agreed
Sufficient and reliable power supply	23	3.48	0.71	Agreed
Full support by the school management on integration of electronic resources while on interactive – engagement and analogy – enhancement instructional session with student	23	3.64	0.63	Agreed
Provision of adequate fund to the school for full adoption of ICT in instructional delivery	23	3.32	0.67	Agreed
Injection of curriculum that support the use of electronic resource in instructional delivery	23	3.49	0.31	Agreed
Improving the Technical know – how of the teacher on use of electronic resources in instructional delivery	23	3.26	0.60	Agreed
training and re-training of teacher on the significance of integration of electronic resources in instructional delivery	23	3.48	0.71	Agreed
Improved government policies on education and teaching convention that will encourage integration of electronic resources in instructional delivery	23	3.64	0.63	Agreed
Grand mean	23	3.44	0.58	Agreed

Decision mean 2.50

Table 4.4 unveils the respondent responses on strategies needed to enhance the integration of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies. The result on the table revealed that; provision require electronic resources to Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies, provision access to computer or laptops,

access to multimedia projector, sufficient and reliable power supply, full support by the school management on integration of electronic resources while on interactive – engagement and analogy – enhancement instructional session with student, provision of adequate fund to the school for full adoption of ICT in instructional delivery, injection of curriculum that support the use of electronic resource in instructional delivery, improving the Technical know – how of the teacher on use of electronic resources in instructional delivery, training and re-training of teacher on the significance of integration of electronic resources in instructional delivery and improved government policies on education and teaching convention that will encourage integration of electronic resources in instructional delivery are needed to enhance the integration of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies with mean value (\bar{x}) of 3.32, 3.49, 3.26, 3.48, 3.64, 3.32, 3.49, 3.26, 3.48 and 3.64 respectively.

4.2 Analysis of Research Hypothesis

Research Hypothesis One

There is no significance difference between male and female Chemistry Teacher response on the level of awareness of on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Table 4.5 t-Test analysis for difference between male and female Chemistry Teacher response on the level of awareness of on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies

Variable	N	df	\bar{x}	SD	t-val	P-value	Decision
Male	16	21	2.89	0.34	1.36	0.89	NS
Female	7		2..66	0.21			

*NS = Not Significant

Table 4.5 shows the t- test analysis for difference between male and female Chemistry Teacher response on the level of awareness of on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies. The outcome of the result shows that the male teacher average means responses is 2.89 and the SD= 0.344, df = 21, while the female mean scores is 2.66, SD = 0.21, with p-value of 0.89, therefore the null hypothesis; which is no difference between male and female Chemistry Teacher response on the level of awareness of on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies was not rejected. Hence, there was no statistical significant different between male and female chemistry teachers’ responses on awareness of on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Research Hypothesis Two

There is no significance difference between male and female Chemistry Teacher response on level of usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Table 4.6 t-Test analysis for difference between male and female Chemistry Teacher response on level of usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Variable	N	df	\bar{x}	SD	t-val	P-value	Decision
Male	16	21	2.69	0.29	4.21	0.07	NS
Female	7		2.25	0.33			

*NS = Not Significant

Table 4.6 shows the t- test analysis for difference between male and female Chemistry Teacher response on the level of usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies. The outcome of the result shows that the male teacher average means responses is 2.69 and the SD= 0.29, df = 21, while the

female mean scores is 2.25, SD = 0.33, with p-value of 0.07, therefore the null hypothesis; which is no difference between male and female Chemistry Teacher response on the level of usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies was not rejected. Hence, there was no statistical significant different between male and female chemistry teachers’ responses on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Research Hypothesis Three

There is no significance difference between male and female Chemistry Teacher response on the factors affecting the usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Table 4.7 t-Test analysis for difference between male and female Chemistry Teacher response on the factors affecting the usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Variable	N	df	\bar{x}	SD	t-val	P-value	Decision
Male	16	21	3.09	0.08	2.69	0.15	NS
Female	7		3.14	0.13			

