

## ASSESSMENT OF E-LEARNING PRACTICES AMONG PUBLIC SECONDARY SCHOOL CHEMISTRY STUDENTS IN BOSSO LOCAL GOVERNMENT AREA OF NIGER STATE, NIGERIA

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### **Abstract**

*The present study sought to investigate the assessment of perceived interest of students in e-learning practices in chemistry among some public secondary schools in Niger State. A descriptive research design of the survey type was adopted for the study. Three research questions and two hypotheses were raised and formulated respectively to guide the study. The research instrument used was a 20 items questionnaire which was constructed and developed by the researcher to obtain Perceived Interest of Students in E-Learning Practices in Chemistry (PISEPC). A reliability coefficient of 0.84 was obtained for the instrument using split halve method. One hundred and twenty (120) SS II chemistry students - fifteen (15) male students and fifteen (15) female students from each of the four (4) public schools in Minna, Niger State, were randomly selected for this study. The research questions were answered using mean and standard deviation while hypotheses were tested using analysis of variance (ANOVA) at 0.05 significant levels. Findings of the study revealed that majority of chemistry students in Niger State public senior secondary schools have positive interest in chemistry as a result of e-learning practices, gender and age difference have no influence on students' interest in chemistry as a result of e-learning practices. It was recommended that, in order to sustain students' positive interest in chemistry as a result of e-learning, the government should equip schools with computers connected to internet; parents should also make e-learning facilities available for their children.*

**Keywords:** Students, Interest, Chemistry, e-learning, Senior Secondary School.

### **Introduction**

Chemistry is the study of matter in relation to energy. Matter is defined as anything that has weight and can occupy space. Matter exist in three forms: solid, liquid, and gas. Chemistry is one of core science subjects offered at the senior secondary school level of our education system. The teaching of science in general and chemistry in particular, is to help students develop an understanding of the natural world and its phenomena from a scientific approach. It has been observed that due to the abstract nature of chemistry and the lecture method being used by teachers to teach the subject most students fear chemistry and hence they see chemistry as difficult to understand (Woldeamamuel, Atagana, and Engida, 2014). Chemistry has been identified as a very important science subject as it is important in scientific and technological development of the nation. Interest is a learned motive, which drives a person to occupy himself with activity when he is free to choose what he will do. Interests are important because they

serve as a source of strong motivation to learn. Interest in a subject is a mental resource that enhances effective learning, which leads to better performance and achievement. Interest is often thought of as a process that contributes to learning and achievement that is being interested in a subject is a mental resource that enhances learning (Timothy & Uguma, 2017; Udumo & Aglande, Ambe & Udumo, 2020a; Ambe & Udumo, 2020b), which then leads to better performance and achievement (Sanda & Sunday 2017; Sanda, 2018).

Colloquially, being interested in something can mean that we care about it. That it is important to us and that we have mostly positive feelings towards it. According to John Dewey to once described interest as “being engaged engrossed or entirely taken up with an activity, object or topic. More contemporary interest theorists have divided interest into two compounds, individual interest, and situation interest. Bhawana (2016) researched the interest of secondary school students in the selection of subject and sources of guidance. The survey method was used for the present study. The sample of the study was selected from the secondary schools of Mandsaur (Madhya Pradesh). Hundred (100) students were selected randomly from different schools. A standardized educational interest test was used. Electronic copy available at: <https://ssrn.com/abstract=3865814> by investigators. One self-made open questionnaire was constructed by investigators to know respondents’ opinions about whom they take guidance for selecting their subjects. The study found that students’ interest has a significant effect on their academic performance. The study concluded that it is very important for any student to choose the subject carefully from various subjects according to their interest. At this time, there is a need for guidance in the selection of subject.

Formal education worldwide has traditionally been associated with teachers having high degree of personal contact with learners. The significance of education, particularly in a developing country like Nigeria has increased because of the need to catch up with the developed world in several areas, particularly in global competitiveness and best practices. As the world grows more towards being a global village, the need to innovate in teaching and learning practices with particular reference to Information Communication Technology, ICT, becomes imperative if attempt is to be made to bridge the gap between the developing and developed world.

