

**EFFECTS OF SCHOOLGY AND CANVAS ELECTRONIC LEARNING
PLATFORMS ON COMPUTER SCIENCE STUDENTS' LEARNING
OUTCOMES IN WEB DESIGN IN NORTH-CENTRAL UNIVERSITIES,
NIGERIA**

BY

OHADUGHA, Ogechi Rosemary

PhD/SSTE/FT/2018/7807

**DEPARTMENT OF EDUCATIONAL TECHNOLOGY
FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA, NIGER STATE, NIGERIA**

JULY, 2023

ABSTRACT

The aim of the study was to determine the effects of schoology and canvas electronic learning platforms on computer science students' learning outcomes in web design in North-Central universities, Nigeria. The study adopted a non-randomized pre-test, post-test control group quasi-experimental design. Seven hypotheses were formulated to guide the study. Two hundred and thirty-six (236) 200 level computer science students selected from three universities out of seven universities using purposive sampling method formed the sample size of the study and were randomly assigned into experimental group I, experimental group II and control group. Web Design Achievement Test (WDAT) and Questionnaire on students learning engagement and perception towards schoology and canvas ELPs were validated by Computer Science and Educational Technology Experts. Reliability coefficient of WDAT was determined using K-R₂₀ and 0.79 was obtained. Cronbach alpha was used to analyse Questionnaire on learning engagement and perception and a reliability coefficient of 0.76 and 0.71 were obtained for both respectively. The data gathered were analysed and significant difference determined at 0.05 alpha level using Analysis of Covariance and independent t-test. Findings revealed that ELPs enhanced students' academic achievement. There was a significant difference in the achievement scores of the three groups ($F_{(2, 236)} = 23.398, p < 0.05$). Result obtained showed no significant learning engagement difference among schoology and canvas students. Findings showed a significant perception difference among schoology and canvas students ($F_{(1, 165)} = 4.382, p < 0.05$). Result obtained also showed that gender had no influence in the academic achievement of students exposed to schoology and canvas ELPs. In conclusion, schoology and canvas electronic learning platforms have shown to be useful, flexible and engaging learning tools that increase academic achievement when compared with lecture method. The study recommended the adoption and implementation of these ELPs into Nigerian Universities for teaching and learning.

TABLE OF CONTENTS

Contents	Page
Title	i
Declaration	ii
Certification	iii
Dedication	iv
Acknowledgements	v
Abstract	vi
Table of Content	vii
List of Tables	xi
List of Figures	xiii
Glossary	xv
List of Appendices	xvi
CHAPTER ONE	
1.0 INTRODUCTION	
1.1 Background to the Study	1
1.2 Statement of the Research Problem	11
1.3 Aim and Objectives of the Study	12
1.4 Research Questions	13
1.5 Research Hypotheses	13
1.6 Scope of the Study	14
1.7 Significance of the Study	15
1.8 Operational Definition of Terms	18
CHAPTER TWO	
2.0 LITERATURE REVIEW	
2.1 Conceptual Framework	20
2.1.1 Concept of computer science in education	21
2.1.2 Web design in computer science	23
2.1.3 The need and relevance of computer education for Nigerian students	26
2.2 Status of Teaching and Learning in Nigerian Tertiary Institutions	29
2.2.1 Relevance of technology in teaching and learning	32

2.2.2	Challenges of integrating technology into Nigerian tertiary institutions	35
2.3	Electronic Learning as a Teaching Concept	36
2.3.1	Types of electronic learning	40
2.3.2	Electronic learning as a tool for learning	42
2.3.3	Advantages of electronic learning	43
2.3.4	Disadvantages of electronic learning	45
2.3.5	Paradigm shift from traditional learning to electronic learning platform	46
2.3.6	Status of electronic learning in developing countries	49
2.4	Concept of Schoology Electronic Learning Platform (SELP)	54
2.4.1	Schoology electronic learning platform as a learning tool	59
2.5	Concept of Canvas Electronic Learning Platform (CELP)	60
2.5.1	History of canvas electronic learning platform	63
2.5.2	Canvas electronic learning platform as a learning tool	64
2.6	Concept of Student Learning Engagement (SLE)	66
2.7	Students' Perception of their Learning Environment	69
2.8	Theoretical Framework	73
2.8.1	Connectivism theory	75
2.8.2	Connectivism in electronic learning	77
2.8.3	Social constructivism theory	78
2.8.4	Social constructivism in electronic learning	80
2.9	Related Empirical Studies	81
2.9.1	Empirical studies on the effects of ELPs on academic achievement	81
2.9.2	Empirical studies on student learning engagement using electronic learning platforms	105
2.9.3	Empirical studies on student perception towards learning ELPs	112
2.9.4	Studies on the influence of gender on students' academic achievement	119
2.10	Summary of the Literature Reviewed	128

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1	Research Design	132
3.2	Population of the Study	134
3.3	Sample and Sampling Techniques	135

3.4	Research Instruments	135
3.4.1	Schoology electronic learning platform (SELP)	136
3.4.2	Canvas electronic learning platform (CELP)	138
3.4.3	Development of web design achievement test (WDAT)	140
3.4.4	Development of questionnaire on students' learning engagement using schoology and canvas platform (Q-LE)	141
3.4.5	Development of questionnaire on students' perception towards learning web design using schoology and canvas ELPs (Q-SP)	142
3.5	Validation of Research Instruments	142
3.5.1	Validity of schoology and canvas ELPs	142
3.5.2	Validity of web design achievement test (WDAT)	143
3.5.3	Validity of questionnaire on students' learning engagement using schoology and canvas platform (Q-LE)	143
3.5.4	Validity of questionnaire on students' perception towards learning web design concepts using Schoology and canvas ELPs (Q-SP)	144
3.6	Reliability of the Research Instruments	144
3.7	Method of Data Collection	145
3.8	Method of Data Analysis	148

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1	Results	150
4.1.1	Pre-test result of experimental groups I, II and control group	150
4.2	Research Questions	150
4.2.1	Research question one	151
4.2.2	Research question two	152
4.2.3	Research question three	152
4.2.4	Research question four	153
4.2.5	Research question five	154
4.2.6	Research question six	155
4.2.7	Research question seven	156
4.3	Analysis of Null Hypothesis	157
4.3.1	Hypothesis one (H ₀₁)	157
4.3.2	Hypothesis two (H ₀₂)	159

4.3.3	Hypothesis three (H ₀₃)	159
4.3.4	Hypothesis four (H ₀₄)	160
4.3.5	Hypothesis five (H ₀₅)	161
4.3.6	Hypothesis six (H ₀₆)	162
4.3.7	Hypothesis seven (H ₀₇)	163
4.4	Summary of Findings	163
4.5	Discussion of Results	164
4.5.1	Learning achievement outcomes of computer science students taught web design concepts using schoology and canvas ELPs	165
4.5.2	Learning engagement outcomes of students taught web design concepts using schoology and canvas ELPs	171
4.5.3	Perception outcomes of students towards learning web design concepts using schoology and canvas ELPs	174
4.5.4	Influence of gender on the academic achievement outcomes of students taught using schoology and canvas ELPs	177
4.5.5	Influence of gender on the learning engagement outcomes of students taught web design concepts using schoology and canvas ELPs	181

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1	Conclusion	185
5.2	Recommendations	186
5.3	Limitations of Study	187
5.4	Contributions to the body of Knowledge	187
5.5	Suggestions for Further Studies	188

REFERENCES	189
-------------------	-----

APPENDICES	209
-------------------	-----

LIST OF TABLES

Table	Title	Page
3.1	Research Design Layout	134
3.2	Bloom's Taxonomy Table of Specification	140
3.3	Time-line for the Research	148
4.1	ANOVA Result Comparing Pre-test Scores of Experimental Group I, Experimental Group II and Control Group	150
4.2	Mean and Standard Deviation of Pre-test and Post-test Achievement Scores of Experimental Group I, Experimental Group II and Control Group	151
4.3	Mean and Standard Deviation Learning Engagement Scores of Experimental Group I and Group II at Post-test	152
4.4	Mean and Standard Deviation Perception Scores of Experimental Group I and Experimental Group II at Post-test	153
4.5	Pre-test Post-test Mean Achievement Scores and Standard Deviation of Male and Female Students in Experimental Group I (Schoology)	154
4.6	Pre-test Post-test Mean Achievement Scores and Standard Deviation of Male and Female Students in Experimental Group II (Canvas)	154
4.7	Pre-test, Post-test Mean Learning Engagement Scores and Standard Deviation of Male and Female Students in Experimental Group I (Schoology)	155
4.8	Pre-test, Post-test Mean Achievement Scores and Standard Deviation of Male and Female Students in Experimental Group II (Canvas)	156
4.9	ANCOVA Comparison of Post-test Scores of Experimental Group I, Experimental Group II and Control Group	157
4.10	Sidak Post-hoc Analysis of Post-test Mean Achievement Scores in Experimental Group I, Experimental Group II and Control Group at Post-test	158
4.11	Summary of Analysis of Variance (ANOVA) of Post-test Learning Engagement Scores for Students in Experimental Group I and II	159
4.12	Summary of Analysis of Variance (ANOVA) of Post-test Perception Scores for Students in Experimental Group I and II	160
4.13	ANCOVA Comparison of Post-test Scores of Male and Female Students taught Web Design using Schoology ELP	161
4.14	Result of Independent t-test Comparing the Mean Achievement Scores	

of Male and Female Students Taught Web Design using Canvas ELP	161
4.15 Result of Independent t-test Comparing Mean Learning Engagement Scores of Male and Female Students Taught using Schoology ELP	162
4.16 Independent t-test Result Comparing Mean Learning Engagement Scores of Male and Female Students Taught using Canvas ELP	163

LIST OF FIGURES

Figure	Title	Page
2.1	Conceptual Framework Model	20
2.2	Theoretical Model in line with Connectivism and Social Constructivism	74
3.1	Visual representation of Research Variables	133
3.2	Sign up Stage into Schoology ELP	136
3.3	Homepage and Course Content Interface on Schoology ELP	137
3.4.	Sign up stage into Canvas ELP	138
3.5	Settings and Module Interface Page on Canvas ELP	139
3.6	Learning Stages for Schoology and Canvas ELPs	146
3.7	General process of Research Methodology	149

GLOSSARY

CELP	Canvas Electronic Learning Platform
CSS	Cascading Style Sheets
EL	Electronic Learning
ELPs	Electronic Learning Platforms
HTML	Hypertext Markup Language
iOS	iPhone Operating System
LLL	Lifelong learning
NUC	National University Commission
SELP	Schoology Electronic Learning Platform
Q-LE	Questionnaire on students' learning engagement using Schoology and Canvas platform
Q-SP	Questionnaire on Students' Perception towards learning web design concepts using Schoology and Canvas ELPs
WDAT	Web Design Achievement Test

LIST OF APPENDICES

Appendix	Page
A Web Design Achievement Test (WDAT)	209
B Questionnaire on Student Engagement and Perception towards the use of Electronic Learning Platforms	221
C Sample Lesson Plan for Experimental Group	225
D Sample Lesson Plan for Control Group	229
E All Computer Science Students from Seven Public Universities in North-central, Nigeria /Sample size; 200 Level Computer Science Students (2020/2021)	235
F Validation Form for Schoology Platform	236
G Validation Form for WDAT	238
H Validation Form on Students' Learning Engagement and Perception using ELP	240
I Pilot Study Result from WDAT	242
J Pilot Study Result from Students' Learning Engagement	244
K Pilot Study Result from Students' Perception	245
L Homepage of Schoology Platform	246
M Homepage of Canvas ELP	247
N Pictures for Experimental Group I (Schoology) at Pretest	248
O Sample Students who participated in Schoology ELP	249
P Sample Responses of Students in Schoology ELP Class	250
Q Sample Pictures for Experimental Group II (Canvas) at Pretest	251
R Sample Students Who Participated in Canvas ELP	252
S Sample Responses of Students in Canvas ELP Class	253
T Sample Pictures for Control Group at Pretest	254

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

The world is constantly evolving and in the past decade or two, teaching has also evolved significantly to affect both opportunities and challenges in the educational system and in the world at large. Teaching can simply be seen as a way of transferring information or knowledge that is worthwhile on expected learners. According to Smith (2015), it is an interaction that occur between teachers and learners. In other words, teachers are expected to educate learners on set objectives while the students on their part are expected to optimize the knowledge gained by conducting themselves within the acceptable standards of the society. In essence, teachers walk a fine line of trust between the students and their academic pursuit, and therefore, need to create an enabling environment where there is mutual trust in teaching and learning process while at the same time relying on the students for feedback as they serve as valuable resources to ascertain whether the instructional methods used is or is not working.

Instructional methods are integral part of every educational endeavour and can be described as the teaching strategies a teacher adopts in order to effectively impact learners with the knowledge that will bring positive change not only to the learners but also to national development (Landoy *et al.*, 2020). In other words, learners are made useful members of the society through education and the educational system serve as a medium through which knowledge, skills and attitude are transmitted. The advancements in the areas of education have caused the expectation of a child as regards to his learning to evolve. This means that as the strategies for teaching and learning advance, so also does the educational systems face challenges of integrating the

curriculum 21st century learning strategies or skills and utilization of time in a scarce resource, among others which tasks the conventional methods employed in teaching (Ayo, 2015). Moreover, the world is now extended by a digital space and has invariably changed the way people communicate and learn new things (Forbes, 2019). Therefore, fresh approaches are constantly needed in order to provide a child with an education relevant to the needs of the modern information-based society.

An information-based society is a society where every aspect of cultural, political, educational as well as social life is been transformed as a result of information technology (Ayo, 2015). In essence, there is every indication that the need to access and use information is no longer a luxury, rather a necessity for creation, integration, distribution, manipulation of information and development (Christie, 2018). To this end, it is expected that a child in all educational settings should be taught to self-access information in order to become self-oriented and take more responsibilities for their progress and attain self-actualization, especially in the 21st century (Forbes, 2019). Hence, the educational system must prepare youths for an information society that has become economically interdependent and is hinged on technology (Church, 2018).

Technology has become very essential in education. This is as a result of the role it plays towards the creation of innovative teaching and learning strategies to the delivery of instruction as the need of learners cannot be met by the use of traditional method of teaching alone (Winthrop *et al.*, 2016). When the traditional method of teaching is not complemented with other modern methods of teaching and approaches, it places the onus of learning on the teachers and also places students on a disadvantaged position of being passive (Sawant & Rizvi, 2015). This can only force achievement to vary among the students, leaving the low-achieving students behind and at the same time preventing the higher-achieving students from moving at their own very pace (Winthrop *et al.*,

2016). An alternative way to hold time constant and allow learning to take place at a single rate is to hold achievement at a constant level through a sequenced instructional method and this can be achieved using technology (Winthrop *et al.*, 2016). In other words, technology stirs the teaching and learning process by leading it to a new paradigm shift (Eassey, 2018). This means that an instruction that was once teacher-centred will move to a learner-centred approach, giving students the time they require to achieve mastery as a result of the customized pace in their instruction, which is made possible through the use of technology. Eassey (2018) argued that with the use of technology, the progress of students can be tracked towards mastery and their learning assessed. This implies that, the use of technology can make it easier for teachers to design meaningful learning experience and the students on the other hand would have the opportunity to learn the proper utilization of modern technology tools.

Technology tools, which come in form of hardware or software tools can serve as catalyst for change and can also be used both in and outside the classroom to promote learning activities (Church, 2018). In addition, technology tools support new models of connected teaching and learning, which can link teachers and their students to learning resources, professional contents and systems that have the power to improve instruction and personalize learning (National Education Technology Plan, 2015). Moreover, the use of technology tools will remain inexhaustible and this is because they are dynamic and has the capacity to influence the way people create, use and share information in the society. As a result of this dynamism, Brown (2011), acclaimed that there has been a proliferation of Information and Communication Technologies (ICTs) witnessed in the field of education.

Information and Communication Technology (ICT) according to Okoro *et al.* (2017), can be defined as anything that allows one to obtain or gather information and

communicate with others, or that which has an effect on the surrounding using electronic or digital apparatus. Ratheeswari (2018) posited that the introduction of ICT into the educational system has become a major endeavour and this is because of the role it plays in the diffusion and acquisition of knowledge, which fundamentally improves teaching and learning processes. Through the use of ICT, classrooms can be infused with digital learning tools such as computers, hand-held devices, and other technological tools that can be used to facilitate programs and applications, which invariably give students and teachers the opportunity to seek learning recourses such as electronic instructional materials from the Internet (Agyemang & Dadzie, 2010). Consequent to this development, the availability of the Internet gave rise to an electronic learning approach called electronic learning or e-learning.

The concept of electronic learning can be described as a learning system that is aided with the help of electronic resources. Broadly defined, e-learning can be defined as an electronic administration and delivery of learning opportunities that is supported via computer network and web-based technologies (Zhang, 2013). It is also a learning system that is based on formalized teaching that is facilitated through the use of electronic learning resources (Coleman, 2019).

Electronic learning resources, which are significantly facilitating teaching and learning processes are catalysing the pedagogical shift in the educational sector by way of reversing the shift from top-down lecturing and passive students to a more collaborative approach, which allow teachers and students to co-create the learning process (Anderson & Dron, 2014). At the inception of electronic learning packages, instructors had to personally create their own instructional package or virtual classroom from the scratch for the purpose of teaching but with the emergence of various software technologies, a wide range of electronic learning systems and tools are made available

by various industries and groups, which are immensely contributing to online instruction delivery. Essentially, as electronic learning advanced, cloud-based software technologies emerged and has significantly made instructional materials easily accessible over the Internet (Maguire, 2019). In other words, students can readily register to attend online classes and at the same time obtain instructional materials from multiple sources over the Internet or from institutions who organize learning programmes electronically using cloud-based technologies.

Cloud-based technologies do not require any installation in any computer system or smartphones. Rather, by simply logging into the web portal of any cloud-based electronic learning platform that has already been created by an educational institution or group of educational scholars, one can access information and learn on-the-go (Zhang, 2013). Basically, instructional materials obtained or created can be stored on the cloud through a secure electronic platform, which can as well be remotely accessed by other people or students who have registered and are approved users of the same platform. This implies that contents can be derived from variety of sources and from user's preferred devices. This offers teachers and students an opportunity to have a paperless classroom from anywhere around the world (Brhanu & Mulugeta, 2015). There are so many kinds of cloud-based Electronic Learning Platforms (ELPs) and typical examples of these Electronic Learning Platforms which are of this study's focus are Schoology and Canvas ELPs.

Schoology and Canvas ELPs are innovative pedagogical approaches built on the inspiration of modern technologies for the purpose of teaching and learning. Schoology in particular has a user interface similar to Facebook and can be described as a virtual learning environment that is used to create, manage and share academic contents (Sarrab *et al.*, 2016). Schoology is a web-based platform that encourages collaboration

among learners and give students and teachers 24 hours' access to instructional materials and information via the Internet (Schoology, 2014). The platform also allows a teacher to build-in educational contents online where students can also learn and share. That is to say, students can get reading materials, collaborate through the platform's discussion board and submit assignments to the teacher electronically (Sicat, 2015). While Schoology can be accessed using their website www.schoology.com, it is also compatible with Internet Explorer, Firefox, Google Chrome and Safari using any computer system. Furthermore, Schoology offers free mobile applications through smartphones such as iOS, androids among others (Schoology, 2015), thereby, enabling the students to learn at any time. Just like Schoology, students are also able to learn anytime using their computer systems, mobile or smartphones to access their learning content on Canvas ELP.

Canvas ELP can be described as a flexible learning approach that is aimed at providing students with greater choices over where, when, and how they learn by having various flexible delivery strategies provided by their instructors. Mendo (2018) explained that Canvas ELP is an open-source learning platform developed to work on cloud computing and virtualization environments, which offers various online tools for students and teachers both in lower education and higher-education levels. Again, Instructure (2018) offered that Canvas allows a teacher to integrate tools which helps to facilitate teaching, collaboration, projects and assignments for students.

More so, information concerning each assignment given to students can be analysed automatically into the syllabus, course calendar or grade book without any additional action by the teacher. The platform is an activity-based instrument that has the capacity to enhance communication with the teacher and students as well as interactivity between students and technology. This means that for students to be able to interact

with Canvas ELP in order to gain knowledge, computer literacy skill is imperative in the sense that an effective utilization of technological tools or platforms requires knowledge in computer education (Beschoner & Hutchison, 2013).

Computer education is of utmost importance to Nigeria's national development leading the Federal Government of Nigeria to plan the national policy document that is aimed at supporting the integration of ICTs in all levels of Nigerian schools in order to promote literacy in computer related concepts and skills through the introduction of computer science (National Policy on Education, 2018). Computer Science is the study of computer technology that includes hardware and software applications. It is also a discipline that is concerned with the underlying principles that concerns the design and implementation of computer systems (Stansifer, 2017).

These underlying principles allow students gain insight into techniques on analysis, modelling and problem solving as well as the understanding into the power and limitations of human and machine intelligence (Hawi, 2013). The teaching of Computer Science courses according to Suleiman (2012), provides students with the knowledge and skills that allow them to understand the current computer technology applications as it influences the way people create, learn and share information, especially as it relates to the use of the web.

The web makes connectivity, speedy appearance and transmission of new forms of information, ideas and contents possible (Trilibis, 2014). In other words, this makes web design a crucial aspect of web development as it involves the arrangement of content into graphical models which is used as basis for coding sites or websites as the case may be (Almeida & Monteiro, 2017). Emphasis on web design as it relates to students learning is necessary as students need to be well-informed on how to

effectively use the web in order to increase their access to learning resources, tools and information (Trilibis, 2014). Fundamentally, learning how to create user-friendly websites, pages and software applications for educational purposes has become popular and is deemed relevant for computer science students, as these educational websites and pages are embedded with multimedia contents that can increase the learning opportunities of students and also remove the possible barriers on learning outcomes (Ogwo *et al.*, 2015).

Learning outcomes can be defined as the measurable skills, values and knowledge a student is able to demonstrate after learning a course or completing a programme (Education Quality and Policy Office, 2019). In other words, learning outcomes describe what the student can do and not what the teacher can teach. Thus, the measure of success of institutions of learning is not just in the enrolment and graduation rate of students, but also in the documentation of students' achievement in the learning outcomes that is associated with the degree being awarded (Coe, 2014). In Veresova and Foglova (2016) view, the benefits associated with learning outcomes is that it helps the teacher select appropriate teaching materials and strategies and at the same time help students learn more effectively. However, Nurulafizan (2012) argued that students' learning outcomes should not only demonstrate what students know but should capture the changes that occur in their cognitive as well as affective development. This implies that in most academic settings, students' learning outcome is most often centred on students' academic achievement.

Kpolivie *et al.* (2014) stressed that academic achievement is the outcome of students learning experience as it reflects the extent of what the students, teachers, curricular and educational institution has been put in place in order to achieve predetermined educational goals. York *et al.* (2015) on the other hand argued that student's academic

success in a teaching and learning process is multidimensional and must be measured by the effectiveness of teaching and learning objectives. Sinclair (2014) reiterated that students' academic achievement would not only depend on instructional approach but also on the extent to which students are actively engaged in a teaching and learning process. Although, Weimer (2012) indicated that there is no agreement in literature as to what stimulates students' learning engagement or their desire to actively participate in learning activities, however, the dominant view is that when students are allowed to have some level of control over their learning process, it stimulates their confidence and commitment, thus, increasing their learning engagement.

Learning engagement according to Raza *et al.* (2021), is a crucial element in keeping the students linked with any form of teaching and, thus, with their learning activities. Student learning engagement generally is the extent to which students are actively carried along by way of talking, thinking and interacting with a learning content, their fellow students and the teacher (York *et al.*, 2015). Gunuc and Kuzu (2015) defined student learning engagement as students' sense of belonging, acceptance of school value and active participation in learning activities. Essentially, the need to measure how students are engaged is necessary for researchers and this is because educators through this assessment can be guided on instructional strategies that work best and adjustments also made where necessary to enhance students' participation, performance and quality education (Stephenson *et al.*, 2020). In agreement, Raza *et al.* (2021), remarked that understanding the relationship between students' learning engagement and modern instructional strategies hold great promise for promoting positive outlook on students' perception towards learning.

Students' perception or disposition, especially, towards modern instructional strategies cannot be overlooked (Basioudis *et al.*, 2012). This means that student perception can

serve as vital information for the implementation or modifications of any instructional strategy, thus, leading to the optimization of students' learning environment (Basioudis *et al.*, 2012). Student's perception towards teaching strategies as well as their learning outcomes has become of interest to researchers at various levels of educational setting and this is because meaningful learning according to Goldsmith *et al.* (2010), correlates directly with students' perceptions of their educational environment, which invariably impacts on their learning experiences and outcomes. This implies that perception is a broad term that includes a systematic process that affect students' mind set and is informed by prior knowledge, social environment and past experience (Gül *et al.*, 2011). Another variable that is informed by prior knowledge, social environment and past experience aside perception is gender (Australia's Science Channel, 2018).

Gender can be defined as the socially constructed characteristics of a man or woman such as roles, norms and relationship between or of groups of men and women (Borglum, 2016). The role of gender in determining students' academic achievement cannot be side-lined and this is because male and female differ and reinforce different kinds of behaviour, which play a part in their learning process. Male and female brains are wired differently (Kane, 2018) and this affects the way they reason and learn. As a result of these differences, researchers have shown keen interest in the way male and female students learn and handle different tasks. Gender and learning related outcomes such as students' academic performance, student learning engagement and perception towards different pedagogical approaches cannot be overlooked in educational research. Hence, this study seek to enhance computer science students learning outcomes in web design concepts using Schoology and Canvas electronic learning platforms in North-central Universities, Nigeria.