*NS = Not Significant

Table 4.7 shows the t- test analysis for difference between male and female Chemistry Teacher response on the factors affecting the usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies. The outcome of the result shows that the male teacher average means responses is 3.09 and the SD= 0.08, df = 21, while the female mean scores is 3.14, SD = 0.13, with p-value of 0.15, therefore the null hypothesis; which is no difference between male and female Chemistry Teacher response on the factors affecting the usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies was not rejected. Hence,

there was no statistical significant different between male and female chemistry teachers' responses on the factors affecting the usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

4.2.3 Research Hypothesis Four

There is no significance difference between male and female Chemistry Teacher response on strategies needed to enhance the integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Table 4.8 t-Test analysis for difference between male and female Chemistry Teacher response on strategies needed to enhance the integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Variable	N	df	\bar{x}	SD	t-val	P-value	Decision
Male	16	21	3.39	0.08	2.69	0.15	NS
Female	7		3.55	0.13			

*NS = Not Significant

Table 4.8 shows the t- test analysis for difference between male and female Chemistry Teacher response on strategies needed to enhance the integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies. The outcome of the result shows that the male teacher average means responses is 3.39 and the SD= 0.08, df = 21, while the female mean scores is 3.55, SD = 0.13, with p-value of 0.15, therefore the null hypothesis; which is no difference between male and female Chemistry Teacher response on strategies needed to enhance the integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies was not rejected. Hence, there was no statistical significant different between male and female chemistry teachers' responses on strategies needed to enhance the integration of

electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

4.3 Summary of Findings

1. The findings on research question one shows adequate awareness of integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies with grand mean value of 2.71.
2. The findings on research question two shows inadequate usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.
3. The findings on research question three unveils inadequate availability of require electronic resources, inadequate access to computer or laptops, inadequate access to multimedia projector, insufficient power supply, lack of support by the school management among others as factors affecting integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.
4. The findings on research question four unveils provision access to computer or laptops, access to multimedia projector, sufficient and reliable power supply, full support by the school management on integration of electronic resources while on interactive – engagement and analogy – enhancement instructional session with student, provision of adequate fund to the school for full adoption of ICT in instructional delivery, injection of curriculum that support the use of electronic resource in instructional delivery, improving the Technical know – how of the teacher on use of electronic resources in instructional delivery are strategies needed to put in place for adequate integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.
5. The finding on research hypothesis one shows that there is no significance difference between male and female Chemistry Teacher response on the level of awareness of

on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

6. The finding on research hypothesis two shows that there is no significance difference between male and female Chemistry Teacher response on level of usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies
7. The finding on research hypothesis three shows that there is no significance difference between male and female Chemistry Teacher response on the factors affecting the usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.
8. The finding on research hypothesis four shows that there is no significance difference between male and female Chemistry Teacher response on strategies needed to enhance the integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

8.4 Discussion of Findings

The findings of the study unveiled awareness chemistry teachers on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies. From the result it was agreed upon by the respondents that they are fully aware of the significance importance of integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies, it was believe integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies makes lesson efficient, enhance classroom management, makes lesson effective, provides an Information Technology oriented cycle in the classroom, give more avenue for student-teachers interactive session. This implies that chemistry teachers are aware of integration of electronic resources in interactive –

engagement and analogy – enhancement instructional strategies. The result also goes with that of (Etuibon, 2014)

The findings of the study also disclosed the level of usage of electronic resources by chemistry teacher in interactive – engagement and analogy – enhancement instructional strategies. From the outcome of the analysis the respondent agreed upon the fact that, they neither often use electronic resources in interactive – engagement and analogy – enhancement instructional strategies, not find ease in usage of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies. The implication of this is that there is inadequate or no use of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies. The study findings is similar to that of (Oladejo et al., 2011).

The findings on showed the factors affecting the usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies. The result unveils that; inadequate availability of require electronic resources to Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies, inadequate access to computer or laptops, inadequate access to multimedia projector, insufficient power supply, lack of support by the school management on full integration of electronic resources while on interactive – engagement and analogy – enhancement instructional session with student, lack of fund to the school for full adoption of ICT in instructional delivery, the curriculum does not support the use of electronic resource in instructional delivery among others. This is in agreement with finding of (Ayodele, 2014; Etuibon, 2014).