E-Learning is a unifying term used to describe the fields of online learning, web- based training and technology delivered instructions (Eloma and Anefiok, 2016). E-learning according to Aboderin (2015), encompasses an ample array of systems, from the teacher using visual effects to students accessing academic materials online and teaching delivered entirely with the use of computer. E-learning is learning utilizing electronic technologies to access educational curriculum outside of a traditional classroom (www.e-learning.gov, 2019). It (e-learning) involves the use of network technologies to create, foster, deliver and facilitate learning and it encompasses face-to-face, distance, mixed and blended delivery models that utilizes electronic means, a unifying term used to describe the fields of online learning, web-based training and technology delivered instructions. E-learning is a computer based educational system that enables learner to learn anywhere and at any time. E-learning is mostly delivered through the internet, although in the past it was delivered using a blend of computer-based methods like CD-Rom (Epignosis, 2014). Social interactive education and e-learning are used as modes of education. Social interactive education is known as traditional method of learning where student and teacher have face to face interaction whereas e-learning or open

learning is contrary to traditional education as it has some distance between learner and teacher. Students who belong to remote areas or have jobs can get education at their door step through e-learning education and enhance their qualification at any time and at any stage of age (Ansari, 2014).

According to Alismail (2015), e-learning is a powerful tool which provides direct access to get information and knowledge by themselves. E-learning leading to independent learning. Teachers have the responsibility to guide students as they research and obtain information in order to further develop that skills. Subsequently, without even knowing it students “learn how to learn” and develop their own learning strategies that can last a life time.

The use of Information Communication Technology, ICT in education lends itself to more student-oriented learning settings. With the world moving rapidly into digital media and information, the influence of ICT on both education and students’ learning behavior is becoming more and more important and this importance will continue to grow in the 21st century. Although, classrooms are considered a face-to-face learning environment, yet the installation of ICT equipment such as web-based tools and other technologies would positively influence students’ blended learning situation. This is because there appears to be some consensus that both teachers and students feel that ICT use in the class greatly contributes to students’ motivation and engagement in learning. A very high percentage (86%) of teachers worldwide agree that students are more motivated and attentive when computers are in their study programs so as to remain relevant in the rapidly changing condition for educational services (Salau, 2012). In this study, a research regarding the use of ICT and its influence on students’ academic performance and learning outcome was provided.

The main purpose of E-Learning is to increase accessibility of education and reducing costs and time as well as improving students' academic performance. It has been found that students in secondary educational institutions that engaged in E-Learning, generally performed better than those in face-to-face traditional teaching methods which do not have the required effectiveness. The interaction between technology and learning is inseparable in the 21st century. It is critical to understand the impact of technology in education which leads to interest in school attendance and subsequently to learning and creativity. Children can help one another in use of technology as well as taught learn in schools (Shafieiosgouei, Nourdad, Hassantofighi & Shafieioskouei, 2018). E-learning in teaching-learning process could be a way to arose students’ interest in learning (Zare et al., 2014). Therefore, efforts and experiences related to this type of learning is given due attention around the world.

Today, technology has brought sporadic learning opportunity that removes teaching and learning barriers in Science. The interactive nature of teaching and learning of Chemistry offers a clear and enjoyable learning paradigm as in constructivists’ learning (Neji & Meremikwu, 2016). Effectiveness in teaching and learning could be accomplished depending on the availability of information on the subject matter, this include E-learning materials in form of e-library, e-journals, virtual chemistry laboratory, e-textbook. Students at the higher institutions of learning can harness this information with the use of a well-equipped computer library, cell phones, laptops, tablets and many other electronic materials.

For many years, educational researchers have maintained an interest in the effective prediction of students' academic achievement at school. Societies all over the world strive to achieve quality education for her citizenry. In order to achieve this noble course, so many factors must be put into consideration. Among them is the introduction of ICT into education particularly at classroom level a result of technological development. We are in the world of digital age where ICT needs to be introduced into classrooms to enhance learning and develop students' digital experience. Students' learning behavior and understanding have been the issue in many research studies as teachers have been observed complaining of the difficulties involved in classroom management practices due to lack of concentration by the students (Adebayo, 2019).