1.2 Statement of the Research Problem

The essence of computer education in Nigerian Universities is to ensure that students become prepared and efficient in a technologically-driven society. In essence, the quality and quantity of computer education taught should be targeted towards producing students who are proficiently and professionally inclined. However, conventional method of teaching is more widespread in most Universities in Nigeria and is often teacher-centred (Idogho, 2014). This method of teaching not only give room for rote-learning which is void of in-depth understanding, it also causes students to be less productive due to their inactive participation in the classroom. As a consequence, this reduces students' ability to either interpret what was taught adequately in order to produce the required skills or be disconnected from frameworks that would engage them actively to enhance their academic achievement (World Bank, 2019).

To address this setback, exploring technology tools that are able to promote active learning, seamless interaction, and monitoring, prompt feedback and increased learning outcome is crucial. Examples of such technology tools are Schoology and Canvas electronic platforms. Schoology and Canvas ELPs are web-based platforms that allow students to self-study collaborate and communicate with their teachers while accessing learning resources that are otherwise inaccessible in a conventional classroom.

Apart from schoology and canvas ELPs, other teaching strategies have been examined in order to improve academic achievement of students using technology, however strategies geared towards improving the academic achievement of computer science students as well as increase their proficiency in web design development have not be adequately explored, as this is unfortunately evident in the massive proliferation, patronization and usage of foreign web-based applications in most Nigerian education

systems and Industries, leaving out locally made web applications untapped by Nigerian youths (Ogunade, 2019). In other words, computer science students are not required to only excel in their academic achievement by reading course materials but are also required to be drilled and adequately skilled in order to develop web applications and software that are known and used in a larger society and for the benefit of the county. Moreover, web design requires hands-on practical and this may be facilitated through multimedia tools that are well embedded in Schoology and Canvas, which when introduced may allow seamless and active collaboration, prompt feedback from teacher(s), independent repetition and mastery of skills demonstrated. Hence, this study seek to determine the effects of schoology and canvas electronic learning platforms on computer science students' learning outcomes in web design in North-Central universities, Nigeria.

1.3 Aim and Objectives of the Study

The aim of this study was to determine the effects of schoology and canvas electronic learning platforms on computer science students' learning outcomes in web design in North-Central universities, Nigeria. Specifically, the objectives of this study were to:

1. ascertain the academic achievement of students taught web design concepts using Schoology ELP, Canvas ELP and Lecture method;
2. determine the learning engagement of students taught web design concepts via Schoology and Canvas ELPs;
3. assess the perception of students towards learning web design concepts using Schoology and Canvas ELPs;
4. determine the influence of gender on students' academic achievement when taught web design concepts using Schoology ELP;

5. ascertain the influence of gender on students' academic achievement when taught web design concepts using Canvas ELP;
6. determine the influence of gender on students' learning engagement in web design concepts when taught using Schoology electronic platform;
7. ascertain the influence gender on students' learning engagement in web design concepts when taught using Canvas electronic platform.

1.4 Research Questions

Seven research questions were raised to guide the study and they are:

1. What are the mean achievement scores of students taught web design concepts using Schoology ELP, Canvas ELP and Lecture method?
2. What is the mean difference in the learning engagement scores of students taught web design concepts using Schoology and Canvas ELP?
3. What is the perception of students towards learning web design concepts using Schoology and Canvas ELPs.?
4. What is the difference in the mean achievement scores of male and female students taught web design concepts using Schoology ELP?
5. What is the difference in the mean achievement scores of male and female students taught web design concepts using Canvas ELP?
6. What is the difference in the learning engagement of male and female students taught web design concepts using Schoology ELP?
7. What is the difference in the learning engagement of male and female students taught web design concepts using Canvas ELP?

1.5 Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

H01: There is no significant difference in the mean achievement scores of students taught web design concepts using Schoology ELP, Canvas ELP and Lecture method.

H02: There is no significant difference in the learning engagement of students taught web design concepts using Schoology and Canvas ELPs.

H03: There is no significant difference in the perception of students towards learning web design concepts using Schoology and Canvas ELPs.

H04: There is no significant difference in the mean achievement scores of male and female students' taught web design concepts using Schoology ELP.

H05: There is no significant difference in the mean achievement scores of male and female students taught web design concepts using Canvas ELP.

H06: There is no significant difference in the learning engagement of male and female students taught web design concepts using Schoology ELP.

H07: There is no significant difference in the learning engagement of male and female students taught web design concepts using Canvas ELP.

1.6 Scope of the Study

This study sought to determine the effects of schoology and canvas electronic learning platforms on computer science students' learning outcomes in web design in North-Central universities, Nigeria. The study created an e-learning classroom using Schoology and Canvas platforms in order to determine the following learning outcomes; students' academic achievement, student engagement, student perception and influence of gender on 200 level undergraduate students offering Computer Science in North-central Universities in Nigeria. North Central is made up of six states which includes Benue, Federal capital territory Abuja, Nasarawa, Niger, Kogi, Kwara and Plateau. The

Computer Science course that was taught was on web design concepts. This course outline covered the following aspects; Introduction to HTML, CSS and JavaScript, Basic web pages and structure of a web page as well as Links and Images.

Aside that this course selected fell under the 200L Computer Science syllabus, web design was also chosen in this research because it is considered as a child of the Internet. What this means is that web design allows individuals to create user-friendly website pages, software and applications on the Internet which is essentially relevant to the trending electronic learning.

This research measured students' learning outcomes using Schoology and Canvas ELPs in web design using Web Design Achievement Test (WDAT). The content of the WDAT was strictly based on the web design course outline in the Curriculum stipulated by the National University Commission (NUC) for 200 level University students in Nigeria. Questionnaire was also administered to determine students' learning engagement and perception towards the use of electronic learning platforms. To collect data for this study, three Universities out of seven Universities in North-central, Nigeria was selected. The study lasted for ten (10) weeks.

1.7 Significance of the Study

The finding of this study was of utmost importance to the following groups; students, teachers, curriculum planners and developers, researchers, education policy makers, the ministry of education and higher institutions of learning.

Students are mostly attached to technology in and outside the school. In essence, Schoology and Canvas ELPs was a good way to hold their attention on educational matters. Students were able to interact with their learning content and also connect with the teacher and fellow classmates anytime and any day. This helped improve their class

participation and work collaboration. Additionally, through the use of technology, students acquired 21st century skills and competences which in turn, increased their creativity and understanding of new source of information, social skills and critical thinking skills.

Additionally, this study was of benefit to teachers in the sense that e-learning offered them various ways to easily deliver courses or materials to student and at the same time helped them assess students' performance and monitored their learning progress. ELPs are software tools that provide a centralized source of learning and teachers used this to their advantage by adding all necessary learning contents and saving them in one server in the cloud. This way, the teacher easily communicated and created engaging lessons online. The teacher also made quizzes, administered tests and assessed the students from any location and device with Internet connectivity. This promoted optima learning and added novelty to the teaching of web design web design concepts.

The findings of this study enriches the knowledge of curriculum planners and allow them embark on current and practical methods of ensuring that the ELP is effectively introduced for teaching and learning in schools. This fosters student's readiness to learn and increase their interest in the utilization of ELPs in their studies. Again, with the variety of electronic resources, ELPs facilitates the movement of curriculum development out of file cabinets to cloud-based in the sense that curriculum planners and the university management can have access to almost unlimited stored resources for both teachers and students.

More so, the findings of this study, enables curriculum planners to align curriculum and instruction to be founded on the integration of technologies in order to meet the needs of the educational system. This helps students receive integrated and coherent learning

experience that contributed to their personal, academic and professional learning development. Furthermore, curriculum developers through the use of ELPs can develop instructional designs models, and linear approaches that are generally suitable for schools and departments.

This study is of benefit to researchers because it gives them insight into related literatures, methodologies and findings that serves as reference point when conducting their own study on related issues. New researchers can formulate new topics based on the recommendation made in this study. In other words, fresh researches are further carried out on areas where this study has been limited. This helps to inspire new researchers to research into the unknown to discover more ways to better the educational system.

Education policy makers are also able to make strategies in implementing 21st century education. This is achieved by way of ensuring that the policies made towards the use of flexible electronic learning methods are improved. This is to ensure a continuous acquisition of knowledge, technological changes and collaboration among educators, administrators and others stakeholders in the education system. Through better policies, new pedagogical concepts which form integral part of school reforms are able to transform the educational system and enable teachers and students connect with a host of other institutions for greater collaboration and learning.

As Computer Science play an important role in the discovery and implementation of innovative technologies, the ministry of education through the Federal and State government are able to make provisions for ICT facilities, Internet connections and online resources to public universities to support effective teaching and learning process

via ELPs. This will remain in line with the government's National policy on science and technology which is aimed at promoting computer education in Nigeria.

This study is also of utmost importance to higher institutions. This is because people who make up the university community are encouraged to use ELPs to meet a lot of academic and administrative needs. Among these needs are managing students' demographic information, scheduling, collecting, analysing, sharing data of students' achievement and coordination various learning materials for teaching and learning processes. These needs are integrated seamlessly using a single password protecting system which allow students, teachers, administrators and even parents to have access and review their own processed data. Higher institutions can take advantage of the built-in teaching system in ELPs for monitoring and reporting. This can go a long way in removing a huge amount of administrative burden that is associated with the traditional human resource process. This way, staffs would be able to spend less time doing basic administrative work and spend more time improving the quality of learning content and enriching their jobs through staff engagement and training. This enables the creation and management of internal and external administrative processes to be embarked on by higher institutions as part of a great organizational system.

1.8 Operational Definition of Terms

Schoology ELP: This refers to virtual learning environment that the teacher used to deliver planned lessons on web design concepts, manage classroom, encourage peer collaboration and provide real-time formative feedback on lessons taught.

Canvas ELP: This is a web-based software that the teacher used to create, manage and present lessons on web design concepts to computer science students virtually using modules, discussion, assignments and quizzes.

Web design: This refers to instructional concepts contained in the syllabus of computer science students in Nigerian universities that was delivered to the students virtually using Schoology and Canvas ELPs

Perception: This refers to Computer Science students' views, standpoints and thoughts concerning their use of Schoology and Canvas ELPs in learning web design concepts.

Learning engagement: This has to do with Computer Science students' participation and collaboration in learning activities while been taught web design concepts using Schoology and Canvas ELPs.

Gender: This is the categorization of students into male and female into experimental and control groups.

CHAPTER TWO

2.0

LITERATURE REVIEW

2.1 Conceptual Framework

The framework of this study outlines the network of concepts that are discussed therein and as to how they are connected in order to provide an in-depth understanding on the direction this study intends to achieve the aim and objectives specified in the study. The conceptual framework model is shown in Figure 2.1.

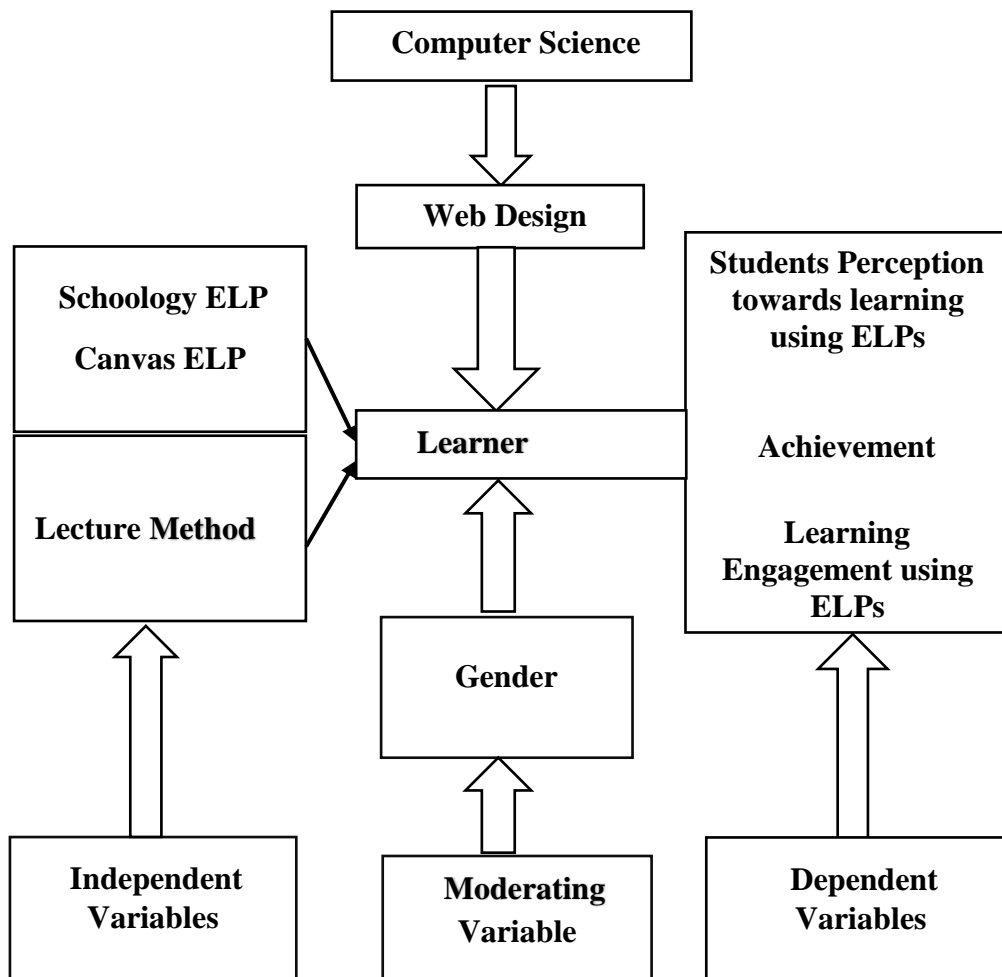


Figure 2.1: Conceptual Framework Model

Source: Researcher (2023)

The framework model illustrates that while Computer Science is a discipline approved and studied in the Nigerian Tertiary Institutions, web design on the other hand is a

course mapped out by the NUC and is offered to Undergraduate Computer Science students. In essence, for web design as a concept which is of interest to this study to be taught, three teaching modes were incorporated in the study and they formed the three independent variables. These independent variables include; Schoology and Canvas electronic learning platforms which formed experimental group I and experimental group II and lecture method, which formed the control group.

Others group of variables are the dependent variables whose outcomes are dependent on the independent variables and they include; achievement, students' learning engagement and students' perception towards learning web design concepts using the teaching modes incorporated in the study. The last variable of the study whose influence is ascertained on both the independent and dependent variables is gender which stands as the moderating variable.

2.1.1 Concept of computer science in education

Technology has become necessary as countries and organisations around the world continue to devise means of gaining a competitive edge over the others. Given this scenario, Computer education is of utmost importance thus, making most countries around the world sought to introduce the study of computer science in their educational system from primary through to tertiary institutions. Computer Science can be defined as the study of practices and principles that buttress the modelling and understanding of computation, and the development of applications in computer systems (Garcia & Al-Safadi, 2014). Computer science is also the study of computers and computing concepts. It includes hardware and software, as well as networking and the Internet (Katai & Toth, 2013).

Essentially, Computer Science is concerned with how computers and computer systems work as well as how they are programmed and designed. This implies that Computer Science goes beyond software and hardware application but spans across several core areas such as computer theory, scientific computing, hardware systems, and software systems. Computer science makes use of hypothesis testing and experimentation during conceptualization, design, measurement, and refinement of new algorithms, information structures and computer architectures.

The hardware aspect of computer science covers the basic design of computers and the way they work while the software side of computer science covers programming concepts which includes functions, algorithms, and source code design. The study of Computer Science allows students to solve problems, design systems and also understand the power as well as the limits of human and machine intelligence.

The study of Computer Science has many branches which include programming and computer graphics, software engineering and artificial intelligence. Computer science is considered as part of a family of five separate disciplines that are yet interrelated. These disciplines include Information Technology, Computer Science, Information Systems, Computer Engineering, and Software Engineering. The need for computer science as a discipline has grown and this is because computer has become highly integrated into every day-to-day activity as technology advanced (Techopedia, 2019). Computer science is essential and this is because it adds to the success of students in a digital, inter-connected world.

In essence, Computer Science is a discrete academic discipline and is also imbedded in nearly every other area of academic study, since the use of computers and computer technologies as well as data and digital computing have become an essential skill in

most disciplines. Moreover, the modern information age has made computer technology an important tool for research, discoveries and dissemination of information, virtual learning, creative expression for artists and musicians, gamers and film makers, publications, collaboration with people from around the world among others. In the view of this, Yang *et al.* (2015), emphasised that Computer Science empowers students and allow them to think computationally and to also conceptualise and understand computer-based technology so as to be better equipped in order to function in a modern society.

2.1.2 Web design in computer science

Computers control many systems that are essential in daily life. They are practically found in organizations and institutions and play a role in business, communication, medicine, science and education. As the range of computer applications continues to grow, so does the need for computer scientists and the study of computer science. Computer science is a diverse field that requires skills that are both applicable and in-demand across almost every institution or industry in the modern day technology-dependent world (Bennett *et al.*, 2012).

For this reason, universities are granted the licence by the Nigeria Universities Commission (NUC) to offer various computer science degree programs to students. Among the courses outlined by NUC for both State and Federal Universities in Nigeria includes; programming I, programming II, computer hardware, web design, operational systems among others (Salihu & Ago, 2016). Essentially, new innovations in computer science and indeed technology means that computer programmes, graphics and design will continue to forge ahead and create new specialized areas. Furthermore, as the Internet continues to shape the world in deeper ways, computer science students must

show proficiency in the creation of computer graphics, content and animation as well as master code programmes that will enable them properly format and add content pages through the knowledge, they acquire in a computer course called web design (Trilibis, 2014).

Web design according to Mohorovicic (2013), is the process of creating websites. It encompasses several different aspects that include webpage layout, content production and graphic design. While the terms web design and web development are often used interchangeably, web design is technically a subset of the broader category of web development. Web design is a course offered by computer science students which provides them with hands-on training in the development of web pages and websites.

In the view of Gardner (2011), Web design is both a perspective branch of education as well as a valuable part of education. Educational websites need student-friendly design and modern ways to present information in order to attract more users of any age and specific needs. Web design in other words is connected with other practical sciences that help students perceive information faster, easier and more efficiently (Almeida, 2017). The goal of the web design is to train computer science students on the principles and issues involved in web design and this is accomplished through the teaching of basics concepts like HyperText Markup Language (HTML), Cascading Style Sheets (CSS), JavaScript, XML, multimedia among others.

According to Chong (2010), most websites include a combination of HTML and CSS which defines how each page will appear in a browser. In other words, web designers build webpages from scratch using HTML tags that define the content and metadata of each page, while the layout and appearance of the elements within the webpage are defined using cascading style sheets (CSS). A breakthrough in web design occurred in

the 2000s with the tremendous and rapid usage of the Internet which increased in the past decade (Internet Use over Time, 2014). The design of websites has become one of the most important public communication portals for most, if not all organizations and businesses and because a lot of businesses, interactions and partnerships occur online in most part of the world, website design has become critical in engaging users (Lee & Kozar, 2012).

Students therefore need to be conversant with the rudiments as to what makes a website usable and engaging. This is so because poorly designed websites may frustrate users or cause them to visit the entrance page of the site without exploring other pages within the website (Google.com, 2015). This means that a well-designed website with high usability can have positive influence on users in terms of their revisiting rates and purchasing behaviour.

Although Chong (2010) stated that little research has been conducted on the specific elements that constitute effective website design, however, one of the key design measures is usability. Website usability can be described as the extent to which users can achieve desired tasks such as accessing desired information, a purchase or place with effectiveness, efficiency and satisfaction within a system. By the way, Garrett *et al.* (2016) pointed out that website design elements that best facilitate usability as well as keep users engaged include; the purpose of the website which can be personal, commercial, or educational, how logical the website is organized, user interaction with the website, the usefulness of the information provided, the credibility of the information provided, easy navigation of the website, loading speed of the website, how well the website utilizes icons, contrasting colours, and multimedia content.

Duggan *et al.* (2015) concurred but however added that social media has emerged as an effective communication platform for organizations and institutions of learning, hence integrating social media into website designs may also increase user learning engagement by facilitating participation and interactivity. In essence, effective web design requires a balance of a well-planned design, quality content, and proper use of available media so as to give users what they desire in a website. While the number of studies that has investigated students' learning outcomes on web design courses are very low, the studies available are however opinion-based and collected based on the personal experience of web and mobile developers, hence this present study seeks to experimentally fill this gap in knowledge.

2.1.3 The need and relevance of computer education for Nigerian students

The use of technology is dependent on the use of the computer and even from the basic electronic devices to related astronomical devices; the use of the computer is required. This has essentially made the use and knowledge of computer vital. Computer education can be defined as the acquisition of knowledge, skills and abilities to manipulate and interpret the language of the computer (Katai & Toth, 2013). As computers have become widely used, acquiring computer education will indeed offer the required knowledge and skills for computer operations.

Computer education is a work-based learning and a continuous process that should be grounded in experience. Computer education can also be seen as a skill and craft-oriented training. The need to equip students with computer education cannot be over emphasized and this is simply because computer education provides opportunities for on-the-job experience and research activities. Essentially, it is becoming obvious that the rapid and sustainable growth in any nation hinges on the abilities to harness

computer resources as this can be observed among the western countries that are controlling the whole world because of their competence in the use of computer related resources (Mosa *et al.*, 2016). Computer education is therefore a powerful gateway for creating competent opportunities for students in order to achieve sustainable growth and development in Nigeria.

Oviawe and Oshio (2011) indicated that the philosophy of National Policy on Science and Technology was aimed at developing and creating mass awareness for people to embrace science and technology. Computer education in the national policy on science and technology, was essentially explained as an aspect of technical and vocational education that leads to the acquisition of practical and applied skills as well as basic scientific knowledge (National Policy on Education, 2018). In other words, computer education is aimed at equipping students with thorough understanding of the concepts of computer so as to allow them fit into the information age favourably (Oviawe & Oshio, 2011).

It is therefore based on this need for computer education that Nigerian government deemed it necessary to introduce Computer Science into the educational system so that it can be taught from primary through to tertiary institutions. As a result, computer science related courses and programmes in schools has become one of the far reaching and fast-growing developments in the educational sector (Mbaeze *et al.*, 2012). The fundamental need of computer science education lies in the potentials of computers to aid in instruction delivery as Computer can be used to evaluate students' performances and also direct students for further appropriate learning activities (Oliveira *et al.*, 2018).

This implies that at both primary and secondary levels of education, students can learn to explore, generate learning through different computer programmes at the tertiary

level, use and store daily as well as weekly activities in experiments and in science (Odu, 2011). This implies that computer education would expose individuals to be able to access and operate computer hardware and software technologies which would make it easier for them to function well in various computer-related applications they may come across (Oliveira, *et al.*, 2018).

Odu (2011) pointed the relevance of Computer Education to Nigerian students, indicating that the use of the computer grants students' access to the Internet which is necessary for research. Computer access opens up many research opportunities and makes it easier for students to search for journal articles and online books. Making use of the computer generally makes access to information quicker and through computer education, students can learn how to use the computer to access the Internet. It exposes students to computer programmes. Students' can learn to type their assignments, projects and the likes using the Microsoft word office programs.

Again, Students can make their typed work, charts and graphs and statistical analysis readable and more presentable with higher proficiency through the use of Microsoft Excel office and SPSS. It also promotes games and simulation instruction for students which in turn increases students' cognitive development particularly in the area of visual intelligence, where certain computer activities and games may enhance the ability to monitor several visual stimuli at once or to recognize icons, read diagrams and visualize spatial relationships. Kibin (2022), supported the above view by adding that computer programmes allow students to engage in activities such as simulations and problem solving which can help develop their critical thinking skills as they conduct their research through the construction of knowledge.

Lastly Odu (2011), is also of the view that computers make use of Multimedia/Hypermedia which provides students with visual support in order for them to develop mental models of the problems they intend to solve. Multimedia/hypermedia is the combination of sounds, texts, graphics and images with a single information delivery system. Multimedia/hypermedia, allow students to create presentations, develop skills, communicate with others in their own perspectives (Kibin, 2022). There is a number of multimedia software programmes among which are Authorware, Hyperstudio, Hypercard, among others which can help students create productions that include video or audio clips of various subject areas. Every nation invests in education simply because it can produce immeasurable benefits for individuals, groups, organizations and the society as a whole. In the same vein, computer education is very vital in the development of any society because no nation hopes to develop without embracing computer technology. Essentially Harel (2014), opined that computer education has a strong connection to many disciplines, adding that many problems in Science, Health, Engineering, business, and the likes can be solved efficiently with computers even though finding these solutions require both computer scientists and knowledge of the particular application domain.

2.2 Status of Teaching and Learning in Nigerian Tertiary Institutions

Teaching and learning processes in tertiary institutions in Nigeria can be described as being effective if only it is capable of bringing about the expected transformations in the knowledge, attitude and skills from students in higher institutions over a period of time (Odetunde, 2012). In other words, effective teaching and learning should be able to produce graduates who are sufficiently informed, self-reliant, technically equipped, good citizens, selfless in leadership and having sound attitude towards becoming productive workers in the 21st century (Mosa *et al.*, 2016).

Teaching and learning in Nigerian tertiary institutions, according to Amiya (2014), is ineffective, and this ineffectiveness has become a concern for Nigeria's growth and development. Among the reasons why this ineffectiveness has persisted according to Amiya (2014), is because Nigerian youths are finding it hard to become employable and worse still, they end up working in sectors that either has nothing to do with what they have studied in school or have poor conditions. Another reason according to Onifade *et al.* (2021), is that graduates of Nigerian tertiary education acquire skills in disciplines that are neither demanded by the labour market nor required by the economy especially in growing sectors such as petroleum, gas, agriculture, manufacturing, solid minerals, tourism and ICT. In recent times, the problem of poor learning has amplified and has led employers of labour to complain that skills of Nigerian graduates are steadily deteriorating and these graduates are also becoming increasingly unproductive on the job. To make matters worse, there has become a poor attitude of the Nigerian government in providing adequate facilities for effective teaching of technology-oriented subjects and this seems to be an underpinning societal factor (Amiya, 2014).