Finally, the findings of the study unveiled the strategies needed to enhance the integration of electronic resources by Chemistry Teacher in interactive – engagement and analogy –

enhancement instructional strategies. The result revealed that; provision require electronic resources to Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies, provision access to computer or laptops, access to multimedia projector, sufficient and reliable power supply, full support by the school management on integration of electronic resources while on interactive – engagement and analogy – enhancement instructional session with student, provision of adequate fund to the school for full adoption of ICT in instructional delivery among others. This finding is in line with that of (Onasanya et al., 2011; Ayodele, 2014; Etuibon, 2014).

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study investigated the awareness and usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies as determinant of the achievement of students in Chemistry. The population of this study comprises of all chemistry teachers in Senior Secondary Schools in Minna metropolis. Five public secondary and private secondary school will be considered. The findings of the study also disclosed the level of usage of electronic resources by chemistry teacher in interactive – engagement and analogy – enhancement instructional strategies. From the outcome of the analysis the respondent agreed upon the fact that, they neither often use electronic resources in interactive – engagement and analogy – enhancement instructional strategies, not find ease in usage of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies. The implication of this is that there is inadequate or no use of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies. p-value of 0.89, therefore the null hypothesis; which is no difference between male and female Chemistry Teacher response on the level of awareness of on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies was not rejected.

5.2 Conclusion

This study is target at investigating into the awareness and usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies as determinant of the achievement of students in Chemistry. From the findings of the study it could be concluded that; the chemistry teachers are fully aware of the significance

importance and use of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

Similarly, from the findings of the study it could be concluded that the chemistry teachers neither often use electronic resources in interactive – engagement and analogy – enhancement instructional strategies, not find ease in usage of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies.

The implication of this is that there is inadequate or no use of electronic resources.

It could also be concluded that; inadequate availability of require electronic resources to Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies, inadequate access to computer or laptops, inadequate access to multimedia projector, insufficient power supply, lack of support by the school management on full integration of electronic resources among others are e factors affecting the usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

Finally, from the findings of the study it could be concluded that; provision require electronic resources to Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies, provision access to computer or laptops, access to multimedia projector, sufficient and reliable power supply, full support by the school management on integration of electronic resources on interactive – engagement and analogy – enhancement instructional session with student, among others, are strategies needed for full integration of electronic resources among others are e factors affecting the usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

5.3 Recommendations

Based on the conclusion above the following recommendations were made;

1. More awareness program should be organized to sensitize chemistry teachers on the integration on electronic resource in interactive – engagement and analogy – enhancement instructional strategies.
2. The teachers as well as secondary school management should be encourage on adequate integration electronic resource in interactive – engagement and analogy – enhancement instructional strategies.
3. Challenges and factor affecting adequate integration electronic resource in interactive – engagement and analogy – enhancement instructional strategies cited in the study should be looked into, in order improve teaching and learning.
4. Regular training and re-training of Chemistry Teachers should organize to improve their knowledge on usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies cited in the study should be looked into, in order improve teaching and learning.

5.4 Contribution to the Knowledge

The present study contributed to already existing literatures, by creating awareness and providing measures needed for adequate integration electronic resources in interactive – engagement and analogy – enhancement instructional strategies

5.5 Limitation of the Study

This study is limited to find out awareness and utilization of online chemistry electronic resources by Chemistry Teachers in the interactive – engagement and analogy – enhancement instructional strategies for teaching chemistry in Minna metropolis. The study was restricted to all the chemistry teachers in both the public and private schools in Minna.

5.6 Suggestion for Further Study

The following are suggestion for further study:

1. Investigating the use of electronic resources in interactive – engagement and analogy – enhancement instructional strategies in North Central Nigeria
2. Investigating the Challenges Facing the Integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies in North Central, Nigeria

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APPENDIX A

Department of Science Education
Federal University Technology,
Minna,
Niger State.