The problem of students' under-performance in secondary schools in Nigeria has been a much discussed educational issue. In solving any problem however, it is pertinent to understand the causes of such problems. Many causes or agents have been studied as the etiological starting point for investigating the phenomena of school failure or success. These causes are looked into from several perspective. Gender is one of such factors which have considerable effects on students' academic performances especially in science subjects. Gender is the range of physical, biological, mental and behavioural characteristics pertaining to and differentiating between the feminine and masculine (female and male) population. The importance of examining performance in relation to gender is based primarily on the socio-cultural differences between girls and boys. Some vocations and professions have been regarded as men's (engineering, arts and crafts, agriculture to mention but a few.) while others as women's (catering, typing, nursing to mention but a few.). In fact, parents assign task like car washing, grass cutting, bulbs fixing, and climbing ladders to fix or remove things to the boys. On the other hand, chores like dishes washing, cooking, cleaning and so on are assigned to the girls. In a nutshell, what are regarded as complex and difficult tasks are allocated to boys whereas girls are expected to handle the relatively easy and less demanding tasks. As a result of this way of thinking the larger society has tended to see girls as a weaker sex". Consequently, an average Nigerian girl goes to school with these fixed stereotypes.

Possible explanations for this impact have been suggested, and they point to maturity and developmental differences among children in the same classroom. Burusic, and Babarovic (2013) confirm that students who are older when they start school do slightly better, at least in early elementary, and add that "Differences in brain maturation can be related to differences in functions important for successful performance in school" (p. 658). Koh and Lim (2012) studied the impact on academic performance when an online tool for collaborative work was used in a university computer science course. Students in the class ranged in age from 18 to 26 years old, and the average age of the students in the course was 21.18. The researchers found that as the age of the student increased, the student's grade on the final project also increased. This study lends support to the thesis that older students score higher than younger students on measures of academic performance when web-based tools are utilized in a course. Koh and Lim (2012) also studied the relationship between age, academic performance, and the level of social interaction afforded by different web-based collaborative tools. As the age of the student decreased, the student's preference for tools that allowed for more online means of

communication increased. Younger students scored better on the assignment when they could chat online, post pictures, share biographical information, and share comments.

Hanan, Marie-Anne and Lori (2015) concurred that age and gender could only be the predictor of postsecondary students' academic achievement provided if the traditional classroom discussion (i.e. face to face) is embraced rather than modern mode of teaching (online). Eze, Ezenwafor and Obi (2015) reported that age and gender had no linear relationship with academic performance, and even that their joint influence was insignificant while significant difference in academic performance existed among university students in Vocational and Technical Education (VTE) Department as a result of age and gender. This according to them was attributed to the involvement of Mathematics, science and ICT in the content of the VTE courses.

According to Neji and Ntibi (2017) learning is promoted when the students are actively engaged in the learning process through activities and the use of material resources which encourages thinking and enables learners to link new information to old and acquire meaningful knowledge; hence it is the instructional strategy which motivate students to learn and the use of technological resources is undoubtedly a means of motivating chemistry students to learn which translate to better performance in chemistry. It is based on this reason that the researcher decided to make an assessment of perceived interest of chemistry students in e-learning practices amongst the public secondary school chemistry students in Niger State, since it is believed that the students who use e-learning efficiently are more likely to learn and/or perform better than students who do not use e-learning strategy.

### **Statement of the Problem**

Interest is often thought of as a process that contributes to effective learning and achievement (Timothy, 2016; Eyang 2016b). In other words, being interested in a topic is a mental resource (Eyang, 2014) that enhances effective learning, which then leads to better performance and achievement (Ainley, 2016; Sanda & Oladokun, 2017). Interest is critically important in its own right. When a student excels in a particular subject more than others, it tells that he or she has a special interest in the subject area. This may not always be the case. Often times, students perform well in a particular course due to parental pressure, peer group prompting, teachers praise or even lack of exposure to other courses of study. Despite the importance of chemistry as one of the science subjects in the school curriculum, many studies have shown that students in public secondary schools in Niger State are not very much interested in chemistry when compared to their counterparts who are studying chemistry in private senior secondary schools. Many public school students, especially females, are scared of chemistry leading to poor performance.