Emphasis was made by Osakwe (2012), that tertiary institutions must keep pace with the advances of learning technologies, adding that many developing countries lack different basic needs of life which has made their governments to concentrate their developmental efforts on the traditional education such as provision of classroom buildings, furniture, laboratory equipment, libraries and salaries instead of making the educational system technologically adequate. At the macro level, provision of infrastructural facilities such as road, water and electricity are made available instead of the provision of technological facilities for university education.

Teaching and learning in Nigerian tertiary institutions are mostly presented using lecture method of teaching and this method is mostly teacher-centred. This leaves the

teacher at the centre doing most of the talking and passing the knowledge, while the students on the other end are passive and receivers of the information provided.

There is need to move from teacher-centred to learner-centred instruction. This is because technology is rapidly creating changes in all aspects of the society and as well changing the expectations of what Nigerian undergraduate students must learn and how they must learn in order for them to function effectively in the new world economy. Students need to learn how to navigate through large amounts of information, analyse and make decisions as well as master new knowledge domains in an increasingly technological society (UNESCO, 2015). This notion was supported by Anekwe and Williams (2014), who were of the opinion that technology allow individuals to obtain, analyse, assemble, and communicate information in a detailed form and also at a faster pace. Abas and Imam (2016) additionally stated that the outcome of the use of technology will always be demanded increasingly on the educational system to help learners acquire higher level skills that will enable them become ready to make decisions and solve complex and real-life problems (Linways Team, 2017).

These increased demands should then reflect in the way Nigerian universities interact with students academically in order to rise learners who would begin to think critically and creativity. Moreover, these changes have to be grounded in an understanding of how a diverse population of students learn. In line with this, UNESCO (2015), affirmed that students need to be lifelong learners by collaborating with others in accomplishing tasks that are complex and by effectively using different systems for representing and communicating knowledge to others.

Therefore, a shift from teacher-centred instruction to learner-centred instruction is required to allow students acquire 21st century knowledge and skills. Abas and Imam (2016) however submitted that of particular importance, the new 21st century skills will

introduce the students to higher order skills and the manner in which students acquire them will be enhanced through students' critical thinking and communication skills. Raza *et al.* (2021), emphasised that in a learner-centred setting, emphasis must be on problem-solving and transfer, adding that the use of other methods such as simulations, discovery and cooperative groups should not be ignored for learners to experience and solve real-world problems. This implies that when the above stated methods are employed in teaching and learning process, one will out-rightly notice a shift in the manner in which the learning experience is planned and also carried out.

Instead of the teacher's total control of the classroom, the importance of the learner's role in planning, implementation, and self-evaluation should be emphasized. In other words, when institutions of learning proactively engage students with various sources of potential information embedded in technology and media to help them gain insight into a problem and the possible solutions, teachers' role will shift to the one that guides, facilitates and assists students in achieving their learning goals.

2.2.1 Relevance of technology in teaching and learning

The important role of technology in the present-day teaching and learning cannot be over emphasised and one of the reasons why the use technologies need to be increased in the educational sector is for the educational system to prepare a levelling ground that will potentially give students of the 21st century a sense of embodiment and also make it possible for these students to interact with the technology as well as other students (Nsofor *et al.*, 2015). The vital role of technology is evident as it has penetrated all organizations, institutions and groups worldwide among which include; governments, educational systems, researchers, teachers, students and parents.

Technology, according to Umeh (2015), is the scientific application of knowledge that is put into practice in order to solve problems or develop the world. Hence technology can broadly be described as the application of tools, products, techniques, methods, and processes to practical tasks. The use of technology has become an integral part of industries, firms, entertainment, communication, and essentially in education (Baldwin, 2019). Technology have influenced the way people use, create, share and develop information in the society. The development of students' knowledge and skills relating to information and communications technologies in the school can help students' lay stronger foundation later in life (Baldwin, 2019). Moreover, ICT provides students equal opportunity to compete with their counterpart, regardless of their background.

This implies that the mere provision or access to technology is not enough if the users are not enthusiastic to use technology to gain meaningful knowledge. In other words, a meaningful development of technology-based knowledge as well as practicable skills is essential for all students so that it can help prevents a digital divide in the society (Organization for Economic Co-operation and Development, 2010). Accurately, there is need to keep pace with the growing needs of the society and prepare students for essential roles that is demanded by the society each and every passing day.

This clearly justifies why technology should be used in teaching and learning process. Researchers and educators have pointed out how potentially useful technology is to promote teaching and learning, cater for different learning styles and improve learning outcomes (York, *et al.*, 2015). Whenever the use of technology is mentioned in teaching and learning, the word 'integration' often accompanies it. It therefore goes without saying that the idea of integrating technology into the curriculum came about as a result of the concern that the educational system may have emphasised the need to adequately

and not fairly or sometimes use technology in teaching so as to address how students can apply technology related knowledge and skills comprehensibly (Al-Ammary, 2012).

As technology has become part of people's everyday lives, it is important to rethink the concept of integrating technology into the curriculum and shift the focus of technology into pedagogy in order to support the learning process (Organization for Economic Co-operation and Development, 2010). The important role played by technology in education creates an avenue for teachers to design meaningful learning experiences that embeds technology and this includes considering the right tools and resources that can best support learning activities for students. Meanwhile, the advances in modern technologies and accessibility have made the possibilities seem almost endless. It is therefore important not to just use technology for using sake but to embed technology appropriately in teaching and learning. It has been well argued that just making technology available in schools does not mean that teachers will make use of the technology in teaching students, nor will it necessarily be used effectively (Akinsowon & Osisanwo, 2014).

However, as long as the integration of technology into learning is concerned, the expertise and role of teachers are critical because they are at the fore front of designing and delivering the learning experience. In other words, teachers are in a better place to support students to process information by assisting them to organise new information, linking the information to their existing knowledge and then using memory aids to retrieve information. Technological resources and computer software can then be used to facilitate these processes.

As technology is increasingly incorporated into curriculum and classrooms around the globe, understanding how to adequately integrate technology in order to achieve

educational objectives becomes increasingly important. The global adoption of ICT into education has often been a premise on the potential use of new technological tools to revolutionize the educational system and better prepare students for the information revolution as well as accelerate national development efforts (Bordar, 2010). Therefore, understanding the impact of technology in education and the best ways to integrate it into the classroom is critical and whether technology in the classroom is beneficial is dependent on the competence of the users, the type of technology used and in the way it is integrated in the classroom (Giannakos, 2014).

2.2.2 Challenges of integrating technology into Nigerian tertiary institutions

Nigeria is a multi-cultural state that is rich in both human and material resources. Despite these numerous blessings endowed on her by the creator, still lack the ability to keep to growth (Mosa, *et al.*, 2016). Nigerian educational system according to Babagbemi (2011), encounter various challenges in integrating ICT related technologies in the classroom and among them includes; Infrastructure challenges, negligence in the integration of locally meaningful content, preferably in the local languages as well as in technology in education. According to Aina (2013), this set back occurs as a result of lack of competence in the part of teachers and school administrators. Teachers requires professional development in order to gain skills with particular applications of technology integration into the contemporary curricular, curricular changes related to its use, changes in teacher role, supporting educational theories such as construction or student-centred learning. School administrator on the other hand must be competent enough to have a clear understanding of the financial administration and social dimensions of technologies and technical curricular, for technology to be effectively integrated.

Aina (2013) further pointed out that issues such as curriculum and pedagogy, analysis of current practices and arrangements, identification of potential drives are to be considered in the formulation of policy and planning for proper integration of technology in the classroom. Unfortunately, this is faced with barriers such as; corruption, mismanagement of funds, inadequate security, users' perception and characteristics, inadequate man-power, Epileptic nature of power supply, community clashes and rivalries, among others.

2.3 Electronic Learning as a Teaching Concept

The Internet facilities and the way they are applied in education and other industries or organization have significantly influenced how peoples access information, teach and learn. This is taking place as a result of emerging technologies as well as the demand for online instruction by consumers. Amidst this rapid growth in technology, a new form of pedagogy emerged and is called electronic learning or e-learning. According to Cambridge Dictionary (2019), the term electronic can be described as any equipment, device, interconnected system or sub-system equipment that facilitates automatic acquisition, control, display, movement, manipulation, storage, management, representation, switching, reception or transmission of information and this includes, computer hardware and software applications, telecommunication products such as telephones, operating systems, web-based information and applications, video equipment and multimedia products, World Wide Web sites, among others.

In the early 70s down to the 80s, electronic learning became popular but was done using mail until the rise of Internet (Isaacs & Hollow, 2012). Later in the 90s the digital learning environment became more prominent and the World Wide Web (www) started as a distributed learning mechanism supporting on campus student and distance learners

(Coleman, 2019). With the instructional content delivered technologically, learners started getting a wide range of resources like multimedia, discussion forums, video conferencing chat and electronic black boards (Isaacs & Hollow, 2012). Electronic learning has been defined by different researchers in various literature, however, some of the definitions overlap. Typically, Tunmibi *et al.* (2015), defined electronic learning as the use of telecommunication technology to deliver information for education and training. Okiki (2011) on the other hand, defined electronic learning as a virtual learning environment where a learner interacts with materials, instructors and peers through information and communication technologies. In this instance, both definitions cover important aspects of electronic learning such as delivery of information for education and interactions through technology.

While electronic learning come with different synonyms which are expressively used to achieve similar learning goals, Okiki, (2011) submitted that electronic learning can be described in various ways as learning requires a number of different technologies and methods for delivery such as Computer-Based Training (CBT), Web-based instruction (WBI), Internet-based training (IBT), distributed learning (DL), advanced distributed learning (ADL), online learning (OL), distance learning, mobile learning and learning management systems (LMS) which are all considered as electronic learning mediums. From another view, Coleman (2019), described electronic learning as the delivery of education and training through networked interactivity and distribution technologies, adding that components in an electronic learning environment include content delivery in multiple formats, management of the learning experience, and a networked community of learners, content developers and experts.

Electronic learning programmers recognize the dawn of a new era in the educational system and the challenges in the diversity of programmes as well as the diversity of

learners. Hence, electronic learning quickly evolved to include not only courses that can be taught primarily online but also an avenue where students can get the chance to interact anytime and wherever with variety of instructional materials and resources that comes in the form of text, pictures, sound, and video. In essence, it can allow the students to communicate with their teachers, classmates both individually and in a group discussion with the use of instant message exchanges message boards or video conferencing.

Pardemean and Suparyanto (2014), opined that electronic learning is mostly used in an open, flexible and diverse electronic learning environment, adding that this system of learning can be viewed as an inventive approach for instructional content delivery, learner-centred, interactive and facilitated learning that can take place anywhere, by anyone and anytime through the utilization of the available resources from different digital technologies along with other types of learning materials that is suited for a flexible, distributed and open learning environment (Maguire, 2019).

Electronic learning had passed through three noticeable generations. The first generation started from 1994 to 1999 and was marked with a passive use of the Internet where traditional materials were repurposed to an online format. However, the second generation which took place from 2000-2003 transited to higher bandwidths, rich streaming media, increased resources and virtual learning environments which incorporated communications, access to course materials, and student services.

The third-generation electronic learning which is still evolving is currently marked with greater collaboration, project-based learning, socialization and reflective practices, through the use of tools like e-portfolios, blogs, wikis, social bookmarking, networking and online simulations. From a different perspective, Zhang (2013), explored the

development of electronic learning and indicated that the first-generation electronic learning which started in the early 1990s depended on professional technical staff and advanced technological knowledge and skills to develop electronic learning platforms and courses. In this case, Teachers and courseware developers mainly provided course content that had already been used in the classroom to technical staff who uploaded the course content to the course website. At that time, it was difficult to transfer the teacher's knowledge, enthusiasm and experience through e-course design and development and this unfortunately formed a one-way transmission electronic learning mode. In the era of the 2nd generation electronic learning, the principles and practices of electronic learning transformed from being technology-driven to pedagogy-driven.

During that time, there became many successful electronic learning instructions which took place through Open universities and other Colleges affiliated to other universities around the world. In these universities, pedagogy and student support services were fundamental while technology was just regarded as a supporting tool. Since the focus of any pedagogical type of learning mode is interaction, there is need to develop a comprehensive mode of electronic learning that is predicated on electronic learning principles. Hence, this led to the 3rd generation electronic learning. The 3rd generation electronic learning considered all aspects from an educational perspective to include electronic learning principles and methods, learning centre management.

Other perspective include learning resources management, staff management, design and development of e-courses, instructional design of electronic learning, student support services, design and development of the electronic learning platform, evaluation and quality assurance, and staff development. Attributes of the 3rd generation electronic learning include user-friendly and flexible functional features, easy communication and collaboration, interactive learning content, cost effectiveness management, and student

support services of learning and teaching. Also, with the instant communication that is available to individuals and groups and with the cloud-based learning on the rise, the 3rd generation electronic learning is increasingly being influenced by advances in mobile computing, social learning, predictive and advanced learning tracking and management tools, micro modules among others (Arshavskiy, 2017).

Presently, electronic learning is facilitated by different types of communication technologies especially where the use of the Internet provides unique possibilities to deliver electronic learning across space and also support interaction-based learning types. Electronic learning makes it possible to extend the reach of educational system and training systems into new areas, in the sense that it can be applied in the primary schools, secondary schools, colleges of education, universities, as well as vocational training. In line with this, a wide range of opportunities are developed and implemented in the academic, vocational and continuing education to support life-long learning.

According to Sadan and Kumbhar (2012), there are potential objectives for the implementing electronic learning and they include; increased convenience for the students and teachers, increased learning effectiveness for the students and teachers over a face to face learning mode or online learning, cost effectiveness for the school, organizations or Government, reduced traffic and parking congestion on campuses by students, lecturers or visitors and the ease in classroom space which allows students and lecturer learn more outside the classroom.

2.3.1 Types of electronic learning

Electronic learning is enabled to allow students learn anytime and anywhere. As such it encourages the development of progressive learning content through the application of effective instructional design that is required to meet the learning objectives set by the

instructor. Electronic learning, according to Algahtani (2011), can be classified in different ways. Some of the classifications however are based on the extent of their engagement in education while others are based on the timing of interaction. Algahtani (2011) divided electronic learning into two basic types among them are the computer-based and the Internet based electronic learning. Algahtani (2011) was of the view that the computer-based learning comprises the use of a full range of hardware and software that are generally available for the use of ICT facilities and that each component can be used as either a computer-assisted learning instruction or a computer managed instruction. In computer-assisted learning instruction, computers are basically used instead of the traditional methods and it provides interactive software as a support tool either inside the classroom or as a tool for self-learning outside the classroom. On the other hand, in the computer managed instruction, computers are basically employed for the purpose of storing and retrieving information to assist in the management of instruction.

Firat (2016) opined that the Internet-based learning is rather a further improvement of the computer-based learning which makes content readily available on the Internet, via links that are related to the knowledge sources. A typical example is the e-mail services and references which can be used by students at anytime and anywhere be it at the availability or absence of instructors or teachers. From another point of view, Isaacs and Hollow (2012), classified electronic learning by the extent to which their features are used in education, indicating that it can be mixed or blended or more, assistant mode or completely online mode. Isaacs and Hollow (2012) further revealed that the assistant mode supplements the traditional teaching method when needed adding that the mixed or blended mode can only be used minimally for a partly traditional method. However,

the assisted or completely online mode, involves the exclusive use of the network for learning.

Algahtani (2011) went ahead to describe the completely online mode as either synchronous or asynchronous by the application of applying optional timing of interaction adding that the synchronous timing comprises of alternate on-line access between teachers and learners or between learners. According to Algahtani (2011), the asynchronous allows all users to post communications to any other participant over the Internet. The synchronous learning on the other hand, allows learners to discuss with their instructors or teachers or among themselves through the Internet and via tools like the chat rooms or video conference.

The synchronous learning according to Firat (2016), offers the advantage of prompt feedback in the sense that interaction can take place over the Internet at the same time but can be viewed later, with the use of tools such as thread discussion and emails. In essence, learners can learn at the time that suits them even though the disadvantage of this mode of learning is that the learners would not be able to receive instant feedback from instructors or teachers as well as their colleague learners (Firat, 2016).

2.3.2 Electronic learning as a tool for learning

The use of information technologies, multimedia and the Internet as technique of teaching has made significant changes in the traditional process of teaching. According to Gay (2012), electronic learning courses offer flexibility to fit onto the students of instructor's lifestyle without compromising with their scheduled commitments. In other words, electronic learning has generated more choices for learners seeking to acquire knowledge, making it convenient for educational institutions who have recognized electronic learning as a prospect to transform peoples' knowledge and skills through this medium (Gay, 2012). Again, Firat (2016), acknowledged that there are universities,

colleges and other educational institutions who are racing to advance their online course capability in a present speedily developing cyber education market. This therefore implies that electronic learning is becoming more and more important in institutions of higher education and the introduction and expansion of a wide range of electronic learning tools is beginning to initiating several changes in higher education institutions, especially when it relates to their support processes and educational delivery.

Just as there are various types of electronic learning, there are also various ways electronic learning can be employed as a technique in learning. Algahtani (2011) noted that there are three distinct models of using electronic learning as a learning tool, and they are described as follows; the adjunct electronic learning, blended electronic learning and online electronic learning. The adjunct electronic learning is a mode where electronic learning is used as a supplementary for learners in the traditional classroom so as to provide them with relative independence in learning. The blended electronic learning, on the other hand, is a way of learning where learners' educational content is delivered through the combination of face-to-face teaching mode and electronic learning method in the classroom setting. The online electronic learning is devoid of the face-to-face teaching and learning interaction or classroom participation. In other words, the online electronic learning as a tool for learning is totally done electronically and offers maximum independence to learners or students (Tunmibi *et al.*, 2015).

3.3.3 Advantages of electronic learning

While electronic learning offers a wide range of online courses, Sulisworo (2012), are of the view that universities stand a great chance to benefit from this mode of learning because learning times is reduced in an average of 40 to 60 percent. Also, delivery of content is made possible with asynchronous or self-paced electronic learning and expert knowledge is communicated and captured with good electronic learning and knowledge

management systems. Electronic learning however, cannot go without disadvantages. According to Raman *et al.* (2014), the development costs for the start-up investment of electronic learning solution can be expensive for institutions. Also, technology issues can become a factor and that includes whether the existing technology infrastructure can accomplish the training goals or whether additional technology expenditures can be modified or compatible for all software and hardware to be fully functional. Again, without proper coaching, electronic learning can be programmed to provide institutions and individuals with inappropriate learning tools which may become irrelevant to the acquisition of skills required.

Advantages of electronic learning to learners is that the use of electronic learning offers no geographical boundaries allowing individual from all over the world to complete courses or training they are interesting in. Among the advantages of eLearning is that it reduces stress and increases self-paced learning for slow or quick learners and increases the interactivity in the use of electronic learning engages learners. It also produces quick reference materials that are readily available which reduces the burden of mastery on learners. In addition, Akinsowon and Osisanwo (2014), pointed out that it provides on-demand availability of resources which enables students to complete training, tasks or reading conveniently, be it at school, out of school, off-hours or from home.

In addition to the advantages of electronic learning to students, Algahtani (2011), stressed that generally, electronic learning is flexible and can enhance the acquisition of knowledge as a result of the easy access to huge amount of information. In addition, it provides opportunities for learners to relate with various instructors and other learners through the use of discussion forums and is also cost effective. Meaning that learners do not need to travel to learn effective acquisition of knowledge or skills since learning can be acquired without the need to erect many structures or buildings. Furthermore, it

allows learning to be self-paced in the sense that each student can study at their own pace and speed. In addition to that, electronic learning allows learners to have access to instructional content and study it every time or everywhere.

While Stantchev *et al.* (2014) drew attention on the transformative potential of learning using technologies by students by recognizing that there is a strong connection between students' acquisition of technology skills in the higher education and their position in the workplace later in life, Maguire (2019), reported that the future demands learners who are skilled and digitally-aware with the capacity to take part in learning throughout their life via technologies of their choice.

2.3.4 Disadvantages of electronic learning to learners

Just as electronic learning have some advantages, it also has unavoidable disadvantages. One of the notable disadvantages of electronic learning is the face-to-face interaction which can play a lot of roles in learning and in communication. Maguire (2019) opined that electronic learning reduces social and cultural interaction which can be a drawback for learners. Although, social interaction occurs during chat and virtual classes, it cannot be compared with the social interaction in a face-to-face communication with teachers and classmates because electronic learning hides communication mechanisms such as body language which still plays a part in any learning process. Again, there are learners who are faced with technology issues such as unavailability of the required technologies to learn which may stand as a barrier for effective learning. Other disadvantages include students' phobias towards the use computers and modern ICT,

Gay (2012) emphasized electronic learning as an instructional method make learners become disconnected learners who lack relation or interaction that would allow the instructor or teacher get to know or understand them in the course of the program, adding that teaching and learning process in a face to face mode is much easier and

effective than that of electronic learning in the sense that face to face teaching method gives more room for the teacher to clarify, explain, and interpret what was taught to the students. Also, since students' assessment test or examination in electronic learning does not go through strict monitoring, students' assessment can probably be done through proxy and this makes it difficult to control or regulate bad activities like cheating.

2.3.5 Paradigm shift from traditional learning to electronic learning platforms

All the changes taking place around the world is as a result of the passage of time. This simply implies that people have moved from the time where ideas were much simpler and perspectives much straightforward into a paradigm shift where innovations have changed the world in countless ways. Abadi (2018) introduced the notion of a paradigm shift by indicating how significant advancements in scientific endeavours have become a step towards breaking the old or traditional ways of thinking and doing thing. Booth (2019) on the other hand describes how paradigms affect the way people think or see things and the technological advancement that has progressed alone side.

The word paradigm is usually associated with theories, models or perceptions (Domjan, 2010). In other words, paradigms can be seen as the way people see, perceive, or understand the world around them. In recent times, modern paradigms in pedagogy have brought in new philosophies and ideas that have changed the educational sector and this has caused a tremendous paradigm shift from a past orthodox teacher-centred classroom to a post-modern and dynamic learner-centred classroom. In essence, education and training now serve as essential strategic tools that a society requires in order to sustain a global competitive advantage and create a better standard of living or development for the citizenry.

Generally, it is necessary to explore the traditional concept of learning, which in essence is comprised of a combination of knowledge, skills, values and attitudes. Ben (2013) posited that concept of traditional method of learning assumes the teacher deposits knowledge into the passive, needy and tabula rasa (empty-headed) student. This implies that the teachers own the knowledge and can deposit it as a special favour to those who attend classes. According to Ben (2013), it is presumed that in a traditional teaching method, the teacher knows everything while the students know nothing. That is, the teacher teaches while the students are only taught. In other words, the teacher only chooses what to deposit while the students take in the deposits as given, giving that the teacher chooses the content of the programme and the students who are not consulted adapt to it, and humbly listen. This also means that the teacher is the subject of the learning process, while the students are the objects and should assume ignorance which serves as the justification for the teacher's existence. Tennyson and Volk (2015) hinted that this method of teaching hinders the intellectual growth of students by turning them into receptors or collectors of information that have no real connection to their lives, adding that teaching and learning must be geared towards more innovative and inclusive ways, hence active participation must take the place of passive learning.

Some of the contemporary educational themes that were suggested by Tennyson and Volk (2015), to complement the traditional teaching method include: Accreditation of prior certificated and experiential learning (APCL/APEL), Open and flexible learning, Lifelong learning (LLL), Widening participation, electronic learning (e-learning) among others. The traditional concept of formal education was previously assumed to be restricted to persons at a younger developmental stage (Coleman, 2011). However, this belief is beginning to change because the centre stage for teaching and learning no

longer recognise traditional classroom setting of the face-to-face mode of learning as the only medium to acquire formal education.

Now, more than ever, adults view education and training as a means of job promotion and retention (Lee & Anderson, 2017). Thus, causing educators to experience a changing clientele that increasingly involve people who seeks to re-enter the educational system while at the same time remaining in or having cycled through, the workforce (Lee & Anderson, 2017). Individuals who seek to obtain another certificate in order to gain promotion or increase in salary at their workplace would look out for educational institution that delivers the requisite program in a way that would make them not to leave their jobs or move. As a result, this has increased the development of online education delivery which provides learning flexibility in relation to when and where the learning events occur.

Though, traditional learning methods is still dominant in most higher institutions, there are however universities that are eagerly investing substantial resources in e-learning technology to improve its quality and delivering processes (Sorebo *et al.*, 2019). Some educators are worried that the presence of technology in education will demean the flow traditional education, however, Sorebo *et al.* (2019), maintained that the technological course-delivery medium is rarely the determining factor for the variety of educational outcome in terms of student perception, satisfaction and learning. Meanwhile Liaw (2018), still maintains that the great advantage of using technology in teaching and learning is that it increases flexibility where both teaching and learning can take place anytime and anywhere.

Tagoe (2012) on the other hand posited that in a contemporary university setting, there is currently a great deal of passionate rhetoric about electronic learning on the part of students, teachers and administrators adding that new generation of students are

demanding that modern technologies like e-learning be blended into their courses, alongside traditional courses that are held in the classroom. There are Institutions of higher education who are already embracing electronic learning education and have a number of students enrolled in their distance learning programs and as a result of the change in enrolment demands, many more colleges, universities and organizations are strategically adopting electronic learning education (Tagoe, 2012).

Essentially, technology has become a focus of teaching and research in the university setting and the ICT technologies used by these institutions has constantly evolved from web 1.0, 2.0, 3.0, and 4.0. As technology evolve at the brisk pace of business, so has many universities around the world adopted electronic learning technologies as the new paradigm of electronic learning (Liaw, 2018).