Dear Respondent,

I am a undergraduate student of Science Education in the above named University.

I am presently conducting research on awareness and usage of electronic resources in interactive – engagement and analogy – enhancement instructional strategies as determinant of the achievement of students in Chemistry.

The questionnaire is designed as part of the study to collect relevant information for a successful completion of this research.

Please kindly provide response to these questions; assuring you that it will purely be used for academic purposes alone.

Thank you for your anticipated cooperation.

Yours sincerely,

TIJANI, Aishat Adenike
2017/3/67253BE

Research Question One

1. What are the level of awareness Chemistry Teacher on integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.

S/N	Statement	SA	A	DA	SDA
1	The chemistry teachers are fully aware of the significance importance of integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies				
2	Teacher are not aware integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies				
3	I am only aware of the usage of integration of electronic resources in for ICT instructional delivery.				
4	I have no idea on the use of integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.				
5	It has never occurs to use integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies.				
6	I believe integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies makes lesson efficient				
7	The use of electronic resources in interactive – engagement and analogy – enhancement instructional strategies enhance, classroom management				
8	Integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies makes lesson effective				
9	Integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies provides an Information Technology oriented cycle in the classroom				
10	Integration of electronic resources in interactive – engagement and analogy – enhancement instructional strategies give more avenue for student-teachers interactive session				

2. What are the level of usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

S/N	Statement	SA	A	DA	SDA
1	Chemistry teacher often use electronic resources in interactive – engagement and analogy – enhancement instructional strategies				
2	Teacher don't find ease in usage of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies.				
3	Teacher prefer the use of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies				
4	electronic resources help to teacher class efficient and effective they use it most often while adopting interactive – engagement and analogy – enhancement instructional strategies				
5	Most teachers don't find the ease use of electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies				
6	The integration electronic resources in interactive – engagement and analogy – enhancement instructional strategies draw student attention to focus on the classes				
7	Teachers hardly integrate electronic resources while adopting interactive – engagement and analogy – enhancement instructional strategies				
8	Teachers perform all instructional activities with electronic resources				
9	electronic resources technicality, makes it usage for engagement and analogy – enhancement instructional strategies dissatisfactory hence, teachers don't use it.				
10	Teachers found it hard to use electronic resources for engagement and analogy – enhancement instructional strategies dissatisfactory, as the student does not flow with me				
11	Teachers don't have access to electronic resources for engagement and analogy – enhancement instructional strategies, hence discourage it usage.				

3. What are the factors affecting the usage of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

S/N	Statement	SA	A	DA	SDA
1	Inadequate availability of require electronic resources to Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies				
2	inadequate access to computer or laptops				
3	inadequate access to multimedia projector				
4	Insufficient power supply				
5	Lack of support by the school management on full integration of electronic resources while on interactive – engagement and analogy – enhancement instructional session with student				
6	Lack of fund to the school for full adoption of ICT in instructional delivery				
7	The curriculum does not support the use of electronic resource in instructional delivery				
8	Technical know – how of the teacher on use of electronic resources in instructional delivery				
9	Lack training and enlighten of teacher on the integration of electronic resources in instructional delivery				
10	Government policies on education and teaching convention				

4. What are the strategies needed to enhance the integration of electronic resources by Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies.

S/N	Statement	SA	A	DA	SDA
1	provision require electronic resources to Chemistry Teacher in interactive – engagement and analogy – enhancement instructional strategies				
2	provision access to computer or laptops				
3	Access to multimedia projector				
4	sufficient and reliable power supply				
5	Full support by the school management on integration of electronic resources while on interactive – engagement and analogy – enhancement instructional session with student				
6	Provision of adequate fund to the school for full adoption of ICT in instructional delivery				
7	Injection of curriculum that support the use of electronic resource in instructional delivery				
8	Improving the Technical know – how of the teacher on use of electronic resources in instructional delivery				
9	training and re-training of teacher on the significance of integration of electronic resources in instructional delivery				
10	Improved government policies on education and teaching convention that will encourage integration of electronic resources in instructional delivery				

**APPENDIX B
VALIDATION**

RESEARCH INSTRUMENT VALIDATION FORM

Ref No.:

The candidate Tijani Aishah Ahenke with Admission Number 2019/13/69253BE is a student of the department. You are requested to make amendments or inputs that will improve the quality of the instrument. Your professional expertise is expected to assist the researcher towards the award of the degree.