This study has become relevant since chemistry education is a priority for the Government of Niger State. More so, senior secondary school education is a determinant of the academic success of students at the tertiary level. Students' perceived relevance of chemistry, affects how they perform in the other science subjects. Despite, the poor performance of students in the West African Senior High School Examination (WASSCE) due to several factors, researchers have not devoted much attention to public school students perceived interest in chemistry due to e-learning practices. This study was therefore designed to make an assessment of perceived interest of students in chemistry in e-learning practices amongst some public secondary school chemistry students in Niger State, Nigeria.

## **Objective of the Study**

The purpose of the present study was to make an assessment of perceived interest of students in chemistry in e-learning practices, and whether difference in students' gender and age influences their interest in chemistry due to e-learning. The study therefore investigates the perceived interest of students in chemistry in e-learning practices amongst some public secondary school students in Niger State, Nigeria.

## **Research Questions**

The study was designed to answer the following research questions:

1. What interest in chemistry does students have as a result of e-learning?
2. What is the difference between male and female students' interest in chemistry as a result of e-learning?
3. What is the difference between male and female students' interest in chemistry as a result of their age differences due to e-learning practices?

## **Research Hypotheses**

**HO<sub>1</sub>:** There is no significant mean difference between male and female students interest in chemistry as a result of e-learning.

**HO<sub>2</sub>:** There is no significant mean difference between male and female students' interest in chemistry as a result of their age differences due to e-learning practices.

## **Methodology**

The study adopted a descriptive survey of the research type. This gives an actual description of a situation or event in an area without subjecting the participants to treatments. To achieve this, the researcher used questionnaire for students, with the aim of obtaining adequate information from the respondents. The population for this study comprised of all chemistry students from public secondary schools in Minna, Niger state. Data collected from the the department of Planning and Research Statistics (PRS) Ministry of Education Minna, Niger State (2018/2019 School Census Report), showed that there are twenty two (22) public senior secondary schools in Minna, Niger State. There are one thousand three hundred and seventy three (1,373) SS2 chemistry students from public secondary schools in Minna, Niger State. The target population for the study was SS2 chemistry students from public secondary schools in Minna, Niger State. The sample for this study is made up of one hundred and twenty (120) SS II chemistry students - fifteen (15) male students and fifteen (15) female students from each of the four (4) public senior secondary schools in Minna, Niger State. Random sampling technique was used to select the respondents for the study to enable the researcher collect data and provide answers to research questions and hypotheses. One instrument titled: Perceived Interest of Students in E-Learning Practices in Chemistry (PISEPC) was used for the study. The PISEPC is a 20-Items designed to assess students' perceived interest in chemistry due to e-learning practices. The instrument was scored on five point likert scale of strongly agree (SA), Agree (A), Undecided (UD), Disagree (D) and Strongly Disagree (SD). Positive

statements were scored as follows; SA = 5, A = 4, UD = 3, D = 2, SD = 1, while negative statements were scored as follows; SA = 1, A = 2, UD = 3, D = 4, SD = 5

The PISEPC was subjected to face and content validity. The face and content validity was carried out by five (5) experts, three (3) lecturers in the Department of Science Education, Faculty of Education, Federal University of Technology Minna, and two (2) professionally qualified experienced chemistry teachers in secondary school level to ensure face and content validity of the instrument. Their corrections and suggestions were utilized in revising the instrument for data collection. Pilot study was conducted to establish the reliability of the instrument. The instrument was administered to secondary schools, which were not part of the sample through test- retest method. The data collected for PISEPC through pilot study were analyzed using Cronbach alpha method. A reliability index of 0.84 was obtained for the students' questionnaire. This showed that the correlation was high enough and the instrument was reliable. The questionnaires were distributed to the study population by hand and the questionnaires were collected after their response. The data was organized accordingly for data analysis. Data obtained from the study were analyzed using mean and standard deviation to answer research questions. Specifically, analysis of variance (ANOVA) was used to test all the hypotheses at 0.05 significant levels.