As it stands, students are not just part of a society that have embraced the Internet, but individuals who carry around with them variety of digital technologies right in their pockets. These students according to Tagoe (2012), can benefit profoundly from the generation of electronic learning technologies that supports their new digital reality and is adapted to the requirements of institutional policies. Electronic learning is more than implanting computers and electronic devices in schools and classes. This is because a successful education does not only lie on technology, but also on a careful planning and adoptive strategies that has been closely investigated on. Therefore, the success of electronic learning in any academic setting must start from the teacher's acceptance which in turns will initiate and promote students' utilization of electronic learning technologies in classroom (ElTartoussi, 2019).

2.3.6 Status of electronic learning in developing countries

The Internet and the advancement in ICT have significantly impacted almost every aspect of life. To top it all, the educational sector is one of the areas that technology has

considerably made a massive impact. The processes involved in technology usage goes from when students apply for admission up on till graduation which is relatively captured by institutions of learning through computer applications. In essence, the Internet and the web facilitate these technological processes irrespective of the students' geographical locations. Students' usage of social media and the Internet on the other hand have ensured that most institutions of learning blend the traditional methods used to teach and learn with technology and as such, this has the ability to transform teaching and learning processes (Ross, 2010).

Furthermore, there has been a notable increase in the utilization of electronic learning technologies even though the uptake of these technology tools is not on the same level worldwide (Mtebe & Kondoro, 2016). However, Usoro and Abid (2015), noted that there are series of ongoing projects in some developing counties that is targeted at introducing computers and technology networks in different schools of various academic institutions, adding that this is in a bid to enhance research processes, promote the use of ICT as well as to transform business practices at various levels of human endeavour. Unfortunately, most of these initiatives tend to fail either totally or partially due to some of the technological challenges some of these developing countries in face on a day-to-day basis (Ssekakubo *et al.*, 2013).

There are higher institutions in Africa for instance that have their own preferences for a certain commercial electronic learning tools that they want to adopt. Ssekakubo *et al.* (2013), indicated that WebCt (Web Course tool) and Blackboard are among the electronic learning tools that are commonly adopted notwithstanding that there are other institutions that base on open sources e-learning tools. Open-source electronic learning according to Makokha and Mutisya (2016), is an important consideration, especially in higher education in developing countries and this is simply because open-

source electronic learning platforms are often customized, cost less and without a license fee. That being said, still the utilization of these electronic learning tools remains a challenge in some institutions and this is as a result of inadequate customization, lack of guidance and teachers and learners' failure to effectively use these electronic learning applications (Wallace & Young, 2010).

Irrespective of the different electronic learning initiatives adopted by institutions in developing countries, innovation in technology is still at an infancy stage when compared to developed countries and with an interest to blend e-learning with traditional methods of teaching, some higher institutions in developing countries try to borrow best practices even though this has not succeeded in some countries because it is still challenging to customize some of the borrowed systems to the local contexts in Africa (Grönlund & Islam, 2012; Nawaz *et al.*, 2013).

Furthermore, the integration and use of electronic learning platforms in some countries, especially in Africa are still faced with big challenges despite the opportunities made available by the open-source innovations as well as the amounts of investments embarked upon by the higher institutions of some countries (Nawaz *et al.*, 2013). In developed countries, electronic learning is well established and this is due to the massive number of resources that have been invested into the education sector and bringing Nigeria particularly into this context, it will be observed also that despite the global penetration of electronic learning around the world, only few higher institutions in Nigeria have embraced electronic learning (Olatunbosun *et al.*, 2018).

In this case, developing countries, like Nigeria, are still at an infancy stage and this can be attributed to a number of challenges faced by higher education institutions which include; lack of funding, inadequate infrastructure, overcrowded classrooms among

others are some of the challenges faced by educational institutions in Nigeria (Boyi, 2019). These challenges mentioned by Boyi (2019), can go a long way in affecting the implementation of other technologies in Nigerian classroom. For instance, school's lack of funding can hinder the purchase and implementation of technology in higher institutions as well as the training required by the teachers and technical support. Again, Mtebe *et al.* (2016), illustrated the cost of acquiring, managing, and maintaining information and communication technology infrastructure as a setback to adopting and implementing electronic learning especially in sub-Saharan Africa. While this is true, the challenge faced by most students and teachers in accessing the Internet for course materials in developing countries will pose a bigger threat for the adoption of electronic learning as students and teachers most times find themselves bearing the cost for their own Internet usage and mobile devices (Yakubu & Dasuki, 2018).

Overall, the implementation of electronic learning in higher education systems in African is limited several challenges (Lwoga, 2012). One of the them is the attitude toward the utilization of electronic learning. This means that having an optimistic or positive attitudes towards electronic learning has been identified as one of the challenges to adopt or make use of e-learning systems in developing countries. Factors that probably lead to this attitude include lack of awareness or lack of motivation to existing electronic learning facilities. Another challenge is the lack of systematic approach to electronic learning integration.

As far as the world is concerned, technological innovations such as electronic learning has come to stay and this is gradually or partially replacing the traditional method of teaching in most part of the country. Therefore, electronic learning being as a complex process, the integration requirements need to be clearly defined and documented before it can be deployed and embarked upon. This challenge is a different ball game in some

higher institutions in developing countries in the sense that the process of integrating or implementing the e- learning systems often begin in the absence a proper planning and policy. This ends up accumulating recording high-level of instructional incompatibility which in turn becomes unreliable with the traditional instructional systems already in place.

As a result, higher institutions without doubt need to have clear electronic learning strategic and institutional policies that would guide the implementation process (Sife *et al.*, 2017). Again, adopting appropriate strategy that will transform higher education tend to be another challenging factor. There are institutions of higher learning who fail to integrate ICT in pedagogical activities simply because there are no appropriate or deliberate plan to support or migrate from traditional practices ICT inclined learning practices. To make matters worse, some of the learning institutions simply imitate the new technology without properly adequately analysing the institutional process and how best that technology of interest can come in and serve the purpose intended.

Again, there are universities that are merely driven to introduce ICT facilities in their institutions who at the end of the day fail to consider the pedagogical and institutional design aspects. In other words, for the transformation of higher education to take a good shape, all stakeholders from managerial, technical and pedagogical are required to review the existing structures and practices of their various institutions so as to be on course and move towards the right direction. In addition technical assistance are insufficient as some Higher Institutions in some developing countries are often faced with lack of technical guidance from experts who are skilled to handle installation, configuration or maintenance of electronic learning systems.

There are certain systems that work for a period of one to two years before they collapse and this is simply because there is no technical assistance, monitoring or support available for the institution, teachers or the learners. Meanwhile, there is a higher level of dependence on system vendors which always hinder the usage of electronic learning systems from penetrating institutions in developing countries. The technical support is very essential because it ensures the effectiveness of the electronic learning systems. Hence, there is need to consider recruiting, training as well as retention strategy to ensure that the implementation of electronic learning systems is enhanced. Again, managerial and administrative support when lacking also contributes to the challenges and this is because the support from school's administration is a crucial step towards achieving a successful integration of electronic learning as well as improving the pedagogical processes of the institution in general. In other words, administrators are saddled with the responsible of making policies and setting of rules and regulations that will guide the electronic learning users.

The administrators are to also plan for incentives and other resources that will ensure that those who adopt electronic learning systems remain motivated. Often in some developing countries, there is low interest and involvement on the part of the administrators, management, stakeholders or decision makers at the high level of higher institutions and when this crucial stop of involvement is absent, the effective implementation of electronic learning systems that would enable positive change and diffusion of innovation in higher education would also be missing (Lwoga, 2012).

2.4 Concept of Schoology Electronic Learning Platform (SELP)

In recent times, information and communication technologies have gone from being a support tool for teaching in the classroom to become a necessity within the educational

field which constitutes a basic tool for numerous kinds of work be it the industries or commerce. Essentially, more users from the educational sector that includes lower, medium and higher institutions around the world are not unrelated to these changes as learning has become diversified to include online learning tools or platforms which give students, teachers, administrators and even parents access to a whole lot of educational content and classroom materials (Sarrab *et al.*, 2016). One of such learning platforms that is gradually gaining popularity in the field of online or blended learning is Schoology.

Schoology which is a collaborative learning tool can be described as a web-based learning environment that give students, teachers and parents 24 hours and 7 days a week access to instructional materials and information via the Internet (Husamah, 2015). Schoology is offered to individuals, schools and local communities and is also considered as a free online collaborative platform that is user friendly that secures environment for teacher to student, teacher to teacher, student to student or even teacher, student and parent for learning purposes. The platform was originally designed for sharing notes and was released commercially in August 2009 but as of October, 2010, Schoology platform service according to Papas (2013), had more than 2,400 schools utilizing the system and this time, the platform has become an interactive content system that teachers can use to support course materials as well as provide substantial access to parents.

Again, the platform was further enhanced to included text message notification, Google document integration, question importer for tests and quizzes, a shared resources library, and an iPhone application (Papas, 2013). Schoology, is an electronic learning medium, classroom management as well as a social networking platform that initiates learning through online communication, collaboration and an increased access to

supplemental content and curriculum (Schoology, 2019). In other words, Schoology is an electronic learning platform that combines both Learning Management System and social networking. Schoology provides the students not only with the opportunity to do the tasks given by teacher but also avails them with the opportunity to interact with others members in Schoology network (Schoology, 2019).

From another view, Schoology can be described as an electronic platform that creates an avenue for the integration of learning tool which allows for customization particularly for individual students and their learning purposes (Irawan & Widiyanti, 2017). Schoology has the same appearance with Facebook even though it is particularly designed as a Learning Management System which is used for electronic learning activities. The similarities shared by Schoology and Facebook can be seen in the interactive features such as online conversations among users, sending or replying of messages, information sharing within the network, statuses update, among others.

However, Schoology differ from Facebook in the sense that there are features peculiar with learning management systems that are absent in Facebook (Schoology, 2014). In Schoology, students are able to submit assignments, take tests and also retain access to resources in their courses when the semester comes to an end (Schoology, 2014). Furthermore, Schoology involves two major contexts among which are the academic information delivery and interactive communication. The academic information delivery is basically concerned with the delivery of academic contents to students by the teacher. In essence, it allows for students to gain access their teaching materials, attendance records, assignments, grades, and teacher's feedback on electronically-submitted task.

Essentially, Zainnuri and Cahyaningrum (2017), claimed that as far as academic information delivery is concerned, students' academic responsibility, meaningful digest of educational content accessed and general learning success hugely depends on the level of communication between teachers and students. In other words, academic information delivery can become meaningless if the key players that is the students and teachers do not have effective communication in the process of delivery and receiving of academic instructions as well as all other academic activities that take place for the general educational purposes and progress. The second context of Schoology which is the interactive communication is capitalized on teachers' ability to create collaborative groups, assignments groups or discussion groups which can avail the students, alongside the teachers the opportunity to interaction online for teaching and learning purposes. For instance, students who are assigned to a written assignment or research can ask questions or post views pertaining to the assignment to fellow classmates online. Then the students in the collaborative groups formed can all together bring in their views or provide feedback as they deliberate on the assignment or research. The role of the teachers in the instance is to monitor these discussions and afterwards participate in the interaction process in order to provide corrective feedback on the assignment given. (Zainnuri & Cahyaningrum, 2017).

As an electronic platform, Schoology provides different instructional tools like self-paced learning, organisable lessons and threaded discussions boards, content migration and import micro-blogging among others (Sarrab *et al.*, 2016). Moran (2010) concurred and added that Schoology provides services such as attendance records, tests and quizzes, online gradebook, homework drop boxes and yet included that the platform contains media-like features that facilitates collaboration among a group, class or even the school as a whole. In addition, the platform can be integrated with existing school

reports and information systems which can provide support, filters and security that a school requires (Moran, 2010). Furthermore, Schoology can help a teacher to systematically manage instructional learning contents into folders and also create different assessments and assignments as well as monitoring student's grades and comments. Again, a teacher can also plan the learning materials and assessment ahead of time and set the time when the material will be available and or allowed to be accessed by the students. Another feature in Schoology platform which is the Calendar play the role of guiding students' self-paced learning. Hence, Schoology electronic platform manages classroom management tasks (Priyatno, 2017).

Additionally, Schoology offers the students an innate mobile learning through mobile applications that allows the teacher to manage the class on the go and also help the students engage in schoolwork in the learning environment they prefer (Schoology, 2019). Schoology as a mobile social networking electronic platform facilitates pedagogically and socially sound mobile learning and the features contained in this platform are also the combination between those of social networking platform and learning management system (Sarrab *et al.*, 2016). In essence, through mobile applications, a teacher can as well instruct, view, annotate, grade and also provide feedback on students' submissions from anywhere and with the help of reusable mobile rubrics which are flexible programming codes in mobile applications, a teacher is enabled with the capacity to assess student performance against learning objectives (Schoology, 2019).

According to Schoology (2019), the platform provides online educational networking for administrators, teachers and students in in variety of ways. For the administrator, Schoology creates an avenue where they can setup network between schools, disseminate information across school regions, provide update to participants through

web access links and supply groups with resources away from school setting. For the teacher, it creates a network between schools, allows for the dissemination of lessons, quizzes and tests, provides online information to students, and supply students with resources they can review on their own. Lastly for the student, the platform creates a network between students, allows for the dissemination of notes, allows collaboration with peers on assignments, receive feedback from one another in a controlled setting and also review additional sources of information for better understanding.

Schoology can serve as a setup network between schools' network and teachers as well as students can disseminate information across through open web access or provide online information to students without being posted on a public site, disseminate lessons or notes, provide updates, attend to quizzes, tests, receive assignments, work collaboratively with peers and receive feedback in a controlled setting.

2.4.1 Schoology electronic learning platform as a learning tool

There are two packages that are available through Schoology electronic platform and they are the Enterprise version, which a school or organization can purchase, or the Basic version, which is free (Schoology, 2019). Most popular features that can be found on the Schoology website that facilitate learning according to Schoology (2019), include; Flexible instructional tools which allows the teacher to differentiate instructional content for students with different abilities and allowing the material to be studied at a student's own pace or as a group depending on the preference of teacher. It also includes badges which serve as incentives and is used by the teacher to motivation the students. Students earn badges when they are recognized by the teachers for their outstanding activities or participation in the platform.

Another feature is the calendar which allows the teacher to manage personal and course events in the platform. This is vital as it promotes prompt functionality and communication for all the students. The calendar in Schoology provides automatic updating, and can also synchronize with other web-based calendars such as Microsoft Outlook or Google Calendar. Online grading system is also another feature which enables the teacher to make comments, mark as well as grade students' assignment without having to download or upload the grade after grading. Assignments and events are equally another unique feature that allows the teacher to create different assignments for students that include content from a hard-drive or the web.

Schoology also features Tests and quizzes that allows the teachers to also create different types of questions for quizzes and tests online. The teacher can include media to the test or quizzes thereby making it easy to personalize and differentiate tests with ease. In additions to the features mentioned above, other features schoology is known for include mobile friendly applications which extend to all Androids, iOS and other mobile devices as well as an online gradebook/attendance feature which allows the teacher to easily access saved grades from any Internet connection and with the in-program grading features, graded assignments and test can be automatically inputted into the gradebook. Also, through the use of schoology, discussions, audio and video recording are enabled to aid easy discussion/ response, creation of groups in the platform as well as recording of audio and video from a personal computer system to be used within any area in Schoology including assignments and discussions.

2.5 Concept of Canvas Electronic Learning Platform (CELP)

Canvas is a learning network that provides a platform and avenue through which teachers, students, and institutions can connect and plan their own course for academic

inquiry, personal development, and professional growth. Canvas can be described as an online learning platform for schools, colleges and universities which also enable teachers to manage their classrooms by taking attendance, uploading assignments and class files as well as posting grades while students on their part log on to check and complete assignments, view course materials and monitor their grades (Fenton, 2017).

Mendo (2018), submitted that Canvas electronic platform is a course management system used by several higher educational institutions with the aim of building a link where teachers or educators can share information and educational content with students, adding that Canvas platform offers both desktop web-application and a mobile application which is used in reviewing and checking class content, keeping tracks on pending assignments and receiving messages from a teacher. Main features of Canvas according to Mendo (2018), include access resources, assignment notifications and submissions, classification of enrolled classes, group and classmates' collaboration, among others.

Furthermore, Canvas allows a teacher communicates or remain in contact with students using announcements, discussions and conferences. The function of the announcements feature in Canvas electronic platform is to help the teacher reach a large number of students at the same time and are also useful when the teacher wants to point students to internal and external resources in the form of written content, attachments, audio or video comments. Announcements also remind students about upcoming deadlines as well as important events that may be of interest to the students. The discussion page however provides an integrated system for a teacher and their students to begin or contribute to discussion topics.

Discussions can be created to engage students in an assignment for grading purposes and can also be integrated with the Canvas Gradebook. A teacher can use discussions to follow-up on questions or conversation that began in a face-to-face classroom or online discussion group so as to test their understanding about a particular information of assignment or to allow students' debate over ideas presented to them amongst themselves in a supervised setting. Discussion can also be used by student to make input on the discussion boards in order to enhance or improve the usefulness of class sessions.

Meanwhile, Conferences can be used largely for conducting virtual lectures and virtual office activities. An educator or administrator can use conferences to conduct presentations to a large audience online, using applications such as webcams, audio or desktop sharing facilities and can equally be used by students to conduct group study sessions. A teacher can use Conferences to convey a live lecture, chat or session to the students that are not no onsite. The teachers can also connect with students for study sessions and online office hours or invite special guests to the classroom by adding them as a student or observer to the course or even use conference as a meeting room for one-on-one sessions with students in a virtual environment.

Canvas electronic platform provides a customizable design and architecture through which students can personalize their learning process according to their needs. According to Kandemir (2013), the teacher and learner can collaborate in the learning process easily with its integrated communication tools. This is because the platform allows the students to receive notifications, discussions and learning materials. Another good thing is that the Canvas platform account can be synchronized with social media accounts like Twitter and Facebook. In other words, teachers or educators in general can use Canvas electronic platform to create and customize a learning environment that is suitable for their students. Teachers at the same time can monitor the progress of the

students, give feedback and also use blogs, wikis, videos, and other learning materials in teaching and learning process.

2.5.1 History of Canvas electronic learning platform

Instructure was founded in 2008 with initial funding from the founder named Josh Coates who is presently the executive chairman of the Board in Utah, United States (Instructure, 2011). Instructure is also the developer as well as the publisher of Canvas electronic platform (Instructure, 2011). It was in February 2011 that Instructure made an announcement that they were making their leading product, Canvas and also making it freely available under an Affero General Public License (AGPL) as open-source software (Dawson, 2011). Canvas is a cloud-based learning platform which according to Canvas (2017), has numerous analytical functionalities with a comprehensive cloud-native software package developed by Instructure, an educational technology company based in Salt Lake City, Utah. Canvas electronic platform was built using Ruby on Rails and is backed by a PostgreSQL programming database within a web application framework.

Canvas as a learning platform that operates as a software service using Amazon Web Services in the Cloud and incorporates Hypertext Markup language 5 (HTML5), JQuery JavaScript and Cascading Style Sheet 3 (CSS3) programming language to provide a modern user interface (Canvas, 2017). It also incorporates OAuth which is an authorization framework that enables third-party application and this is used to provide limited access to users' information on social media sites such as Facebook, Twitter and this is done in order to enable collaboration between sites (Instructure, 2011). In February 2012, Instructure launched a learning management system platform designed for the precise needs of elementary and secondary schools known as Canvas K-12. The

platform also signs up parents in order to provide them with a more visibility into the learning experience of their word as well as to provide them with actionable analytics to administrators and teachers. In November 2012, Instructure also entered the Massive Open Online Courses (MOOCs) market through the launching of Canvas Network (Instructure, 2011).

Canvas Network allows educational institutions to outline the structure of the courses they intend to offer and how to teach these courses themselves and this development has resulted into various or different formats ranging from a smaller online course format with more interaction to a massive video lecture-based course (Canvas, 2017). While Canvas launched their iPhone Operating System (iOS) application earlier in 2011, it was in 2013 that the Android application was lunched which currently enables mobile access to the Canvas learning platform. Subsequently, the Canvas electronic platform was split into Canvas Student and Canvas Teacher and separating features for students and instructors (Canvas, 2017). Later on in 2016, Canvas launched Canvas Parent as well as the mobile application version for parents for both iOS and Android and this allows parents of elementary and secondary schools known as K–12 students to stay informed and up to date on their ward’s activities such as assignments, grades and general academic activities.

2.5.2 Canvas electronic learning platform as a learning tool

Canvas electronic platform is available online and can readily be accessed and utilized by both the teacher and students to solves and attend to various teaching and learning needs. For the teacher, Mazenko (2019), assert that canvas electronic platform allows assignments to be quickly created on the website from several places. Again, information about each assignment created for the students can be automatically passed

into the syllabus, course calendar or students grade book without any further action from the teacher or instructor. The teacher can also grade the scores of students through the use of canvas feature known as speed grader.

This allows the teacher to grade students' results faster on the platform. For the Students however, Littlefield (2018), pointed out that students can keep track of their progress in the class by attending to the instructional contents or materials given by the teacher, completing assignments promptly and by participating in discussions where information can be gained from both the teacher and fellow students. The students can also view their progress through the online grade book as the teacher permits the students to view their grades for individual assignments as well as their overall grade performance (Littlefield, 2018). As students' learning progress, the students can also choose to connect their accounts to different or multiple email addresses, text-receiving phone numbers as well as social media pages and this is done in order for the students to have more access to learning contents or materials that is relevant to their studies. In general, basic Canvas features include; variety of built-in course construction and management tool that a teacher can use to customize or create accessible teaching and learning experience. It also allows for the creation of lesson notes or course content to be shared using modules, discussion, assignments, quizzes, and pages. Through the use of canvas ELP, instructors or institutions can add learning outcomes to rubrics so as to measure and track the students learning achieving and developmental skills.

The teacher can also provide students with comprehensive feedback on quizzes and assignments submitted as well as manage grade reports in canvas Gradebook using Speed grader. Canvas also has features that facilitate real-time course interaction using chats and communication on courses, news, updates with students using calendars, announcements and syllabus. It also enables the teachers to gain better insight into

students' success and make informed instructional decision using the data provided in canvas features called Analytics.

2.6 Concept of Student Learning Engagement (SLE)

Student learning engagement can be described as the degree of curiosity, attention, passion, interest, and optimism that students show when they are learning or being taught which Franklin-Guy and Schnorr (2016), indicated to depend on the level of motivation they have to learn and progress in their education. An increased understanding of the role intellectual, behavioral, emotional, physical, and social factors play in the learning process and social development of a student, student engagement is becoming a popular construct that is holding the attention of researcher (Flynn, 2014). Gunuc and Kuzu (2015) on the other hand, defined student learning engagement as how interested or involved a student or students appear to be in their learning or willingness to participate in school activities such as attending classes, submitting required assignments or projects, and following the teachers' instructions in class.

Student learning engagement is often predicated on the notion that learning improves when a student is interested, inspired, or inquisitive, and that learning tends to depreciate when students are dispassionate, disaffected, or bored (Franklin-Guy & Schnorr, 2016). Research studies on learning have revealed connections between non-cognitive factors or skills such as perseverance, motivation, work habits, determination, interest, responsibility, self-regulation, social skills and the likes and cognitive learning outcomes such as test scores, improved academic performance, retention, skills acquisition, among others (Domenech *et al.*, 2017).

In essence, the concept of student learning engagement usually come up when educators or teachers want to prioritize or discuss educational teaching techniques and strategies

that would address the behavioral, intellectual, developmental, physical, emotional, and social factors that either enhance or undermine the learning process of students. While the concept of student learning engagement seems straightforward, it can take fairly complex forms in practice as there are variety of perspectives from which to approach the concept of student learning engagement. Flynn (2014) noted that teachers or educators might hold different views on student learning engagement which may be described and understood differently.

Some educators may interpret student learning engagement as observable behaviours like attending class, participating in discussions, listening attentively or following rules and directions, while others may describe it as a student's internal state such as optimism, motivation, enthusiasm, curiosity, or interest. Kahu (2013) described student learning engagement in four perspectives which include; behavioral perspective, psychological perspective, socio-cultural perspective and holistic perspective. According to Kahu (2013), the behavioral perspective focuses on effective teaching practices while the psychological perspective interprets engagement as an internal or highly individual process. The socio-cultural perspective on the other hand emphasizes on the significance of socio-cultural context in learning engagement while the holistic perspective links the other perspectives together. Fredricks *et al.* (2011) pointed out that there is a difficulty in defining learning engagement since it practically deals on how students behave, think, and feel and this can make it harder to conceptualize and examine literature that is labeled learning engagement.

This implies that varying views of learning engagement can lead to a plethora of concepts, definitions and measurements which may end up not helping to improve the conceptual understanding of the issues (Kahu, 2013). Fredricks *et al.* (2014) however suggested that learning engagement should be viewed as a multidimensional construct

or meta-construct that involves three generally defined dimensions; cognitive, behavioral, and affective which can be measured either with the use of questionnaire, self-report, teacher rating, interviews or observation. While, Fredricks *et al.* (2014,) describes Cognitive engagement as how much effort a student is prepared to invest in learning a class content or mastering a skill, behavioral engagement is concerned with a student's participation in academic or extracurricular activities which is believed to be essential in keeping students in school and helping them achieve desirable academic outcomes. Meanwhile, affective engagement relates to positive or negative feelings that are related to the teachers, classes or classmates.