Thank you

Dr. Rabiu M. Delle

(SD Signature, Date & Official stamp)

Head of Department
Science Education
Fed. University of Technology
Minna

Title of the Research Instrument: Awareness and Usage of Electronic Resources in Interactive-Engagement and Analog-Enhancement Instructional Strategies as Determinant of the Achievement of Students in Chemistry

SECTION A

1. Appropriateness of the Research Instrument to: The questionnaire is appropriate to the topics to be taught.
2. Suggest amendment if not appropriate: _____
3. Completeness of Bio-data Information: Satisfactory
4. Suggest inputs if incomplete: NIL
5. Suitability of items generated: Items generated are suitable for the level and class of the students to be taught.
6. Structure of the questionnaire/ test: Satisfactory
7. Structure of the instrument in line with the objectives of the study: The instrument structure are inline with the objectives.
8. Items coverage and distribution across equivalent and domains measured: The items covered the domain in question.
9. Appropriateness of the instrument in relation to the type of data to be collected: Quite appropriate to the data to be collected.
10. What is the general overview and methods of the instrument: Good.
11. Rate the instrument between 1-10: 5/10

SECTION B

Name of the validator: Dr. Bashir Yankuzo A. U.

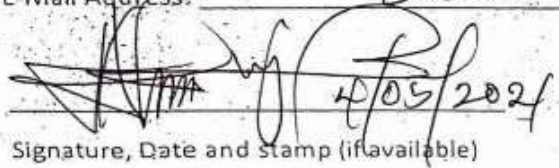
Designation/Rank: Lect

Name of institution: F.U.T Minna

Department/ School: Science Education

Telephone No./GSM No: 88065542625

E-Mail Address: bashir.aue@futminna.edu.ng

 4/05/2024

Signature, Date and Stamp (if available)

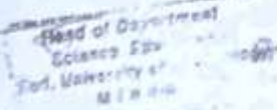
RESEARCH INSTRUMENT VALIDATION FORM

Sir/Ms,

The candidate Jessy Anwar Anwar with Admission Number 2017/3/6925386 is a student of the department. You are requested to make amends or inputs that will improve the quality of the instrument. Your professional expertise is expected to assist the researcher towards the award of the degree.

Thank you.

Dr. Rabiu M. Bello



HOD (Signature, Date & Official stamp)

Title of the Research Instrument: Assessment and Usage of Electronic Resources in Interactive - Engaged and Analog - Engagement Instructional Strategies as the catalyst of the Achievement of Students in Chemistry

SECTION A

1. Appropriateness of the Research Instrument title: Very Appropriate with slight modification.
2. Suggest amendment if not appropriate: The title should be limited to the topic of the research (Quadrant sign).
3. Completeness of Bio-data Information: OKAY
4. Suggest inputs if incomplete: Satisfactorily
5. Suitability of items generated: Very Suitable
6. Structure of the questionnaire/ test items generated: OKAY
7. Structure of the instrument in line with the objectives of the study: OKAY
8. Items coverage and distribution across constructs and domains measured: Satisfactorily
9. Appropriateness of the instrument in relation to the type of data to be collected: Very appropriate
10. What is the general overview and outline of the instrument: The instrument is very appropriate for the study.
11. Rate the instrument between 1-10

8

SECTION B

Name of the validator: Dr. OGUNTOLE F. ABIODUN


Designation/Rank: Dr. / Lecturer I

Name of institution: I.U.T, MINNA

Department/ School: MATHEMATICS / SPS

Telephone No/GSM No: 08166119526

E-Mail Address: festus.fab@futminna.edu.ng

 24/4/2021

Signature, Date and stamp (if available)