## **Results**

The data collected through the administration of the Perceived Interest of Students in E-Learning Practices in Chemistry (PISEPC) were analyzed to provide answers to research questions and hypothesis. The result of the analysis of data were presented below:

**Research Question One:** What interest in chemistry does students have as a result of e-learning? The results is displayed in Table 1.

**Table 1**

*Responses of the respondents on interest in chemistry as a result of e-learning practices.*

S/N	Question	Positive Interest (SA+A)	Negative Interest (SD+D)	Mean	SD	Remark
1	Teaching and learning through computers increase students' interest in chemistry	109	10	4.61	0.93	Positive interest
2	Interest of female students in learning chemistry through computer is higher than that of male students	106	14	4.42	1.00	Positive interest
3	Use of flash drive for chemistry learning does not promote students interest in chemistry	113	5	4.69	0.71	Positive interest

4	E-learning practices among chemistry students of your school increase their interest in chemistry	95	14	4.11	1.09	Positive interest
5	Teaching and learning through computer decrease students' interest in chemistry	108	9	4.30	1.03	Positive interest
6	Interest of male chemistry students who are into use of computers and internet in learning chemistry are higher than that of female chemistry students.	109	9	4.46	1.04	Positive interest
7	Internet facilities encourage students' interest to learn chemistry	67	53	3.23	1.90	Positive interest
8	Chemistry students are made computer literate with e-learning practices and thus decreases their interest in learning chemistry	87	25	4.16	1.39	Positive interest
9	Learning through computer and computer packages are attributed to the high rate of students' lack of interest in chemistry	29	60	2.96	1.21	Negative interest
10	Students' interest in learning chemistry are made better with teachers who are computer literate and engaged in e-learning	113	3	4.57	0.68	Positive interest
11	Chemistry students are made computer literate with e-learning practices and thus increases their interest in learning chemistry	112	8	4.78	0.82	Positive interest
12	Interest of female chemistry students who are into use of computer and internet in learning chemistry are higher than that of male chemistry students	112	3	4.67	0.71	Positive interest
13	Internet facilities does not encourage students' interest to learning chemistry	96	19	4.11	1.11	Positive interest



14	Learning through computer packages are attributed to the high rate of students' interest in chemistry	100	15	3.73	0.97	Positive interest
15	Students' interest in learning chemistry are made better with teachers who are not computer literate and does not engaged in e-learning	109	6	3.98	0.69	Positive interest
16	E-learning practices among chemistry students of your school does not increase their interest in chemistry	108	2	3.99	0.56	Positive interest
17	Use of flash drive for chemistry learning promotes students' interest in chemistry	111	6	4.22	0.91	Positive interest
18	Studying chemistry online is frustrating and thus does not promote students' interest in chemistry	86	32	3.31	1.19	Positive interest
19	Interest of male students in learning chemistry through computer is higher than that of female students	95	25	3.43	1.13	Positive interest
20	Studying chemistry online is not frustrating and thus promotes students' interest in chemistry.	19	90	1.98	1.41	Negative interest

Table 1 shows the result on interest in chemistry as a result of e-learning practices. From the table, majority of the respondents' exhibit positive interest in chemistry, while minority of respondent's exhibit negative interest in chemistry as a result of e-learning. This indicates that, majority of the respondents have positive interest in chemistry due to e-learning practices. Hence, e-learning practices has positive impact on the students' interest in chemistry.

**Hypotheses One:** There is no mean difference between male and female students' interest in chemistry as a result of e-learning.

**Table 2**

*One-way ANOVA comparison on the mean difference between male and female students interest in chemistry as a result of e-learning.*

Source of variation	Sum of squares	Df	Mean square	Fcal	Fcrit	Sig. Level
Between groups	42.068	3	18.023	0.432	2.68	0.833
Within groups	4006.342	116	36.421			
Total	4048.41	119				

ns – Not significant at 0.05 level of significance

Table 2 shows the ANOVA comparison of the mean responses of male and female students' interest in chemistry as a result of e-learning practices. From the table, there is no significant difference in the mean responses of male and female at 0.05 level of the significance ( $F_{cal} = 0.432ns < F_{crit} = 2.68$ ;  $Df = 3,116$ ;  $P > 0.05$ ). Therefore, hypothesis ( $HO_1$ ) is not rejected. Hence, there is no significant difference between male and female students interest in **chemistry as a result of e-learning.**

**Hypotheses Two:** There is no significant mean difference between male and female students' interest in chemistry as a result of their age differences due to e-learning practices.