In essence, behavioral engagement is found within the psychological perspective and can be viewed in three forms; involvement in academic activities, positive conduct and participation in extracurricular activities (Fredricks *et al.*, 2014). The concept of cognitive engagement on the other hand focuses on two aspects which includes students' putting in their time in learn and making use of strategic learning tactics to ensure they retain what was learned. This aspect of student learning engagement, according to Fredricks *et al.* (2014), moves past external actions and looks at psychological investment of mental energy toward learning. Affective engagement, also referred to as emotional engagement is the final type of engagement within the psychological perspective and it focuses on student attitudes toward education and these attitudes may include feelings of happiness, sadness, boredom, interest, among others anxiety. (Fredricks *et al.*, 2014).

Conner and Pope (2013) concurred and pointed out that by looking at the presence or absence of the three basic forms of engagement which includes; cognitive behavioral and affective, it is possible to get a better understanding of the various ways that students may be engaged. From these perspectives highlighted, it can be concluded that

a student is either cognitively, behaviorally or affectively engaged in a learning process, or not, even though Conner and Pope (2013), maintained that these forms of engagement are graduated and fluid.

This implies that students may have different levels of engagement may likely change over time depending on the pedagogical approach employed in a teaching and learning process or the learning environment be it a face to face or online environment. Essentially, Flynn (2014), pointed out that seven principles of good practice in undergraduate education, which include cooperation among students, active learning, prompt feedback, emphasis on time on task, communication of high expectations, respect for diverse talent and ways of learning are instrumental when focusing on activities of students, faculty and administrators to tasks that foster student engagement and produce desired learning outcomes.

2.7 Students' Perception of their Learning Environment

Learning environment refers to the various contexts, physical locations and cultures in which students learn and this encompasses how students interact with and treat one another, their ethos, characteristics, as well as the instructional strategies a teacher chooses to organize an educational setting to aid learning (So & Brush, 2017). In essence, learning environment can be described as everything ranging from face to face mode of instruction or online classroom, department, faculty, or university as a whole. Since the qualities or features of a learning environment is determined by a variety of factors, teaching and learning structural settings, policies and other features may also be considered as elements of learning environment (Jamson, 2018).

Learning environment according to Lizzio *et al.* (2012), affects students' achievement, happiness, motivation, and success. This means that the quality of the learning

environment is suggestive to influence the effectiveness of the students' educational program. It also implies that student perception of their learning environment is significantly related to the quality of their learning experiences which can also affect several other variables such as students' cognitive and affective outcomes (Lizzio, *et al.*, 2012). To this regard, Student perception of instructional strategies in any learning environment will provide teachers with a wealth of information about students' learning experiences (Higgins *et al.*, 2014). Although, as a whole, educators need to spend more time mining the information gathered in order to better understand students' perceptions of their learning experiences (Higgins *et al.*, 2014).

The education system is changing more than ever and new methods and techniques are being implemented throughout the educational system around the world. Modern education according to Jamson (2018), is not necessarily against any traditional values of teaching but rather alters them to suit the present reality which is leading to novel approaches both in the process and forms of teaching and learning. An essential part of identifying the proper teaching methods or techniques that will improve learning can partly be obtained from students who provide valuable feedback and information through their learning outcomes and this will help indicate whether whatever method or technique adopted by the educator or teacher in a teaching environment or setting has been effective or not (Lowenthal *et al.*, 2015).

As the educational process evolve, technology progress as well, bringing about computers, Internet, and many other multimedia devices that are presently prevalent in modern education. Some higher institutions have adopted a blended learning approach to deliver their course content which is a combination of traditional face to face teaching with e-learning resources while other educational institutions singularly offer electronic learning courses for distance learning students. This according to Ong and

Lai (2006), has become a popular approach as it provides learners with greater flexibility and increases their accessibility to a wide range of teaching and learning materials to support their learning.

However, with the growing pressure to provide more technological learning options to learners, it is essential to consider student perception towards this shift away from the traditional face to face to e-learning instruction delivery and as educators look forward to new and better ways to be more efficient in order to support learning network that guide and encourage students' thinking. Student perception about what will improve their chances of success in a learning environment is likely to have a strong influence on the behaviours of students (Jamson, 2018).

Over time, it has been raised whether teachers should focus on academic outcomes in EL without considering the social and psychological aspects of the student in a learning setting. To this regard, Sweeney and Ingram (2011), indicated that students who excel in a face to face environment may do less well in EL or vice versa, auguring that this could be attributed to social or psychological attributes of a student such as inquisitiveness, expressiveness, risk taking and increased social connectedness with other students and teachers in a learning environment. Treleaven (2013), noted the importance of the social setting in learning environment, auguring that EL has been criticized of being less social, lacking verbal clues, social presence and social interaction or collaboration when compared to face to face and since human interaction enriches the learning process, this loophole may as well influence students' participation or perception of connectedness with others.

Social presence can be explored by examining a variety of constructs in a learning environment which may contribute to the interaction of the students in the classroom.

Bali and Liu (2018) define social presence as the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships. This simply means the extent to which a person or student is perceived as real in a mediated communication. In essence, the capacity of the medium to transmit information about facial expression, posture and nonverbal cues all contribute to the degree of social presence of a communications medium. In a traditional face-to-face interaction, however, people or students are able to exchange a range of nonverbal cues such as facial expression, posture, direction of gaze and physical presence. In an EL environment, on the other hand, the social interactions tend to be unusually complex and this is because of the necessity to mediate group activity in a text-based environment.

Salmon (2014) stated that social interactions are often described by one's perceptions of presence of others in an EL and argued that the importance of social presence in an EL environment is to cultivate and build a successful communication which has a direct link to cognitive presence. Kemp and Grieve (2014) on the other hand is of the view that social presence is essential as it would help to increase the communication be it in a traditional and electronic classroom, adding that when the social presence is low, it means the interaction in learning will also be low. On the other hand, when interaction is built, students would be able to work collaboratively, share and develop their interpersonal skills which will guide them into clear objectives and understanding of the task ahead of them as well as the accomplishment of that task at hand (Swan & Shih, 2015).

Kemp *et al.* (2014) illustrated that aside social presence, interaction and collaboration is another important component of teaching and learning experiences in an EL environment. This implies that interaction that uses the social aspect must be applied in

an electronic learning environment in order to improve student learning by way of enhancing students' knowledge. Even though, perception of students towards their EL according to Makumane (2021), could be mired by lack of equity in Internet availability, lack of interest among the students to learn, poor learning environment, lack of traditional way of direct interactions, lack of access to Internet, slow internet connection, digital divide between students who have ready access to Internet and computers and students who do not, technical issues, device issues, lack of follow up by Instructor among others.

In spite of this, Spears (2012), still reiterates that the social interaction is fundamental as it explains the relationship between social presence and social learning theory. Fundamentally, when social interaction becomes part of the classroom dynamics, the classroom becomes an active place (Spears, 2012). And social interaction in learning which is very crucial in the learning environment of students may as well provide and support productive and meaningful learning for the students. Despite the popular belief that learning online is task focused and isolated, students who learn in an electronic learning environment still need social connections (Kreijns *et al.*, (2017). And since social presence and social interaction are imperative components of EL, the focus of student perception of electronic learning environment as regards to Schoology and Canvas ELP in this research was form based on the construct of social presence and social interaction.

2.8 Theoretical Framework

This study which is centred on connectivism and social constructivism are based on constructive and communal knowledge building, where students who are the key actors in a learning process create new knowledge through collaboration and active

participation. In other words, as the students depend on what they perceive and interpret while learning the web design concepts introduced, it is expected that schoology and canvas electronic learning platforms would facilitate their constructed knowledge and possibly reinforce them to partake in more task-oriented activities through assimilation process. In line with this assumption, a theoretical model of Connectivism and Social Constructivism which presupposes that this study could be related to contribute in justifying whether or not students' academic achievement would be enhanced using electronic learning platforms is shown in Figure 2.2.

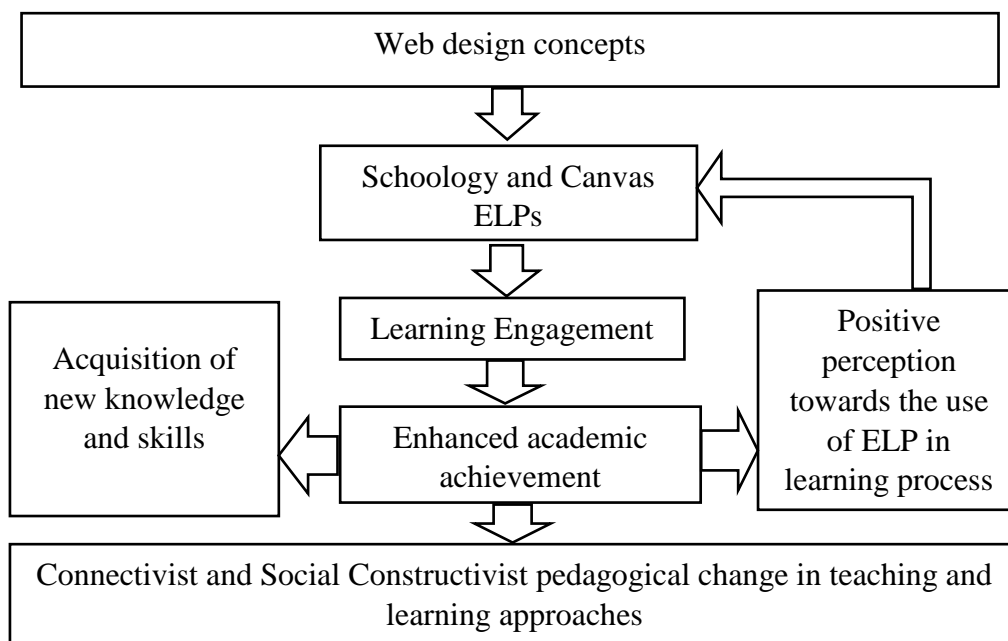


Figure 2.2: Theoretical Model in line with Connectivism and Social Constructivism

Source: Researcher (2023)

From the theoretical model in figure 2.2, it is presumed that the electronic learning platforms introduced as a medium for learning web design concepts would not only engage the students in learning process but also facilitate active contribution to new shared information on each lesson delivery. As a result, this would likely enhance their academic achievement and pave way for the acquisition of new knowledge and skills which is established through the adoption of schoology and canvas ELPs for teaching

and learning. Since the aim of this study is to enhance students' learning outcomes, and following the presumptions of connectivism and social constructivism theories, it would be correct to posit that the enhancement in the learning outcomes of students' through the integration of electronic learning platforms would bring positive changes in students' perception towards learning web design concepts as well as a change in the old narratives of teaching and learning into modern approach, that is, moving from teacher-centred approach to student-centred approach as is purported by connectivism and social constructivism theories.

2.8.1 Connectivism theory

Connectivism is a learning theory that was developed by Siemens (2004). Connectivism discusses the inadequacies of learning theories such as Constructivism, Behaviorism and Cognitivism and also dwells on how connectivism as a theory is related to technology. This theory is concerned with the influence technology has on the society and therefore focuses on learning and educational pedagogy shift on the use of technology. Connectivism theory is not interested in individualistic learning rather it takes a look at learning through participation within communities of practice (Siemens, 2004). In other words, Connectivism is about making connections between people and with technology. Connectivism is often called a learning theory for a digital age which seeks to describe complex learning in a fast changing social digital world.

The speedy development of technology has made the world seem like a small village, allowing people to exchange their knowledge and experiences from their homes and offices just by using small equipment called technology. This thus, makes the work of an educator or teacher easier and more effective (Downes, 2007). This theory explains that learning occurs through connections within networks and the learning or knowledge

which is transferred is as a result of the growing personal networks where sharing with a group of people is made easier as a result of technology. This way of exchanging and transferring of knowledge pedagogically is becoming much more useful because it is treated more as communication and by this continuously communication with a large number of people in a network, new information is acquired and further processed (Kop & Hill, 2008).

Kukla (2010) opined that learning is a knowledge creation process and not only for consumption, adding that learning happens in many different ways among which includes through conversations, web search, courses, email, communities, emails, reading blogs among others. Connectivism support a generation that learn, work, entertain and express themselves through online platforms like LMS, YouTube, Google Talk, Flickr, and Facebook among others. This means that social context provided by Connectivism is a way of learning under a collaborative framework.

These collaborative frameworks according to Downes (2007), includes; collection which allows for organize resources, store data, filter information and create new contacts. reflection which allows an individual to think critically, choose and review information as well as set up new learning routes, connection; which includes an instinctive form of working groups that allows one to integrate oneself into existing learning communities, share learning values, objectives and attitudes, link information, and publication; which involves editing of content in a large variety of formats, sharing learning experiences and converting collaborative tools into cognitive tools.

Siemens (2004) outlined eight core principles of Connectivism and they are follows; Learning and knowledge lies in diversity of opinions, learning is a process of connecting knots of information sources, learning also reside in non-human appliances,

capacity to know more is more critical than what is currently known, nurturing and maintaining connections is needed to facilitate continual learning, ability to see connections between fields, ideas, and concepts is a core skill, accurate in knowledge is the intent of all connectivist learning activities and decision-making in itself a learning process. That is, choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality.

2.8.2 Connectivism in electronic learning (EL)

Connectivism is based on the principles that state that learning is not acquired or gained, rather, it is distributed across a network of connections, built, and grown (Downes, 2007). Enabling interaction, collaboration and social learning in EL is an important part of teaching online and this implies that by learning together in learning community, students have the opportunity to extend and deepen their learning experience, test out new ideas by sharing them within a supportive group, and receive critical and constructive feedback (Anderson, 2008).

Furlong and Christenson (2018) is particularly interested in how instruction changes when knowledge is transferred via networks and a network in this context implies a multidimensional connectedness, as opposed to sequential flow. That is, flow of information directly from teacher to students. In a classroom context of multidimensional connectedness therefore, it implies that students are learning online as well as using online resources which sums up to multiple modes and nodes of information to learn and grow. It is important to note that e-learning courses require someone to create and manage the interactions, however, it does not necessarily require a single source of content or instruction and this is simply because so much of the

information which used to be transferred by the teacher through instruction can now be accessible online by the students.

In essence, e-learning has become a medium which provides the learner with new links to the world instead of continuing to funnel all educational programs through the teacher. In the view of Siemens (2004), learning in the digital age is no longer defined by individual knowledge acquisition, retrieval, and retention rather through interaction with a variety of knowledge sources which includes the Internet and learning management systems, adding that the power of learning through networks is precisely because it demands collaboration and a communal form of knowledge building.

Furthermore, in a connectivist learning environment, learners are not passive learners but are required to be active in the process of knowledge acquisition as they participate in the search for information, discussions, and exchange of opinions with their peers. To this regard, knowledge is co-created and shared among peers and not owned by one particular learner after obtaining it from the course materials, through other links or the teacher. In essence, the learning process creates a bond among and between learners as their knowledge construction depends on each other's contribution to the discussion. Thus, collaborative learning processes assists the students in developing higher order thinking skills and also to achieve richer and a well-informed knowledge through shared exploration, shared goals and a shared process of meaning making.

2.8.3 Social constructivism theory

The first approach to social constructivist learning is the collaborative model and while there is an argument as to whether social constructivism is an actual form of constructivist learning or an offspring that is closely related to the constructivist model, the heart of the collaborative or cooperative model of social constructivism nevertheless

underlines the impactful role of social intercourse in the learning process (Schell & Janicki, 2013). Social constructivism is rooted in the work of Piaget (1972), which stresses on the role collaboration and interaction with the environment as well as the learner's peers and others play in the cognitive development. Social constructivism in other words places emphasis on dialogue, as a means through which ideas are considered, shared and developed. Electronic learning as a means through which social construction may occur, allows students and teachers co-construct knowledge through social processes and this can be done through discussion boards, audio, video, or text chats, video conferencing, blogs, among others. This form of learning is considered a necessity given the type of students populating the present educational institutions who are tech-savvy and depend heavily on online social networking to communicate with others and to access the latest information and trends.

In an electronic learning class, interaction between students and teachers occur electronically and therefore it is expected that students would need to interact through discussions which would also involve the entire class, be it in small groups or in pairs. One principal notion of constructivism is that knowledge is subjective and this is because people construct meaning based on their relationships with the world and this explains why each individual learner imposes meaning based on his or her own experience. Social constructivism focuses on the social phenomena that occur when conceptual schemes are transmitted by means of language and from a social constructivist's view, knowledge is not constructed rather it is co-constructed. In other words, knowledge is created when it is shared. The constructivist perspective therefore calls on instructional designers to make a radical shift in their thinking and to develop rich learning environments that would help to translate the philosophy of constructivism into actual practice (Carwile, 2007).

Assessment in a social constructivist course helps to provide added opportunities for student involvement. To this regard, students can work with their fellow students in order to evaluate one another's work, which is expected to help the students foster an understanding of the content given by the teacher.

2.8.4 Social constructivism in electronic learning (EL)

Social constructivist theory provides a foundation for electronic learning platforms which enabling courses to be taught online. In other words, electronic learning platforms are designed with the aim of allowing the student and teacher to co-develop the dialogue of the online environment. In line with this, social constructivist theory focuses on learners as active constructors rather than passive recipients of knowledge and when assignments are designed for completion by collaborative teams, the objective is for students to learn from and with each other. This instructional approach is called collaborative electronic learning (Kukla, 2010) and can be described as constructing knowledge, or solving problems through mutual engagement of two or more learners in a coordinated effort via the use of Internet and electronic communications.

Doolittle and Camp (1999) offered that the following factors are essential to constructivist online pedagogies: Learning should involve social negotiation and mediation, teachers primarily serve as guides or facilitators of learning and not instructors, learning should take place in authentic and real-world environments, teachers should encourage multiple perspectives and representations of content, skills and content should be construed within the framework of the learner's prior knowledge, students should be measured formatively which will inform future learning experiences and students should be encouraged to become self-mediated, self-regulatory, and self-aware.

Electronic learning platforms supports co-intentional education and social constructivist theory as the component that creates a platform that encourages all participants to play a role in the teaching and learning process (Kukla, 2010). Through the use of interactive discussion, teachers can move from being the source of knowledge to being the role model, influencer, or moderator and students on their part will be engaged in a deeper reflection of their existing knowledge (Kukla, 2010). Within such a proactive environment, the teacher is no longer seen as the sole authority figure and Successful ELPs take advantage of this impression by making students the focus of the online learning environment. Furthermore, by emphasizing the interactive nature of online teaching, the use of effective electronic learning platforms will help maintain a high level of enthusiasm for learning (Freire & Paulo, 1997). In essence, by having social constructivism serve as a foundation, electronic learning developers provide a variety of synchronous and asynchronous platforms upon which teachers can develop a class that appeals to the broad spectrum of the population that encompasses divers' learners.

Incorporating learning technologies such as small group and whole-class forums or blogs and live chats can foster the interaction of student and ingenuity and course content with a student-centered approach, that is, discussion modules, would allow students' play active roles in their own learning experiences (Lewis & MacEntee, 2005).

2.9 Related Empirical Studies

2.9.1 Empirical studies on the effects of ELPs on academic achievement

The dawn of technology and electronic learning platforms is believed to offer an autonomous learning space that tries to facilitate learning through communication among students and teachers. This new environment for learning which centres on

electronic networks has allowed students in universities to obtain individualized support (Gay, 2012) and also to have learning schedules that work for them and is separate from other learners. This construct has therefore made electronic learning a very promising educational technology tool (Liaw & Huang, 2017). Over the years a plethora of studies have tried to examine the benefits and the all-encompassing impacts of the electronic learning. While some other studies did not observe any significant impact brought about by electronic learning platforms Coates *et al.* (2015). According to Coates *et al.* (2015) an elaborate dumping of large amounts of text, audio and video into a website is not sufficient to make the site adequate in improving teaching and learning. Meanwhile, Kistow (2019) disagrees by claiming that electronic learning platforms have instead increased teamwork and collaboration among the students.

Dang and Robertson (2010) carried out a study investigating Vietnamese EFL (English as Foreign Language) students' reflection on Schoology electronic learning platform. The sample size of the study was 562 undergraduate students from four universities across Vietnam. The study looked at the extent to which the interaction between Vietnamese EFL undergraduates and a web 2.0 open-source Moodle site during a 16-week course contributed to the students' ability to initiate, monitor and evaluate their learning processes. A Likert scale survey of 62 items was used as well as a semi-structured interview to collect data. The study used a retrospective method which asked participants to talk about the experiences using the platform and the questions elicited the students' behaviour to provide answers relating to their ability to initiate, monitor and evaluate learning process.

The classes used were classes that consisted of course administration, sharing learning experiences, improving listening skill, improving speaking skill, group presentation and tests. Dang and Robertson (2010) reported that after carrying out the study among

undergraduate students in Vietnam, learners achieved higher level of autonomy in EFL using the Moodle. Result also showed that the platform supported students initiating their learning process but not in the same level for all the students. It also showed that there was an increased level of participation in learning activities and communication and information gathering was encouraging. However, the Moodle platform did not increase students' habit to study consistently and was limited to mainly the male students in the study. Dang and Robertson (2010) concluded that the course assessment, individual learning style and preference to teaching mode may have caused that, pointing out also that training in electronic platform is still limited in the context of Vietnam where Internet broadband was still at the infancy stage. Recommended was that empirical research should be conducted to document students' capacity in socialization and academic activities.

This recommendation is relevant to this study because it is not only focused on gathering data using Likert scale but was also experimental by comparing the academic achievement of students who were taught learning content using electronic learning platforms to students taught using traditional method of teaching. The research of Dang and Robertson (2010), however did not provide measures as to how students learning were initiated, monitored and evaluated since the instrument used was a Likert scale and semi-structured interview.

It did not also indicate how the result of students who performed better was measured since the performance of the students was not compared with another teaching method by another group of students or previous scores. This present study was an improvement on that aspect and was not held back by the infancy Internet broadband limitation experienced by this study as at the time it was carried out.

Tegegne (2014), carried out a study on the influence of electronic learning on the Academic Performance of Mathematics Students in Fundamental Concepts of Algebra Course. The aim of this study was to evaluate the influence of electronic learning on the academic performance of 2012/2013 session second year mathematics students in Jimma University, Ethiopia in fundamental concept of algebra course. While the study was a quasi-experimental design, students were categorized into three performance levels; slow, average and above average and these students were randomly assigned into experimental and control group. The sample of the study was 144 students in which 75 formed the experimental group and 69 formed the control group. A pre-test was conducted before the start of e-learning for both groups. While Moodle was used as a treatment, students were also administered questionnaire to acquire information on the challenges they encountered while using the platform.

The data collected was analysed using descriptive and inferential statistics via SPSS package. At pre-test the result obtained showed a mean score of the experimental and control groups to be 21.61(SD=7.731) and 18.63 (SD=5.873) respectively. Whereas, at post-test the T-test result revealed the mean scores of the experimental and control group to be 22.36 and 22.80 respectively at $P=0.724$, which indicated no significant difference between the two groups. It was observed from the result that the performance of the experiment group after the treatment decreased and this happened especially when there were several other factors challenging the e-learning modality exercised during experiment sessions.

Tegegne (2014) pointed that among them includes students' ineffective use of the computer and also indicated that lack of basic knowledge and skills to handle technology on the part of the experimental group needed more time independent of the experiment time as during the course of the study teachers had to assist the students to

complete their tasks in the study and when the students were on their own to make use of the platform without assistance, it led to frustration. Recommendation given was to have the experiment repeated and this should be after measures to take care of students' computer skill are addressed. This incompetence in handling the tools for learning in this reviewed study is a drawback which this present study would improve on. Students are meant to study materials in their platform at their own pace which is one of the advantages of using electronic learning platforms.

Students are also supposed to reflect and discuss on the ideas shared by their peers in the discussion forum so as to solidify the knowledge acquired and this was lacking in the reviewed study. This is why the recommendation becomes relevant for this study. Students were oriented on how to use the platform before the study and the platform has to be computer and mobile friendly so that students do not have to rely on their teachers for assistance when they are either in or out of school but should be able to access their instruction on the platform through any device wherever they are as well as get prompt feedback and not miss out in learning with their peers.

Alhothii (2015) investigated the impact of using Moodle as a learning tool for students in an English language Institute. The research tried to gain practical understanding of the benefits of learning English through video sharing tools found in Moodle. All students from level one and two elementary levels were used and randomly assigned into the Moodle and traditional method of teaching. The result obtained was measured for comparative analysis, students' performance, skill improvement and staff impression. A total of twelve (12) students in the first part of the study and a total of twenty (20) students in the final part of the implementation were used and as a result the study made use of case-study descriptive design because of the small number of students that were used in the study. A qualitative and quantitative was used in

gathering data for the study. Questionnaire was used to gather responses from students on rating the impact of the Moodle for English learners and all responses were represented in on percentile scale and the skills focussed on were on English and computer skills. Most of the questions were open-ended questions and findings were mixed across categories. Form the results obtained, 70% of the students said they have experience using Moodle, while the other 30% said it was a new experience. While 90% of the students said the platform helped them get organized with less or no supervision, the other 10% said it did not. 100% of the respondents said the liked using the platform and while 60% used the platform to send messages, lower scores were recorded in the amount of interaction.

This according to Alhothii (2015), could be attribute to the fact that Moodle as a learning tool is an unconventional way of learning and the students and the students were more conversant with the traditional method of teaching and learning. Recommendation was therefore to more of electronic learning tools in schools. This study reviewed was geared towards using video as one of the features in electronic learning platforms to enhance students' skills. This review differed from this study in the use of quantitative and qualitative study and in a different electronic learning platform.

This study was focussed solely on experimental study and not a case-study. This reviewed study however did not state how students' performance was measured with the approaches used. Again, the size of the study was relatively small to be used for generalization. This study is though relevant to this present study because it improved on using not just a description approach to determine students learning performance but also used an experimental design to measure students' performance and level of engagement.

A similar study was conducted to determine the effect of blended learning on EFL students' Vocabulary enhancement using Canvas electronic platform. The study was carried out by Tosun (2015), and the aim was to investigate the effects of blended learning strategies in teaching vocabulary and the students' perception of blended e-learning strategies. A homogenous sample of 40 intermediate students from two intact classes who were studying intensive English at a prep-school in Turkey formed the sample size of the study. Twenty (20) students who formed the experimental group studied the vocabulary items through blended learning strategies while the other 20 in the control group learned the same vocabulary through traditional method.

The instrument used in the study included a paper-based test of 20 multiple choice question which was taken as a vocabulary quiz at pre-test by the participants both the experimental and control groups and after the instruction, mid-term examination was utilized as post-test test to the participants. Also, interview was granted to eight participants of the study in order to investigate their perception about learning using the electronic learning platform. The study lasted for six (6) weeks and the data collected was analysed using independent T-test. The result at pre-test includes the following; experimental mean=52.5; SD=15.686, control group mean=49.75; SD=17.112, which showed a significant difference.

The result at post-test on the other revealed the following; experimental group $m=5.65$; $SD=2.207$, control group $m=5.25$; $SD=1.970$ and from the study, based on the obtained p (0.549) which is greater than 0.05 level of significance, it indicated that there was no significant difference between the two groups. This result simply indicated that the blended electronic learning taught using Canvas ELP did not improve the vocabulary knowledge of the students. Tosun (2015) however stated that the students were satisfied with the electronic learning but still preferred to learn the vocabulary in a traditional

based classroom. Tosun (2015) in his study used two different test instruments for pre-test and post-test. It could be possible that this also affected the scores obtained by the students and not just their preference for traditional method of teaching only. Again, while the sample size of the study was small, all the participants in the study should have been interviewed to ascertain their perception of the platform and not just a selected few.

Enhancing College Students' Proficiency in Business Writing via Schoology was a study carried out by Sicat (2015), and the aim of the study was to determine the effectiveness of Schoology ELP as regards to enhancing the proficiency of the college students in business writing. This experimental design involved one hundred thirty-five (135) college students enrolled in Communication Skills at the Centro Escolar University, Makati City, Philippines who formed the sample size.

A 50-item teacher-made achievement test, validated by experts in the field of English language teaching was used as the primary instrument of this study. While the students in the experimental group were asked to login using Schoology platform to access their learning materials, the control group were taught using traditional method. The study lasted for three (3) weeks and the analyses which was done using T-test revealed that the control group had a mean score that was slightly higher than the experimental group who used Schoology electronic platform. While the control group had a mean score and standard deviation of $m= 30.85$, $SD= 4.360$, the experimental group had a mean score and standard deviation of $m= 30.46$, $SD= 4.959$.

The slight difference that was obtained in favour of the control group according to Sicat (2015), suggests that the students cannot depart entirely from the influence of traditional teaching as most of the participants are still dependent on the direct instruction provided

by their teachers in the classroom and since Business Writing involves various topics that need more elaborate discussion the assistance of the teacher is greatly needed. Again, Sicat (2015), posited that traditional method might have been preferred by most of the students to the modern methods of teaching such as the use of the Schoology platform and this could probably be due to the kind of the topic being discussed. Recommendation was to use more activates and exercises sustain students learning. In this study, Sicat (2015) opined that traditional method of teaching may have been preferred maybe because the features in the platform was not probably utilized.

There are features such as video, audio, text, additional learning sites, links and avenues for discussion that would have allowed the students gain greater understanding more than the traditional method teaching and to add to that, the three weeks was too short for the students to learn, take a pre-test and a post-test too. This study may be similar to the present study in the use of Schoology electronic platform but different in scope, sample size, location subject and instrument. Also, the absent of more activities and improper utilization of the features embedded in Schoology electronic platform is a pointer for this study which was improved on as recommended.

Another study was conducted on the effects of blended learning on critical thinking in a high school Earth Science class by Borglum (2016). The study adopted the Classroom Test of Scientific Reasoning (CTSR) by Lawson (1978), to measure the students' critical thinking skill. The sample size of the study was 133 students of the Waverly-Shell Rock Senior High School. These students who formed the experimental group were enrolled in Canvas electronic platform and were expected to use the features therein which includes the online receiving content electronically, calendar, completing and submitting assignments electronically and using the collaboration tools like Google Docs to work on summative projects, assessments and feedback.

The control group whom were taught using the traditional method still had access to technology and the Internet for research but did not have access to Canvas electronic platform. After the data was collected, it was analysed using T-test and the result revealed that the mean scores for the treatment group were 13.50 while the mean scores for the control group were 13.05. This indicated a difference of 0.44 which was regarded not significant ($p = .66$). The result according to Borglum (2016), implies that while technology gets a lot of attention, it does not necessarily correlate to students' critical thinking skills. This study is related to this present study in the use of canvas electronic learning platform; however, it is dissimilar to this reviewed study as it pursues to enhance the students' learning achievement with not just the use of Canvas but also with the use of Schoology ELP.

The result of the achievement test on another study was analysed using t-test statistics which revealed that students who used Schoology performed better with a mean score of $m=72.$, $SD=10.308$, Compared to the control group who had a lower mean score of 45.35 , $SD=8.033$. This study was carried out by Abdellah (2016) on Schoology ELP and the aim of the study was to develop EFL (English as Foreign Language) pre-service teachers and reduce their writing anxiety using Schoology ELP. The instrument used in the study included an achievement test and a scale of writing anxiety.

These instruments were validated by experts before use. furthermore, while the sample of the study comprised of 93 female students of the general diploma program at Taibah University, Saudi Arabia, the students were randomly assigned 43 and 40 respectively into experimental and control groups. The result of this study thus reveals that there was a statistically significant difference in the two groups. What this means in essence is that while the students in the control benefited from the course taught, the students in the

experimental group who were taught using Schoology benefited more which reflected in their higher mean score.

It was suggested that studies meant to develop practical skills be done using schoology ELP with the teacher monitoring their progress at every step. It was recommended that using electronic learning platforms should be part and parcel of instructional process and for all discipline at all educational stages. This study is similar to this one under study as it also made use of schoology ELP to determine students' academic achievement. It is also relevant because it aligns with the suggestion made that schoology should be used to develop practical skills, and in this case, web design requires hands-on practice and is a course in the right direction with the use of schoology as a teaching tool.

Alexander (2016) in his study concluded that flipping the classroom through the use of Canvas electronic learning platform provided stronger partnership among students. This assertion was made by Alexander (2016), who conducted an experiment on flipping one-shot library instruction using Canvas ELP and Pecha Kucha for peer teaching. The study sought to determine whether flipped classroom facilitated health science students' ability to find, evaluate and use appropriate evidence for research assignment using canvas ELP and Pecha Kucha. Five classes, with a total of 175 students were used for the study. While Canvas ELP allowed students to collaboratively learn health science concepts online, Pecha Kucha which is a Japanese presentation image style was incorporated and was used to show the students several images one at a time for several seconds.

The purpose of the presentation is for the students to focus on finding images that would enhance their presentation for appropriate research. The result of the study revealed that

students whose classroom were flipped using Canvas ELP performed better than the students who were taught through the use of lecture-based method. Alexander (2016) concluded that this result was because each course session was modified to meet the inclusive need of the students. Also, students were required to deliver a presentation to their peers which made them become more invested in the content than in the lecture-based method.

The strong partnership posited by Alexander (2016) which was exhibited by the students who used canvas learning platform is relevant to this present study. This is important to this study since students are expected to take the lead in their learning activities so as to ensure that they get engaged in order to enhance their academic achievement in this present study. Just as flipped classroom was a strategy used in the study reviewed to promote partnership among the students, this present study differed by using engagement strategy. To achieve that, the teacher presents the subject and allow the students to deliberate and share their ideas and information together on the topic through the discussion forum. Plus, the students got to learn wherever they go using their mobile phones which is mobile user-friendly.

Impact of software Moodle on English learning was carried out by Feizabadi *et al.* (2016). Thirty-two (32) students were selected using random convenient sampling method for this study. Quasi pretest, posttest, control group design was used. Six weeks was used expose the experimental group and the students attended classes simultaneously by using video conferencing and teacher on the other hand communicated with the students at the same time via Internet interface and provided them with necessary training. The students in the control were taught within the same weeks but using the conventional method. A validated test instrument containing 30 test questions was used. The data collected was analysed using descriptive statistics, mean,

percentage, standard deviation and inferential statistics (ANCOVA). The finding of the study revealed that Moodle has positive impact on students' English course although there was a no significant difference between the achievement scores of the two groups. The limitations encountered according to Feizabadi *et al.* (2016) included lack of computer equipment and lack of cooperation between students and teachers. Institutions are recommended to integrate programs with computer and Internet so that teachers and students can have easy access to their learning materials that could promote their learning.

This present study seek to improve on the study by using schoology and canvas electronic platforms that supports students learning either through the use of their phones or system so that the challenge of limited computer would not be a hindrance for the students and since most of the youths in Higher Institutions find the use of phones as their second nature due to the need to stay connected with their friends, therefore using the so medium to keep them connected with their classmates in learning would help take care of their lack of cooperation among parties involved in the teaching and learning process.

In another study Irawan and Widiyanti (2017), reported an experimental study using Schoology and the aim of the study was to determine the difference in learning outcome between blended learning based on Schoology and problem-based learning. The research design adopted was quasi-experimental non-equivalent control group design. A sample size of 64 students in a vocational high school in Indonesia were randomly assigned into experimental and control groups. The control group was given teacher written feedback on their writing drafts while the experimental group were given electronic feedback on their writing drafts. The instrument of this study was Writing Test (WT) which consisted of 40 multiple-choice items which was the test used in the

study. A questionnaire was used as research instruments in the study. The validity of the instrument included the contents of validation and construct of validation. The data collection procedure consisted of two types of writing tasks and each participant were asked to write argumentative essays within approximately one hour.

The data analysis of this study used include test for normality with One Sample Kolmogorov-Smirnov method, test of homogeneity with Levene Test method, and hypothesis test by using Two Way ANOVA. The result obtained revealed that the learning outcome of the experimental group who made use of Schoology ELP scored higher with a mean score 82.50 when compared with the students in the control group who had a lower score of 72.50. This implies that there is a significant difference between the students who were taught using Schoology and those taught using the traditional method. Irawan and Widiyanti (2017) explained that Schoology was proven to improve the learning outcome better than the problem-based learning because Schoology was able to increase the activity of the students outside school hours and allowed the students to explore the material either with their peers online as well as individually and independently.

Irawan and Widiyanti (2017) concluded that Schoology as e-feedback is good only if the facilities and infrastructure were adequate and always connected to the Internet which can pose a hindrance to students learning. Irawan and Widiyanti (2017) also suggested that students are expected to actively search for various sources of independent study outside school period and do not depend on the teacher entirely to increase their knowledge. This suggestion is relevant to this study as the students with the access they have to platforms be it through their phones or computer systems, accessing new content under the supervision of their teachers enhanced their learning.

Dewi (2018) conducted a study on the usage of schoology and canvas as media-based blended learning. The study was carried out at the University of Riau Kepulauan, Batam Indonesia. Students of English Education Study Program in 2017/2018 academic session were used in the study. The population of the class was 87 students and the sample size which was 48 were selected using purposive technique. The study was made up of two independent variables, that is experimental group I which consisted of used schoology as a learning tool and control group which consisted of students who used the canvas ELP. The dependent variable was their academic achievement. A written test which consisted of 50 multiple choice question was used as instrument for data collection. Independent t-test was used for data analysis.

Result of the study showed that students who used schoology ELP had a mean score of 76.94 at post-test while students who used canvas had a mean score of 73.47. Testing the null hypothesis showed that there was a significant difference in the mean scores of students' achievement using Schoology and Canvas ELP at 0.05 level of significance ($F=5.053$; $p<0.29$). Nevertheless, both platforms succeeded in increasing students learning achievement when the scores obtained is compared to their pre-test scores. The use of schoology and canvas electronic platforms in this study was relevant to this present study as it has proof of the effectiveness of the learning platforms as a means of sharing materials, pictures, learning and discussion videos, and online materials which helped students broaden their scope in a subject area.

In a similar study, Garcia *et al.* (2018) carried out research on Schoology as an alternative to traditional teaching tools for university students and the aim of the study was to determine the effectiveness of using Schoology electronic platform as an innovative approach to enhance the proficiency of College Science students in Physical Activity and Sports Degree at the University of Alicante, Spain. The research design

used was a quantitative nature and quasi-experimental design and this was because the selection of the working groups was not done randomly but were already formed prior to the experiment. The sample consisted of two groups. The first group consist of 47 students from the degree of Sciences of Physical Activity and Sport (CAFD), with a total of 36 men and 11 women, and the second group were made up of 88 students from the Teacher Training in Elementary School (TTES), with 22 men and 66 women all together. While one of the Teaching Degree groups and one of CAFD group received training session on Schoology, the control group received theirs using traditional method.

Two multiple-choice questionnaires that was developed by the researchers, each containing questions related to the Didactics of Physical Education was used. One-way ANOVA was used for statistical analysis in the study. The result that was obtained revealed that the averages between the two groups were different and statistically significant ($F: 35.917$ $p < 0.001$), highlighting that the experimental group that used Schoology electronic platform obtained a higher mean score. Based on the result obtained, Garcia *et al.* (2018) concluded that Schoology allow students to adapt their work and learning pace and this provides them opportunities and cognitive challenge for deeper knowledge processing. This study is relevant to this present study because it showed students can gain mastery of skills taught using schoology electronic learning platform as a tool for learning.

Wihastyanang and Latief (2018) investigated the effectiveness of electronic feedback on second year English college students' writing quality in Jombang, Indonesia. The aim of the study was to find out if there was a difference impact on the writing quality between students who were given electronic feedback using Schoology ELP and students given written feedback. The research designed that was adopted for the study was a quasi-

experimental design with post-test only. Both experimental and control groups were selected using simple random sampling technique and were selected out of all the existing classes that had equivalent competence, especially in English writing. Then they were assigned in experimental group I utilizing electronic feedback and control group utilizing written feedback. While control group used written feedback based on the teacher comment on their essays, experimental group used electronic feedback on the Schoology platform based on the teacher comment on their essays.

In order to collect the data, the post-test was conducted after the treatment to determine if the independent variables had impact on the students' writing performance and this was measured by means of the writing test. Eighty-one (81) students who were selected to form the experimental group and control groups (47 as control group; 34 as experimental group) formed the sample size and after the data was collected, descriptive and inferential statistics was used.

The result revealed that the students who were given written feedback had better writing quality with a mean score of 32.53 when compared with their counterparts who were given electronic feedback using Schoology ELP with the mean score of 31.22. However, the independent test used for analysis showed that the obtained probability was 0.028 and 0.027 which was higher than significance level $p = 0.05$. This means that there was no significant difference between written feedback and electronic feedback of the students. Due to the no significant difference, Wihastyanang and Latief (2018) opined that Schoology as e-feedback can yield either a good or average quality, depending on the infrastructure and the Internet access.

This means that Schoology as e-feedback is good when the infrastructure and facilities are adequate and always connected to the Internet. It was therefore concluded by

Wihastyanang and Latief (2018), that the most influential factors of e-feedback implementation are due to lack of facilities and infrastructure as some students argue that the ineffectiveness of electronic learning might be caused by the differences of students' learning style and the first thing to be done before the implementation of electronic platform is to provide good facilities and infrastructure. Suggestion was made that students need to work hard to generate ideas from various sources to increase their chances to perform better academically.

This study is similar to the present study in terms of the use of schoology electronic learning platform and research design. The difference was that the students were randomly selected and post-tested instead of pre-test post-test was used. Wihastyanang and Latief (2018) mentioned that students who were equivalence were selected from all the classes, however how the equivalence was decided was not ascertained. This became an aspect to improve on in this present study where the equivalence of the students had to be measured using the pre-test before the treatment can be administered to the groups.

Enwere and Emeasoba (2019) researched on the effect of using Edmodo learning platform on academic achievement of students in business studies. Two research questions guided the study. All the Junior Secondary school students from 16 public secondary schools Awka Education zone formed the population of the study. Three schools were selected from the 16 schools using purposive sampling method and were used as an intact class after been randomly assigned into experimental group I and control group. The Experimental group had 60 boys and 73 girls making them a total of 133, while the control group had 54 boys and 80 girls, making them a total of 134.

Edmodo Business Achievement Test (EBAT) was used as test instrument and contained 30 item multiple choice questions. Three weeks was used for teaching before the administration of post-test. Quasi experimental pretest posttest research design was used in the study. The result showed a calculated F ; 183.80 was greater than the critical value of 3.99. This means that there was a significant difference in the achievement scores of students taught using Edmodo and those taught using conventional method. Recommendation given was that electronic learning platforms should be encouraged as the predominant use of conventional method of teaching in schools is ineffective and does not promote meaningful learning that promotes the academic performance of students.

Sari *et al.* (2020) studied the effect of schoology online cooperative learning achievement. The sample of the study comprised of 48 eleven grade students from Yogyakarta secondary school in Indonesia. While 24 students were randomly assigned into experimental group, 24 others were assigned into control group. The concept taught was dynamics of rotation and balance of objects. The study covariate, prior knowledge, numerical abilities and interest in learning to prevent the influence of other factors on the students' learning achievement in cooperative learning online using schoology. The design adopted was a pre-test, post-test control group design. ANCOVA was used to determine the significant difference of the groups.

The obtained result showed that students taught using schoology obtained a higher mean score of 84.55 when compared to their counterpart in the lecture method who obtained a lower mean score of 80.21. It also showed that there was a significant difference in the mean scores of students taught using schoology and those taught using traditional method ($F_{(3,48)} = 9.057, p < 0.05$). This means that using schoology facilitated students learning materials. Sari *et al.* (2020) concluded that schoology provided

opportunity for practical learning that are more in line with the daily habits of students who tend to like social media activities. Recombination was that the interest of the students should always be aroused through learning activates that would keep them academically enlightened. While this reviewed study made use of pair-check for students' study strategy, this study differed by adopting collaborating strategies aimed to engage the students actively in discussion using the discussion boards and forums.

In another study, Sobowale *et al.* (2020), researched on the effects of ATutor platform on learning outcomes in agricultural science among university students in North central Nigeria. The population of the study was comprised of 4,562 Agricultural science students in all North-central Universities. The study adopted a multi-stage quasi-experimental design. The sample size was comprised of 277 students drawn from two universities out of seven universities in north central Nigeria. Agricultural Science Achievement Test was used as instrument to test the student and hypothesis formulated was tested at 0.05 level of significance.

The result of the study showed that there was a significant difference in the mean achievement scores of students between the experiential and control group with 64.17 as the mean score obtained by the experimental group and 60.43 as the mean score of control group. From the result obtained, the null hypothesis was rejected (t -value=0.001; $P<0.004$), meaning that there is a significant difference in the scores of students taught using ATutor and students taught using conventional method. Sobowale *et al.* (2020) asserted that the achievement of the student taught using ATutor was higher because the students were able to learn at their own pace and get assistance from so many learning resources that were available in the platform. The recommendation therefore was that platform that provide accessible learning materials for students

should be encouraged in Higher Institutions and funds to made them readily available should also be encouraged.

Pahamzah *et al.* (2021) examined the impact of schoology on students; reading comprehension and writing skill for Senior High School. All the tenth-grade senior high school students formed the population of the study. Method of data collection include observation, test and documentation. Total number of students used in the study were 34. The result revealed that at pretest, students had a mean score of 62.8 in reading comprehension and had 55.8 in writing skills. Whereas at posttest, the students had a mean score of 83.3 in reading comprehension and 76.9 in writing skill. The result according to Pahamzah *et al.* (2021), proved that schoology can improve students reading comprehension as well as their writing skill.

There was some information that were not provided by Pahamzah *et al.* (2021) and that include the total population of the students in the tenth grade, sample and sampling technique and location of the study. Also, the observation, test and documentation mentioned were not clearly stated and the size of the students' used in the study is rather small for the study. This present study used the saved platform for research but in a different subject area to improve on the content area.

Onuoha and Yahaya (2021) carried out a study on the effects of schoology and canvas blended instruction tools on students' achievement and interest in Economics concepts in FCT Colleges of education, Abuja. A quasi experimental non-randomized control group design was used. The 200 level NCE 2017/2018 academic session were used for the study and while purposive sampling technique was used for selection. An intact class of two combined NCE course was used and they were made up of 34 females and 28 males, making the sample size a total of 62.

The instrument for data collection was a multiple-choice Economics Achievement Test. Schoology, canvas and lecture method were randomly assigned into experimental group I, II and control groups. Descriptive and inferential statistics was used to data analysis. The result revealed that at pretest, students in schoology had a mean score of 68.70 and SD of 9.087 while student in canvas had a mean score of 63.06 and SD of 7.014. The result further revealed that at posttest, students taught using schoology had a mean score of 76.94 and SD of 11.585 while student taught using canvas had a mean score of 73.47 and SD of 2.365. A paired-samples t-test used for the hypothesis showed a calculated t-value of 2.375 with the p value obtained was lesser that 0.05 level of significance.

The study concluded that the use of schoology and canvas improved the academic achievement of the two groups and can be used to engage students in specific learning tasks. The recommendation given was that teachers should plan for varied design that is conducive to help the students' progress in each learning activity. The present study carried out covered schools in North-Central Nigeria including FCT and this study reviewed happened to have conducted a study using schoology and canvas platforms in a school in FCT. However, they differed in terms of the locations of the study, as this present study used three different schools.

They also differed in the schools used, target population, subject area taught and statistics used for analyses. This study reviewed used same school and even though the two classes were different course combinations, that would not have prevented the two groups from interacting which may likely confound the results obtained. It would have been proper for different schools to be used altogether. This therefore became relevant to this present study which was improved on.

In another study, Mustaqim *et al.* (2022), conducted a study on the effectiveness of using elearning on students engineering course. The population of the study was all the 2017/2018 session of students in the Electrical Engineering Education University of Medan, Indonesia. Simple random sampling technique was used to assign 42 students into schoology platform and 40 students into web class. Quasi experimental posttest control design was used with the assumption that both classes have the same pretest scores. A test instrument called N-Gain test was used.

The result revealed that while the mean and standard deviation of students taught using schoology was 64.88 and 13.36, the mean and standard deviation of students taught using web class has mean and standard deviation of 84.08 and 4.39. the t-test used for analysis showed that the value of the t_{count} is 9.6769 which means that there were differences in the achievement of the two groups as observed in the higher score obtained by students in the web class. Mustaqim *et al.* (2022) concluded that web class may have yielded the higher score because the settings in web class are more flexible to use than schoology, noting that the characteristics of web class can be adjusted according to leaners characteristics so as to create enthusiasm for students' learning activities.

This reviewed study has similarities with this present study in terms of the use of schoology ELP and compared with another learning tool, however the dissimilarity which this present study intent to correct is in the absent of pre-test. The assumption by Mustaqim *et al.* (2022) that the two groups were equivalent at pretest may have possibly altered the result and since there was no specific measure that was used to ascertain the equivalence of the two groups before treatment.

Rokhim *et al.* (2022) carried out a study on needs analysis of the development of schoology and Powtoon-based learning media to increase learning motivation and students learning outcomes. The study is on research and development the ADDIE developed model was comprised of analysis design, development, implementation and evaluation. The data was collected using an online questionnaire and this was filled by 16 teachers and 30 students at SMPN Krembung. The questionnaire was an open and closed questionnaire which was used to obtain data on the need for learning using schoology and Powtoon-based technology.

The data collected was analysed using descriptive statistics analysis that included calculating the average. The result obtained showed that the interest of the students in learning increased by 60% and their learning outcomes increased by 85.71%. The result also showed that the level of confidence on how to interact with technology was high, but the confidence in the use of technology was not very high. This according to Rokhim *et al.* (2022), was attributed to limited facilities available in school and availability of teachers to master how to use the platforms. However, students and teachers had higher trust in the use of Powtoon because they considered it to be a media that was easy to use when compared to schoology.

On the other hand, schoology was easily accessible for learning. At the end of the study, the recommendation was that platforms that sustains the motivation of students in learning should be used for better learning outcomes. The studies reviewed are similar to this present study as they all made use of either Schoology, Canvas or other related electronic platforms to determine students' academic achievement. However, this study differed in course scope, variable scope and in geopolitical scope. The course scope which was on web design and students learning engagement using Schoology and Canvas electronic platforms in North-central, Nigeria has not been researched on.

2.9.2 Empirical studies on student learning engagement using electronic learning platforms

Student learning engagement has been conceptualized in multiple ways across discipline and researchers. According to Azvedo (2015), one of the abstract concept and key idea in research of online student learning engagement among others can be expressed in social constructivism which stipulates that learning occurs through social interaction. In essence, students may perform well in a set of actions all by themselves but may perform better when they are allowed to work in collaboration with others (Hrastinski, 2009). Electronic learning according to Chen *et al.* (2010), can positively promote high level of learning outcome and higher-order thinking abilities, simply because it allows students to actively engage in learning anytime and anywhere.

Lewis *et al.* (2011) agreed by indicating that when students are highly engaged in their learning, they can improve their academic achievement, such as critical thinking and grades, and also go ahead to apply the acquired knowledge to real life. However, despite these advantages, one vital problem in electronic learning according to Raza *et al.* (2021), is that electronic learning records higher dropout rate among students. This implies that students are apparently less engaged in an electronic learning environment when compared to the traditional learning environments because interactions between students and teachers are reduced due to time and space (Cho & Cho, 2014).

The move towards more active learning in the case of students is particularly important in an electronic learning environment where the challenge of not being online at the same time by the students or not being at the same geographical location have to be overcome (Anderson, 2014). In order to overcome these challenges, researchers have

recommended that teachers create courses that will actively promote community of meaningful interaction and engagement (Bigatel *et al.*, 2012).