**Table 3**

*ANOVA comparism of mean responses of students ages 17-18 and above 18, on interest in chemistry as a result of e-learning and ages.*

Source of variation	Sum of squares	Df	Mean square	Fcal	Fcrit	Sig. Level
Between groups	78.189	3	26.063	0.637ns	2.68	0.593
Within groups	4748.978	116	40.939			
Total	4827.167	119				

ns – Not significant at 0.05 level of significance.

Table 3 shows the ANOVA comparison of the mean responses of males and females within ages 17 and 18 and above 18. From the table, there is no significant difference in the mean responses of the four groups (males age 17 and 18, female 17 and 18, males above 18 and females above 18) at 0.05 level of significance ( $F_{cal} = 0.637 < F_{crit} = 2.68$ ;  $Df = 3,116$ ;  $P = 0.59$ ). Therefore, hypothesis three ( $HO_2$ ) is not rejected. Hence, there is no significant difference between males and females students interest in chemistry as a result of their ages.

## **Discussion**

The result of this findings revealed that majority of the respondents (97%) exhibit positive interest in chemistry, while minority of respondents (3%) exhibit negative interest in chemistry as a result of e-learning. This indicates that, majority of the respondents have positive interest in chemistry due to e-learning practices. Hence, e-learning practices has positive impact on the students' interest in chemistry. This finding supports the findings of Bhawana (2016) from a study which researched the interest of secondary school students in the selection of subject and sources of guidance. Also, this finding is in agreement with the findings of Abou El-Seoud et al. (2014) which emphasized that the usage of e-Learning gadgets such as phones, laptops and projector, boosts undergraduate students' motivation in Egyptian universities, this is also consistent with the study of Harandi (2015), which confirmed that students are more likely to be motivated when using e-Learning.

Furthermore, the findings of this study revealed that there is no significant mean difference in the mean responses of male and female at 0.05 level of the significance ( $F_{cal} = 0.432_{ns} < F_{crit} = 2.68; Df = 3,116; P > 0.05$ ). Therefore, hypothesis ( $H_{O1}$ ) is not rejected. Hence, there is no significant mean difference between male and female students interest in chemistry as a result of e-learning. This study prove that the gender difference amongst the public school students in Niger state does not change their perceived interest in chemistry as a result of e-learning. This result agrees with the findings of Dania (2014)) that students' performance is not determined by gender. Goni et al. (2015) findings is also in support of this finding that there is no significant gender difference in students' academic performance. Meanwhile, the findings of this study seem to be rejected by scholars like Wangu (2014) who claimed that male students outperform their female counterpart.

Also, the findings of this study revealed that there is no significant mean difference in the mean responses of the four groups (males age 17 and 18, female 17 and 18, males above 18 and females above 18) at 0.05 level of significance ( $F_{cal} = 0.637 < F_{crit} = 2.68; Df = 3,116; P = 0.59$ ). Therefore, hypothesis two ( $H_{O2}$ ) is not rejected. Hence, there is no significant mean difference between males and females students perceived interest in chemistry as a result of their ages. This finding is in agreement with the research findings of Aransi, (2017) who found no significant difference in the academic performance of students in two compulsory subjects at High School level that is Mathematic and English Language on the basis of gender.

### **Conclusion**

The result from the study revealed that; majority of public school SS II chemistry students in Minna, Niger State have positive interest in chemistry with e-learning practices. Gender and age difference amongst SS II chemistry students have no influence on their perceived interest in chemistry with e-learning practices.

### **Recommendations**

The following recommendations have been made in line with the findings of this study:

1. The government should make a consorted effort to provide e-learning environments that would enhance student performances in schools and also facilitate their self-development efforts.
2. Students should be frequently given assignment and research works that are meant to encourage them to the most effective use of the e-learning facilities as this will help to significantly increase-their interest in studying chemistry, improve their self-independence and development in their general respective academic endeavors.

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