Student learning engagement according to Dixson (2010), is increasingly seen as an indicator of successful instruction and is increasingly valued as an outcome of school or classroom improvement activities. Students can only be engaged when they are attracted to the work before them and are able to persist irrespective of the hurdle or challenges they encounter, thereby taking visible delight in having the work accomplished (Dixson, 2010). A number of studies have shown that student learning engagement overlap but Dixson (2010), made it clear that student learning engagement is not the same student motivation in the sense that student learning engagement portrays students' willingness to participate in every activity lined out by the teacher. In other words, students are likely to show general positive emotion during an ongoing action which includes optimism, enthusiasm, interest and curiosity.

Junco *et al.* (2011), experimented on the effect of Twitter on college student engagement and grades. A total number of 125 students of the first year seminar course for pre-health professional majors formed the sample size of this study of which 70 formed the experimental group and 55 the control. The study used four groups and while one set of the students were randomly assigned into the experimental group and other three were assigned into control group.

The experimental group used Twitter as part of the class while the control group used the traditional way of teaching. Learning engagement instrument was quantified using a 19-item scale based on the National Survey of Student Engagement (NSSE). The 19-item learning engagement scale included demographic items, items inquiring students' technology use and items for forthcoming analyses. Engagement scale items were coded

using a four-point Likert scale ranging from 'Never', 'Sometimes', 'Often', and 'Very often'. The reliability analyses of the 19-item learning engagement scale showed an internally consistency of 0.75 after it was analysed using Cronbach alpha. To assess the differences in engagement and grades, the study used a mixed effect analysis of variance (ANOVA).

The results disclosed that students' learning engagement in the experimental group was significantly higher with a mean score of 5.121 and SD of 6.69 when compared to the control group that had a lower mean score of 2.291 and SD of 7.65. The analyses of Twitter communications also showed that students and faculty were both highly engaged in the learning process in ways that exceeded that of the traditional classroom activities.

In a similar study, Courtner (2014), carried out a study on the impact of student learning engagement on academic performance and quality of relationships of traditional and non-traditional students. The study seeks to determine if there was a significant difference in academic performance of traditional and non-traditional college students based on student engagement. In the study, student learning engagement was identified using the five benchmarks of effective educational practice that have been established by the National Survey of Student Engagement (NSSE) survey.

The study used the secondary data was obtained from the 2010 National Survey of Student Engagement and the National Survey of Student Engagement used was the College Student Report which served as survey instrument data collection. The survey was administered to all 1st-year and senior year baccalaureate-seeking students both full-time and part-time and they include 18,250 traditional and non-traditional students who were used as the sample size of the study. The NSSE is based on 42 key questions

that capture many vital aspects and components of the student learning engagement process and was rated using a 7-point Likert scale.

Two-group MANOVA was used to determine if there was significant difference between the student type, that is, traditional or non-traditional and the level of student learning engagement based on the five benchmarks of effective education practice. The result of the analysis revealed that the non-traditional students had higher mean score of $m = 57.446$ compared to traditional students who had a lower mean score of $m = 56.474$. It was concluded that supportive campus environment, student-faculty interaction, and enriched educational experiences was the reason for the student engagement process for traditional students. It was recommended that school administrators should design specific initiatives that is tailored towards taking care of the schedules, needs, and lives of non-traditional college students in order to increase the levels of their engagement.

Bolliger and Halupab (2018) conducted a study on online student perception of engagement, transactional distance, and outcomes. The data used was collected from students enrolled in an online course at three private universities situated at the East, South, Southwest, and Midwest regions of the United States. Six hundred sixty-seven (667) 2015/2016 academic year students formed the sample size of the study. The study consisted of 74.3% female and 24.8% male students. The instruments used in the study were a Revised Scale of Transactional Distance (RSTD) developed by Paul *et al.* (2015) and a revised Online Student Engagement (OSE) scale by Dixson (2010).

The OSE which was used to determine student perception of engagement consists of 19 Likert-type items measuring student engagement in the online learning environment which has an internal reliability coefficient of 0.91. The internal reliability coefficient of the original OSE scale was 0.91. All the students that were enrolled in the online

courses at the three institutions were invited to complete an online questionnaire via an email at the end of the course. Basically, the OSE scale intended to measure items pertaining to skills, emotions, and performance of the students and this was analysed using regression analysis.

Bolliger and Halupab (2018) reported that the students who completed the OSE scale were engaged at a fairly high level in their online courses with a total mean score of 74.97 (SD = 9.88). In the Skills category, Bolliger and Halupab (2018), posited that 88.1% of the students felt they were reading and listening carefully and thought of themselves as being organized and this yielded a mean score of $m = 4.43$. In the Emotional category, 97.7% identified with the item which asked about the effort they put forth and this yielded a mean score $m = 4.63$ for the factor.

Lastly, the students responded to the Performance scale, where 96.9% identified with the item in the scale which addressed getting a good grade in the course. This yielded the highest mean score $m = 4.70$ in this category in addition to having the highest mean on the scale. This result therefore revealed that students' primary reason for engaging in online discussion and activities was not due to a desire for socialization but to interactively put in effort so that they can obtain higher grades (Bolliger & Halupab, 2018).

Rodgers (2018), carried out a study on student learning engagement in the electronic learning process and the impact on their grades. A regression analysis was used in the study which comprised of a mixed group of 113 Economics, Accounting and Finance students. The aim of the study was to determine the presence of interaction effects between electronic learning engagement and personal characteristics such as gender, age, ethnic origin and degree type of the students and this was to determine if personal-

characteristic relating to learning style differences influenced the extent to which students benefit from electronic learning platforms. Rodgers (2018) revealed that evidence was found of personal characteristic of students influencing the effectiveness of an online teaching and learning process, adding that the differences in performance may possibly be explained partly in terms of differences in the quality of the student intake as well as by the differences in the level of engagement in the electronic learning process.

This statement was given followed by the result which revealed that the female students were more engaged and spent on average 4 hours longer online than their male counterparts, adding that on average, the female students performed better, with mean mark being 63.32% higher than male students who obtained a mean mark being 57.74%. Rodgers (2018) thus, recommended that in order to improve effectiveness teaching and academic achievement, tertiary institutions should consider aiming for the development of electronic learning teaching strategies that encourages greater learning engagement among the student, while also taking into consideration the different learning styles found in different students.

Arvind *et al.* (2019) conducted a study on Improving Student Engagement in Teaching Electric Machines Through Blended Learning. The approach used in the study involved online lectures, peer feedback and forums tutorial submissions, followed by face-to-face tutorial sessions. Online learning was chosen in the study in order to allow the students have to access material on devices and to provide them with peer feedback which is shown to build community, and increase the quality of discourse for both students and lecturer. As a result of their learning engagement, the finding of the study revealed that there was a significant improvement in exam performance when compared to previous years. The result showed that the pass rate of the students' course moved from

approximately 60% in previous years to 86% and their class average mark also increased from approximately 50% in previous years to 63%. Yilian and Xia (2021) carried out a study on the effect of two educational technology tools on students' engagement in Chinese EFL courses. The study aims to explore the relationship between two educational technology tools and three dimensions of student engagement. Participants used in the study were 268 undergraduates and graduates who were enrolled in EFL courses (College English, Advanced Oral English, Academic English) at a university in Beijing, China. Using an adopted and revised questionnaire, the study measured the extent of impact of the specified educational technology tools on student engagement with the help of SPSS.

Through the independent sample T tests, analysis of variance, correlation and regression, the study found that learning engagement has the strongest positive effect on educational technology engagement. The result revealed a 68.0% positive effect which is considered quite good with a significant of $F = 187.137, p < 0.05$). Findings from this study provided preliminary support for utilizing educational technology as a positive factor influencing student engagement.

Several studies have examined engagement in an electronic learning environment but they are limited, meaning that the level of student learning engagement is mostly measured by behavioural indicators which is specifically applied to face-to-face environments rather than an electronic learning environment and this invariably do not reflect the characteristics of engagement in electronic learning environments (Cho & Cho, 2014).

Fredricks *et al.* (2014) and Kahu (2013), insisted that student learning engagement in an electronic learning environment needs to encompass students' behavioural

characteristics such as persistent learning, effort, and sustained concentration in learning; students' emotional type, such as interest in learning and excitement; psychological type, such as independence, involvement in tasks and preference for challenges; and cognitive aspects such as, students' mental effort, investment of thought and learning achievement strategies. These aspects of students' learning engagement according to Kahu (2013), has scarcely being explored.

The studies reviewed are similar to this present study when it came to student learning engagement as it pertained to learning outcomes and even though some of the studies on learning engagement were mostly carried out in foreign countries, this study differed in that direction. Also, this study differed in subject scope, sample size, subject area, time scope, instructional approach and method of data analysis.

2.9.3 Empirical studies on student perception towards learning using ELPs.

With the rapid development of technology in education, electronic learning is becoming another way to provide instruction to students (Rovai *et al.*, 2018). Compared with traditional classroom learning, learning online have some features that offer potential advantages among which include flexibility, cost-efficiency and ubiquity (Moller *et al.*, 2012). Learning is electronically flexible in the sense that students and teachers do not require physical attendance and students can study at their own space.

Again taking courses online are cost-efficient in the sense that it allows participants eliminate traveling to the institution of learning and building maintenance costs. More so, online courses are capable of been held more frequently, accommodating more people, and saving infrastructure costs. Lastly, Ubiquity allows the students to access course content from almost any place and at any time. In spite of an increase in the number of online courses, Tung (2012), indicated that in a face to face learning

environment students' achievement is still more connected with the learning source such as instructional materials and learning tasks when compared to courses taken online and this is why educational studies and students' achievement indicators are still determined by formal or informal assessments. However, in an electronic learning environment, the control of learning sources by the teacher can at times be difficult and this is simply because in an electronic learning environment, the perception of learning or self-assessment scales are used instead of achievement tests to determine levels of students' learning (Brower, 2013).

Buzzetto-More (2018) is of the view that students' perception toward technology and or online learning are influential in determining the educational benefits of electronic learning resources and experiences. With the prevalence of ICT, Marriott *et al.* (2014), raised some concerns relating to electronic learning and the views of undergraduate students regarding Internet use in various disciplines. Marriott *et al.* (2014) posited that students express their preference for a face-to-face form of learning, giving reasons that they would approve only Internet usage that supports traditional delivery of courses and this is because they value the social interaction and the communication skills, they acquired from the traditional classroom environment.

Marriott *et al.* (2014), argued that social contact and the potential isolation of learning on the part of students can be a primary concern in students' perceived use of electronic learning platforms. Roehm and Bonnel (2019), pointed out arguably that the role of teachers and of course the educational institution remain very important in providing useful experience by way of creating an interaction that is vital and meaningful to the students. Despite that submission from Roehm and Bonnel (2019), Student preference for a more traditional style of teaching was again asserted by Osgerby (2013) who claimed that students appeared to have a positive viewpoint for the adoption of well-

resourced ICT based learning process, but they still preferred face-to-face lectures as well as step-by step teaching and learning process.

The study carried out by Yilmaz and Yurdugul (2013) said otherwise as their study investigated the perception of students learning using asynchronous online discussion. The scale items used for the study was adopted and then re-edited by expert opinion. Ninety (90) students were enrolled in the discussion environment in the LMS and the students interacted with the content provided. At the end of the semester, students' messages posted to the discussion was measured and their perception of learning in the online discussion environment was too using the scale developed. The statistics correlation between the perception of learning and the item points from the scale was measured using a model known as Principal Component analysis (PCA). First PCA was applied on the data set and 7.96 was determined with a total variance of 72.30%. The result indicated that the data set was unidimensional.

This means that all the factor loading was higher and the statistically significant value were at a satisfactory level (GFI=0.94; CFI=0.94; RM SEA=0.03). Again, the finding also showed that between the level of students' perception of learning and quality of students' contribution in the discussion forum, a correlation of 0.52 level was obtained. This value according to Yilmaz and Yurdugul (2013) was expected to be on a high value as the students' high perception of learning was supposed to have contributed in discussion forum. Yilmaz and Yurdugul (2013) concluded that perception of learning is a construct to be considered while determining learning effectiveness of learning environment.

Juha-Matti (2014) conducted a study on students' perception of Learning management system. The study employed a qualitative case study approach in the study and it was

based on a semi-structured interview. Five hundred (500) students from the university of Gothenbury (were used for the study and were randomly selected from social sciences program because the class was accessible. On the other hand, ten (10) students were interviewed to identify factors influencing students' perception toward the use of LMS. Upper secondary school in Gothenbury, Sweden was used for the study because the school was planning to conduct an implementation process to replace a previous LMS.

The findings showed that students' perception was affected by students' sociological and technology factors. Other factors that affect students' perception of the platform was their perceived ease to use and perceived usefulness. In other words, their perception reflected on issues that were both technical and social in nature. Yet despite the systems limitations, students have high tendencies to adopt LMS as a learning tool if it would correspond with their expectations.

Juha-Matti (2014) pointed out that the way the teacher talks or interacts with the students using the platform can have a strong impact on the students both positively or negatively. Recommendation offered was that IT professionals in educational system should ensure that teachers are educated on the use of LMS. By so doing, teachers would have a better understanding of how to use the system and why it is beneficial to the students. Attention should also be given to the visual design and functionality of the LMS adopted in order to create a positive perception towards the platform.

In another research, Eldeeb (2014), investigated Students' perceptions to electronic learning and incorporated 110 students as sample size. The participants were taught via electronic learning over a period of 6 weeks and at the end of the course, the students were asked to sign a consent and to respond to a validated questionnaire using Likert

scale. Also, an open-ended questions and free responses were used to assess areas of weakness and strength in electronic learning and the data entry and analysis gathered were done using SPSS.

The result of the study revealed that 98 percent of the participants believed in electronic learning as teaching and learning method, 94 percent of them have been using electronic teaching resources, 79 percent of them founded the electronic learning platform was easy to use, 74 percent of the student found that electronic learning eased their access to the course material, 72 percent believed that electronic learning made the teaching and learning materials available 24/7 which improved their time management and made it easier for them to access the course off campus. Furthermore, the result revealed that 91 percent of the student found that the electronic learning helped them identify their knowledge gaps in the course, while 94 percent believed that it helped them to clarify areas to focus on during their studying of the course module.

Again, 84 percent believed that electronic learning helped them identify area of strengths and weaknesses in their knowledge while 80 percent of the students believed that it helped them to understand the lectures, teaching materials and readings better. In essence, the study's findings had spot light on electronic learning platform flexibility, self-control and convenience and also identified areas of strength of the electronic learning platform as perceived by the students. With the findings, Eldeeb (2014), reported that students' perception toward electronic leaning system was positive.

Wallace (2014) justified the findings of the study by positing that in a net generation, students are most often in need to communicate quickly with their peers and lecturers and the use of electronic learning features is one of the most effective ways to bring

educators and students together and make learning more accessible, flexible and efficient.

Tseng (2020) carried out an exploratory study of students' perceptions of learning management system utilization and learning community. The aim of the study was to investigate how students' perception of teaching, cognitive and social presence within the community of inquiry and perceived benefits of using Blackboard Learn were related to their learning efforts. It was also determined to investigate how the functionalities of Blackboard Learn were used in online courses as well as how students perceived the benefits of using them.

The results of the study revealed that students who consider Blackboard tools more beneficial on their learning had higher perception of teaching presence. The study also revealed that students' learning efforts were increased primarily by students' perceptions on perceived benefits of using Blackboard and secondarily by students' perception of social presence. Tseng (2020) therefore concluded that the effective utilization of ELPs in online courses benefited students' course work and motivated them to put more effort on their learning.

Almahasees *et al.* (2021) conducted a study on Faculty's and Students' Perceptions of online learning during COVID-19. The study investigated faculty's and Students' perception of the online learning process that took place during covid-19 pandemic. The study wanted to identify both faculties and students' perceptions of online learning by utilizing two surveys that was distributed to 50 faculty members and 280 students (88 were males, and 192 were females) who were selected randomly. The analysis showed that the online platforms used were Zoom, with Microsoft Teams offering online interactive classes, and WhatsApp in communication with students outside the class.

The survey used was designed in a Likert Scale format and the data collected were imported into Excel to facilitate SPSS analysis using 25 versions. The grand mean score obtained on students' perception of online teaching and learning during the covid-19 pandemic was SD of 0.67 and 3.548. This means that the students found online learning useful.

The students also agreed on the advantages of online learning which was mainly centred on self-learning, low costs, convenience, easy to use and flexibility. Even though online learning worked as a temporary alternative due to COVID-19, it could not substitute face-to-face learning. The study therefore recommends that blended learning would help in providing a rigorous learning environment.

Khan *et al.* (2021) studied students' perception towards e-learning during COVID-19 pandemic in India. The finding of the study showed that the students had positive perception towards e-learning as well as accepted the platform for learning. This study used a qualitative and descriptive approach as well as primary and secondary data for analysis. A modified Questionnaire was used and was distributed to 184 students enrolled in various Universities of NCT of Delhi, India.

The respondents of the survey were the students who were actively using elearning platform for their regular courses during the COVID-19 lockdown. The questionnaire used gathered both attitude and perception of students as regards to their effectiveness of elearning during the pandemic. Confirmatory Factor Analysis (CFA) technique was used for analysis. Data collection (primary data) was done online using Google doc. Findings showed that 73.4% responded positively to the ease and quick share of educational materials while 10% opined that elearning system was not helpful in sharing elearning materials. 61.4% agreed to flexibility and easy access to resources,

time, space and quick feedback while 53.8% were comfortable with learning online. The least positive response rate was 32.2% with regards to students' collaboration and interaction among students.

According to Khan *et al.*, (2021), collaboration is much important in contemporary scenario and has been a relevant subject for researchers. As this study did not put out measures to ensure collaboration in this study, this became an important aspect to be improved on in this present study. The study however affirmed the usefulness of electronic learning, indicating that it provides students with the freedom to connect with their teachers and fellow students. Recommendation given was that necessary measures should be put in place to improve the quality of elearning to help learners learn better.

Several studies have investigating students' perception towards electronic learning platforms as it related to academic achievement as well as students' perceived preference for either traditional of electronic learning courses. However, there are limited literature on students' perception particularly towards Schoology and Canvas ELPs and in terms of social presence and social interaction aside the studies outside the shores of Nigeria. This study has also differed from other studies reviewed through study's subject scope, sample size, subject area, time scope, instructional approach and method of data analysis.

2.9.4 Studies on the influence of gender on students' academic achievement

Gender related issues have been discussed in different dimensions and will continued to receive significant attention at both the educational and national levels. This is because the concept of gender gap in education according to Reynolds and Burge (2017), has in the past been viewed from the standpoint of inequities that is faced by females even as they advance in the society and in the educational system. Chee *et al.* (2015) likened

female education as a dual-edged sword which has been a source of empowerment, advancement and liberation for women in particular, and also reinforcement for gender inequality as well. In Nigeria, particularly, there has been a large disparity between the education of the male child and that of the female child in the sense that so many girls do not have access to adequate education or drop out of school to assume other responsibilities when compared with the boys (UNESCO, 2011).

British Council (2014) commented that the number and performance of female students have significantly increased over time despite the gender gap which still exists, and this has caused many researchers to examine this gap continually during students' school years. According to Tempelaar *et al.* (2011), gender differences influence pedagogical issues such as communicative style, differential school attendance rates, approach to study, gender effects in achievement and motivations for subjects.

In relation to electronic learning however, Garland and Martin (2015), opined that gender equity should be a factor to be considered when designing online courses. While Salisbury *et al.* (2010), claimed that males incline more to the use of Internet or the Web for information seeking while females tend to use the web to communicate with others, Scott (2013) supported the view by adding that men's perceived ease of use, perceived usefulness and behavioural intention to use technology are higher than that of women's perceptions and even though women have been found to use technology with greater frequency, men had more access to personal computers, laptops which makes them more familiar with the usage and application of several software.

There have been numerous studies carried out on gender, yet there is still no clear-cut explanation to understanding gender issues in part and this is because gender largely mirrors social relationships in the society (Reynolds & Burge, 2017). This could explain

why researchers have increasingly become interested in studying the effect of gender on a number of outcomes and dimensions. Little-Wiles and Hutson-Stone (2014) investigated student engagement online. The reason for the study is to find out if gender play a role in how students engage with online courses. While 76% of the students were male, 24% of the students were females.

A two factor ANOVA was used to conduct the test. The result obtained revealed that there was no significant difference in the mean engagement scores of the groups ($t_{(47)} = .549, p > 0.05$). On the other hand, Arlene (2016) conducted a study on the effects of gender and perceived control on engagement. The study had a sample size of 182 students from Canossa college, San Pablo City. The score was obtained from the Student Engagement Questionnaire while a two-way ANOVA was used to determine the statistical difference. The result obtained showed that there was no significant gender difference on students' engagement ($F_{(1,178)} = 0.45, p > 3.84$).

Adigun *et al.* (2015) studied the effect of gender student' academic performance in computer science in secondary schools in New Bussa, Burgu local government of Niger State. Questionnaire which consists of 30 multiple choice items drawn from senior school certificate examination past questions set by WAEC in 2014 multiple choice past question was used as research instrument. The research design used was expo-facto design. The population consisted of all the 515 SS three students. The instrument used was Computer Studies Achievement Test (CSAT).

The students were randomly selected and with the use of stratified sampling technique 118 males and 157 females were selected. The questionnaire was administered to 275 students from both private and public schools sampled in the study area. The students' responses were marked and scored, and later analysed using independent t-test. The

result obtained revealed that there was no significant difference male and female. While male students had mean and SD of 12.86/4.84, females had a mean and SD of 11.38/4.05. T-test statistics of students' gender showed that the 1.48 difference was not significant since the significant value of the test (0.08) is more than the 0.05 level of significance.

The slight difference from the study was found from the private school. The study concluded that the students' performance was not determined by the treatment administered. Recommendation was that female students should be encouraged to approach every subject without inferiority complex and stakeholders in the educational sector should ensure that the findings of the study is utilized in order to make gender sensitive policies. The study made use of public and private schools but did not state whether they both had equal computer facilities. This probably led the private school to have the slight difference in academic performance however little. This present study improved on that by ensuring that schools used have same equivalence before the research.

The study by Borglum (2016), which was earlier stated to have been conducted on the effects of blended learning on critical thinking in a high school Earth Science class using Canvas electronic platform also aimed at determining the difference in the achievement scores of male and female students offering earth science via Canvas electronic platform. The male students that made up the experimental group were 26 while the female students were 28.

After the data was collected, it was analysed using t-test and on average, the male students significantly improved their scores from 12.16 (pre-test) to 13.92 (post-test) as when compared to the female students who obtained an average score of 11.59 (pre-

test) to 12.59 (post-test), however with a p-value ($p = .18$), it indicated that there was no significant difference in gender. Abdu (2017) carried out a study on the influence of gender on secondary school students' academic performance in South-west, Nigeria.

The result of 2003/2004 to 2007/2008 West African School Certificate Examination was collected on English, mathematics, Chemistry, Physics, Geography, Economics Government, Christian Religious Studies, Yoruba and French from 10 secondary schools selected from five different states in Nigeria. The sample consisted of 2,305 students and stratified random sampling was used two schools from each of the state in South-west. Using purposive sampling technique, the WASCC result of the students sampled was collected. Chi-square was used to test the 5 hypotheses formulated in the study. The result revealed that male and female students performed equitably in English Language.

Males performed better than females in mathematics, science and social sciences while female also did better than male in Arts except in Yoruba. It was recommended that necessary materials and equipment should be provided to make mathematics, sciences and social sciences interesting to girls. Ugwoko *et al.* (2018) conducted a study on the effects of flipped classroom on learning management system and face to face learning environment on students' gender, interest and achievement.

One of the objectives of the study was to determine the effect of gender on academic achievement of students taught elements of accounting using flipped classroom model on LMS. The sample size of the study comprised of 76 males and 96 females. The data collected was analysed using descriptive statistics which answered the research question. On the other hand, ANCOVA was used to test the hypothesis at 0.05 level of significance. The result revealed that male students had a higher mean of 3.00, SD 1.7

and mean of 5.19 and SD of .79 at pre-test and post-test when compared to their female counterpart who had a lower mean of 3.07, SD 1.35 and mean of 5.14 SD of .88 at pre-test and post-test.

Garcia *et al.* (2018) sample size of 58 males and 77 females who were randomly assigned into an experimental group was done to determine the effectiveness of using Schoology electronic platform as an innovative approach to enhance the proficiency of College Science students in Physical Activity and Sports Degree at the University of Alicante, Spain and One-way ANOVA was used for statistical analysis in the study. The result that was obtained revealed that there was a greater improvement among the male students who had an average mean score of 3.66 when compared to the female students who obtained a lower average mean score of 2.32.

Garcia *et al.* (2018) concluded that the results obtained showed that the Schoology electronic platform which was used for the experimental groups proved effective for the acquisition of new knowledge, which indicated that the use of Schoology improved academic performance in students. Onuvughe *et al.* (2018). Conducted a study on gender balance and the generative instructional strategy on students' achievement in reading comprehension in senior secondary schools in Ekiti State. population of the students covered all SS I students.

One hundred and twenty (120) randomly selected students from Ekiti State public secondary schools participated in the study. Quasi experimental design was used, and multi-staged sampling technique was used. For the pretest and posttest same comprehension passages were administered. The data collected using Reading Comprehension Achievement Test (RCAT) which was the research Instrument and the

hypothesis formulated was tested at 0.05 level of significance. T-test was used to analysis the data collected.

The result obtained showed that there was no significant difference of gender on the academic achievement of students exposed to Generative Instructional Strategy (GIS) in reading comprehension ($F_{1,115} = 1.945, P > 0.05$). Recommendation was that generative instructional strategy be adopted by English language teachers in teaching and learning of comprehension in the classroom. Enwere and Emeasoba (2019) researched on the influence of gender on academic achievement of students taught using Edmodo learning platform in business studies. The sample of the study comprised of 267 students (114 males and 153 females) from Awka Education zone. Quasi experimental pre-test post-test research design was used in the study.

The result obtained from the study indicated that male students taught using Edmodo scored higher than their female counterparts a higher post test score of 4.53 and a mean gain of 4.27 when compared with their female counterpart who had a lower post-test mean score of 2.41 and a mean gain of 2.09. The difference in the scores of male and female students which was 2.18 against the females showed that male students were better impacted by the platform more than the female students. Falode *et al.* (2019) carried out a study to determine the effectiveness of WizIQ and MOODLE learning platforms on the academic achievement score of students in educational technology concepts in Nigeria. A pre-test, post-test, non-equivalent quasi-experimental design was used.

Three research questions and three corresponding null hypotheses were answered and tested respectively. out of six universities, a total of 333 educational technology students from three universities were selected randomly and assigned to Experimental

Group I which is WizIQ e-learning platform, Experimental Group II which is MOODLE e-learning platform and control group which is lecture method. Data gathered were analysed using Analysis of Covariance and significance level was ascertained at 0.05 alpha level. Findings of the study showed that gender has no influence on students' achievement when taught WizIQ and MOODLE e-learning platform ($F(1, 110) = 0.115, p > 0.05$).

In another study, Onyenma and Nnoduka (2020) studied the effect of blended learning on students' performance on physics in Federal Colleges of Education, South East, Nigeria. Two research questions and corresponding hypotheses guided the study. A sample size of 81 students who were selected using purposive sample method were used in the study. Mean, standard deviation and ANCOVA were the statistical tools employed for testing. It was revealed that the performance of the students was not dependent on gender $F(1, 59), p > 0.05$.

A study was carried out by Korlat *et al.* (2021) which involved a total of 19,190 students from Austria who participated in an online study during the covid-19 pandemic. The students in the study answered questions on their competence belief, perceived teacher support in online learning and engagement. The result showed that the girls had higher perceived teacher support in digital learning $F(1, 19157) = 0.46, p > 0.05$. The study also showed that there was no gender difference in learning engagement $F(1, 19157) = 0.46, p = 0.500$ and no significant difference in the competence belief of gender when it comes to digital learning $F(1, 19157) = 2.06, p = 0.151$.

This shows that male and female students have equal levels of perceived abilities in digital learning using technologies and technical equipment to complete their academic tasks. This can be explained based on the higher academic competence belief and the

higher engagement that was recorded by the girls. Ogbonna *et al.* (2021) studied the effectiveness of synchronous and asynchronous e-learning on students' cognitive academic achievement and practical skills acquisition in word processing. Quasi-experimental research design was adopted for the study using a pre-test, post-test, non-equivalent and non-randomized design.

Three research questions and three hypotheses guided the study and was tested at 0.05 level of significance using analysis of covariance (ANCOVA). The result obtained revealed that both synchronous and asynchronous e-learning significantly increased students' achievement and skills acquisition in word processing irrespective of the gender of the students. It revealed that male students got a post-test achievement mean score of 53.18 while the female students acquired a mean score of 54.32.

The null hypothesis testing the interaction effect between male and female students showed F-cal at 0.30 with a significant value of 0.864, which is greater than the 0.05 level of significance, which implies that there is no significant interaction effect between male and female students' cognitive academic achievement.

Ahmed *et al.* (2021) investigated the effect of gender on students' Facebook-based learning. The study was a quasi-experimental using pre-test, post-test design which used for data collection from 30 colleges of education students forming the sample for the study. The performance test comprises of two different sets of objective questions. Multiple choice and completion test responses. The findings of the study showed that there was no significant difference ($df = 28$; $t = 0.68$; $p > 0.05$) in the performance of male and female students exposed to Facebook-based learning and thereby concluded that the performance of the students was enhanced when they are exposed to Facebook-based teaching methodology.

Although this present study determined the influence of gender on students learning outcomes when taught using Schoology and Canvas ELPs, however it differed in subject scope, sample size, subject area, time scope, instructional approach and method of data analysis.

2.10 Summary of the Literature Reviewed

Teaching and learning have gone beyond the use of pen and paper to encompass technology and as such, all over the world, technology has become an essential tool used to promote teaching and learning activities.

While there were a number of related empirical studies reviewed in the use of ELPs to determine students' academic achievement, one puzzling finding reported in some of the studies was that of students' preference for traditional method of teaching to electronic learning. This attracted a big question which is; did the studies provide an enabling environment such that it had the capacity to sustain the students to learn and were the teachers doing all the teaching on the ELPs while the students did all the listening to further accelerate their passive learning?

Clearly, with the availability of diverse technologies flooding the market, it is important to ascertain whether the students who were exposed to these platforms were actively engaged and it should be on record what informed their preference for a particular ELP over another. As importance is placed on active learning using ELPs, some of the studies reviewed did not state how the students' learning engagement was measured while they used the platforms. It is therefore no surprise when some of the reports indicated that the students preferred the traditional method of teaching more than the ELP modes of learning.

Again, another notable observation which cut across most of the studies reviewed was that the students used the computer facilities in the school to access their learning content rather than study wherever they were uninterruptedly. If the studies were meant for online teaching, then the students should have been able to learn anywhere, including outside the corridors of the schools which was a short coming. An obvious explanation to this could be that not all the students in the studies owned computer systems in their homes. For that reason, it became convenient to assemble the students in school so that the study does not fall short.

Apparently, other reviewed studies used blended learning also since some secondary schools and obviously some of the University students do not have computer systems and lacked the skills to independently operate the systems by themselves, hence, they needed their teachers for assistance while using the computer systems. So having them be in school while the study progressed became suitable even though this may have interfered with the students' ease to study at their own pace or limited the positive impact the ELPs would have had on their academic performances.

Bringing this scenario down to Nigerian Public Institutions, the story is not different as this study have notably pointed out that limited computer facilities was a challenge to promote electronic learning as observed in some of the reviewed studies. The pertinent question is, why were flexible electronic learning platforms that are all round device-friendly not utilized in these studies so as to tackle the inadequacies in computer facilities? Simply put, with an adequate orientation on how an ELP adopted by a school is utilized, the students would have had their learning on the platform conveniently regardless of the type of device they owned be it at school or at home. With that in mind, students would not have had their learning hindered due to insufficient computer facilities from the school.

This study therefore sought to bridge this gap, by facilitating the access to learning contents using Schoology and Canvas LMS which give students access to their learning content using any Internet-connected device. This means that students have the opportunity to stay connected with their learning materials, peers, teachers and also stay gainfully active, engaged and remain up-to-date just as they should, especially for young people in the Higher Institutions who have the daily habit of having their Internet-connected devices always at hand in order to socialise and stay connected with their peers online. Thus, by promoting learning using Schoology and Canvas LMS which are supported by computer systems, laptops, palmtops, tablets, iPads, android or mobile phones and what have you; students can stay connected and prompt to their lessons 24 hours and 7 days a week.

This approach is imperative for this study since web design is a course that requires practical teaching and so, the students can actually have a chance to the right amount of web technology skills as they interact and master the rudiments of the course using the multimedia features in Schoology and Canvas LMS without having to wait till the next class at school to continue from where they stopped the previous day. More so, full cognisance is given to the power of students' teamwork in this study in the sense that students' interaction with their peers over a learning content is more likely to be understood and fully absorbed when they explain in their own simple language to one another. In essence, through students' collaboration, they would be able to construct new knowledge that is facilitated by active participation online.

The expectation of this study therefore is that through engaging activities, students on an individual basis would be reinforced since they are to use what they have gathered at the discussion forums to gain better learning experience even as they also learn at their own pace. In spite of the observed similarities that this study in focus share with other

studies reviewed, it however differed on the account of students' collaboration anchored on students' social presence online, interaction with the platform, peers and teacher, sample size, geographical area, subject area and statistics used. It also determined if students had a sense of engagement when they approached teaching and learning activities using Schoology and Canvas ELPs.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

The study adopted a nonrandomized pre-test, post-test, control group quasi-experimental research design. The researcher used a pre-existing class, hence the adoption of a quasi-experimental design. This design allowed the researcher conduct the study in the sampled schools without interfering with the schools' academic calendar or activities with any form of equivalent randomization of students into different groups. Quasi experimental design according to Armstrong (2019), is used when researchers intend to control the assignment in a treatment condition using any other criterion such as an intact class when other practical reasons make it difficult to randomly assign students into groups. Quasi experiments are however effective in the sense that it adopts pre-post testing. This implies that initial testing can be done using part of the population that is outside the selected sampled groups before data is then collected in order to ascertain if participants in the main study group confound or are equivalent. In other words, non-equivalent pre-post testing helps to maximize the internal and external validity of a non-randomized study and allow the researcher's finding to be applied to another finding, thus making generalization attainable for the population studied.

There are three levels of independent variables in this study and they are as follows; Schoology electronic learning platform (SELP), Canvas electronic learning platform (CELP) and Lecture method. There are also three levels of dependent variables which includes; students' academic achievement, student learning engagement and student perception. The last variable is gender which is the moderating variable. Figure 3.1

illustrates the visual representation of the variables and in the direction, they were manipulated and measured.

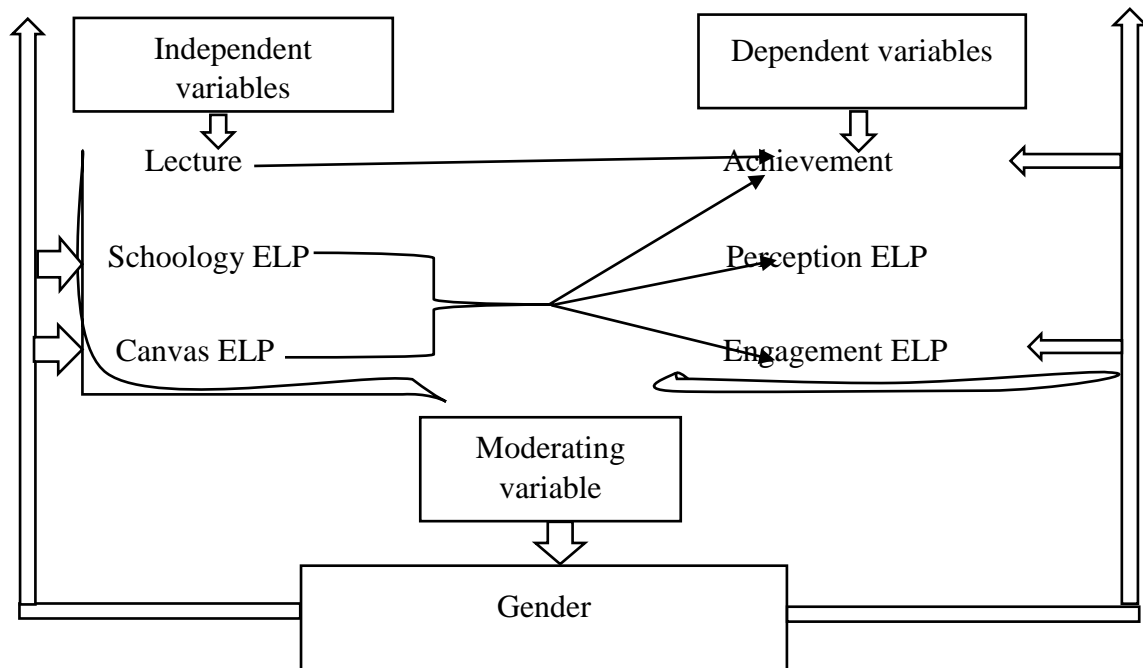


Figure 3.1: Visual Representation of Research Variables.

Source: Researcher (2023)

From the visual representation in Figure 3.1, concentration dwelled on the cause-effect relationship of the independent variables (manipulated) on the dependent variables (measured) and also on the influence of gender as a moderating variable on the association of the independent variables with the dependent variables. Hence, the study determined whether lecture method, schoology and canvas ELP have an effect on students' achievement, students' learning engagement using schoology and canvas ELPs to learn web design as well as students' perception towards learning with schoology and canvas electronic platforms. Additionally, the influence of gender was ascertained on the students' academic achievement and their learning engagement when taught web design concepts using schoology and canvas ELP. The research design layout showing the procedure of carrying the research is shown in table 3.1.

Table 3.1: Research Design Layout

Group	Pre-test	Treatment	Post-test	Learning Engagement	Perception
Experimental group 1	O ₁	X ₁	O ₂	O ₃	O ₄
Experimental group 2	O ₅	X ₂	O ₆	O ₇	O ₈
Control	O ₉	X ₀	O ₁₀		

Key:

O₁, O₅, O₉ represents pre-test scores for experimental and control groups

O₂, O₆, O₁₀ represents post-test scores for experimental and control groups

O₃, O₇, represents engagement for experimental group 1 and experimental group 2

O₄, O₈, represents perception for experimental group 1 and experimental group 2

X₁ represents Schoology ELP for experimental group 1 (Treatment)

X₂ represents Canvas ELP for experimental group 2 (Treatment)

X₀ represents the traditional teaching method (No treatment)

Table 3. 1 showed two treatment groups and one non-treatment group. In other words, test instrument was given to the two experimental groups and control group before the treatment in order to determine the students' prior knowledge (pre-test). After the administration of treatment to the two experimental groups with the exemption of the control group, test was re-administered (post-test) to all the groups in order to determine if there was an effect of treatment on groups.

3.2 Population of the Study

The population of this study consist of 3,663 computer science students (shown in Appendix E) from seven Public (Federal and State) Universities in North-central

Nigeria. The population focussed on these seven universities because the researcher only picked Universities with Computer Science Departments excluding Universities that their Departments have a combined name such as Computer Statistics, Computer Mathematics and the likes. The target population focussed on the entire 200 level Computer Science students; 2020/2021 (Appendix E) session selected from three public Universities.

3.3 Sample and Sampling Techniques

The sample of this study was made up of 236 second year computer science students from three public universities in North central Nigeria. These three public universities were selected using purposive sampling method. This method of selection was to ensure that the schools selected share similar environmental conditions and the criteria for the selection include; that the universities must have a Computer Science Department (no combinations such as computer mathematics, computer statistics and the likes). The Department must have functional computer systems in use which may have exposed the students to the ability to communicate flexibly with a computer system or Smartphone. The school must either be a state or federal university. The three schools selected were randomly assigned into two experimental groups and one control group using simple random method. The three groups that were randomly assigned to were schoology ELP, canvas ELP and lecture method. The two hundred level (200L) male and female computer science students who fell within the three schools for this study were not randomly assigned in the study but used that way as an intact class.

3.4 Research Instruments

For the purpose of data collection, one research treatment and two research instruments were used by the researcher for data collection. They are as follows:

1. **Treatment;** Schoology Electronic Learning Platform (SELP) and Canvas Electronic Learning Platform (CELP)
2. **Test Instrument;** Web Design Achievement Test (WDAT).
3. **Questionnaire;** Questionnaire on students' learning engagement using Schoology and Canvas platform (Q-LE) and Questionnaire on students' perception towards the use of Schoology and Canvas platform (Q-SP)
4. **3.4.1. Schoology electronic learning platform (SELP)**

The first step into Schoology website was to login using schoology website and create an account as a teacher. Figure 3.1 showed the signing up stage where the researcher had to fill in the login details.

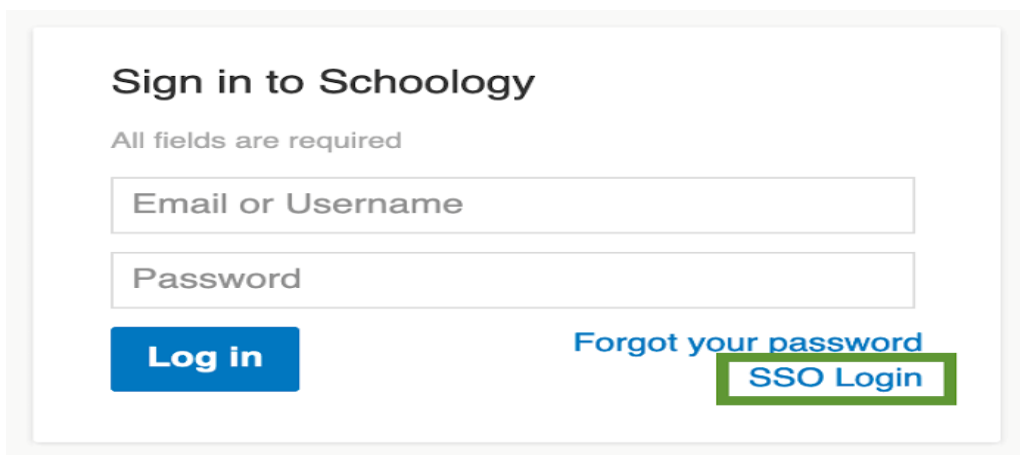


Figure 3.2: Sign up Stage into Schoology ELP

When the signing up and registration was done, the researcher was ushered into the home page of schoology ELP. Figure 3.2 showed the homepage and course content interface in schoology ELP.

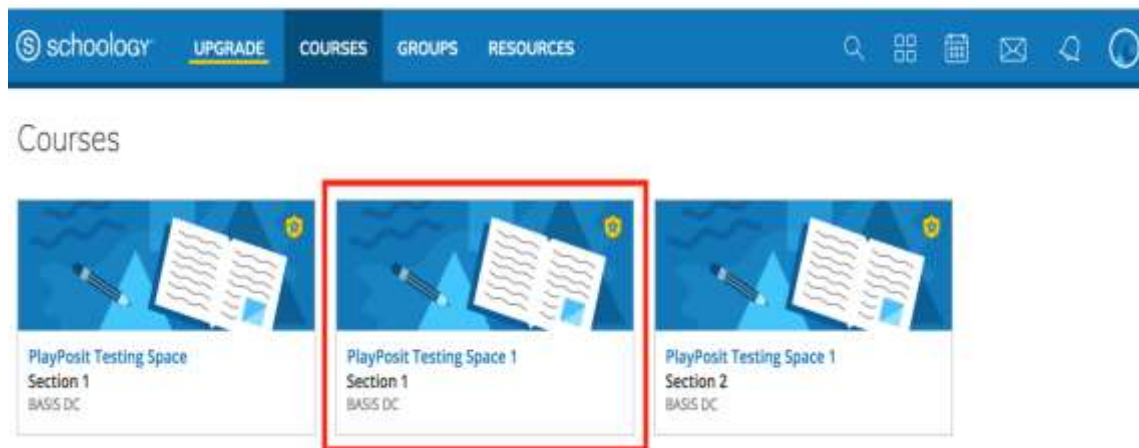


Figure 3.3: Homepage and Course content Interface of Schoology ELP

The general interface of the learning platform was modified to reflect the concept of web design that was taught to the students. The modifications included; preparing module on web design for 2001 level computer science students, adding picture on Schoology dash board to reflect the title of web design, change in time zone to reflect Nigerian time, among others. The next stage was to invite the students into Schoology platform through a code sent to their email addresses which was collected during one of the researcher's visit to the school for introduction and pre-test. The activities in Schoology electronic learning platform included the delivery of lessons on web design to the students with additional links on reading materials on web design to keep them engaged after each lesson. In the course of the lesson delivery to the students, the researcher set up deadlines using the calendar on Schoology to give the students time to write and submit their quizzes as well as to monitor the submission of any given assignment. Other activities were discussion forums by students and teachers on topics covered, attendance, updates, and monitoring of students' participation and activities in the platform.

Experimental group I made up the Schoology electronic learning platform. Once added, the students were welcome and introduced to the different functions of the platform and were encouraged to make the best use of all the different features provided in the

platform. In addition, a mobile application developed by Schoology was also introduced to the students to encourage them to synchronize their use of the website on both computers and mobile phones for notifications and quick access to learning and interaction.

3.4.2 Canvas electronic learning platform (CELP)

The researcher started by signing in and then registering as a teacher in Canvas ELP website and instructions were given on how to setup the account. Figure 3.3 showed the stage of signing up.



Figure 3.4: Sign up Stage into Canvas ELP

When the registration was done, the researcher set up her account and planned the lessons on web design concept to be taught to the 200L computer science students using the modules. Figure 3.4 showed the section for account setting and course creation interface on canvas ELP.

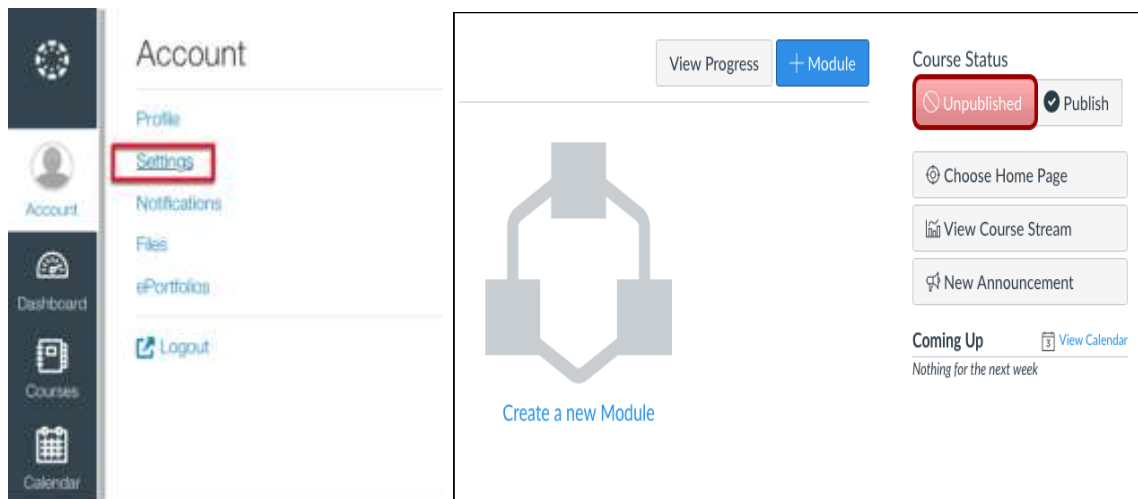


Figure 3.5: Settings and Module Interface Page of Canvas ELP

Afterwards, the researcher went ahead to plan the web design lessons for 200L computer science students in modules within the course icon in the platform. These modules were planned to enable learning take place for the students once they were invited to the platform. The activities lined up in Canvas ELP were delivery of lessons on web design to the students and additional links on reading materials on web design to keep them engaged after each lesson. In the course of the lesson delivery to the students, the researcher set up deadlines using the calendar on Canvas to give the students time to write and submit their quizzes as well as monitor the submission of any given assignment. Other activities included were discussion forums by students and teachers on topics covered, attendance, updates, and monitoring of students' participation. The next stage was for the teacher to invite the students into the platform by sending them the Canvas ELP code through the students' email addresses which was collected from them when the researcher visited the school to commence the research.

Experimental group II made up the Canvas electronic learning platform and the researcher added them by emailing the access code to them which granted them entry into the platform. Once added, the researcher again introduced herself and welcome the

students into the platform. The students were also introduced to the different features of the platform and were encouraged to make the best use of all the different facilities provided therein. The Canvas mobile application was also introduced to the students in order to encourage them to synchronize their access to the website on both their computers and mobile phones to allow them learn with it anytime.

3.4.3 Development of web design achievement test (WDAT)

Web Design Achievement Test (WDAT) was administered both at pre-test and post-test stages of the study. It was a 50 item multiple choice questions and developed by the researcher. The items were planned to meet the instructional objectives of the study as well as the web design concepts that was treated. The materials that were used to construct the items in WDAT was obtained from verified online sources as well as from current web design text books for 200L Computer Science in Nigeria Universities. WDAT was of two parts; sections A and B. While section A contain items that collect the personal data of the students, section B was constructed to gather information on student’s intellectual ability which was centred on the web design concepts taught.

Each of the questions in WDAT consisted of 4 options with three distractors and only one correct answer which carried 2 marks. In total, the test was scored at 100% and aimed to cover the different levels of the Blooms Taxonomy, as shown in Table 3.2.

Table 3.2: Bloom’s Taxonomy Table of Specification

Content	Knowledge	comprehension	Application	Synthesis	Analysis	Activities	total
Topic 1	2	2	3	3	3	3	16
Topic 2	2	2	3	3	3	4	17
Topic 3	2	2	3	3	4	4	18

3.4.4. Development of questionnaire on students' learning engagement using schoology and canvas platform (Q-LE)

Q-LE was used to measure student learning engagement in web design concepts using Schoology and Canvas ELP. It was an adapted self-report questionnaire that was measured on a 5-point Likert scale containing 14 items. Q-LE ranked from 1 to 5 and represented the following; number 5; strongly agree, number 4; agree, number 3; uncertain, number 2; disagree and number 1; strongly disagree.

Sections A of Q-LE was aimed to collect personal data of students while section B contained items targeted to gather information on students' learning engagement and overall experiences while using the platforms. Q-LE was developed based on six factors which included; psychological motivation, peer collaboration, cognitive problem solving, and interaction with instructor, community support, and learning management. The psychological motivation factor represented the students' thoughts and feelings such as expectations, interest and motivation as it relates to ELPs.

Peer collaboration factor referred to activities in which learners discussed knowledge and collaboratively solved problems. Cognitive problem-solving factor represented the process of acquiring, understanding and utilizing knowledge. Interactions with instructors referred to the behavioural engagement in which the student communicated with the teacher while taking courses using ELPs. Community support factor was related to the psychological state of the learner and this included the bonds that is formed among learners as they were enrolled in the platform to take courses on web design. Lastly, learning management was concerned with the behavioural engagement in which learners managed their own learning during their participation in the platform.

Q-LE was administered to the students in the experimental groups at both pre-test and post-test stages of the study.

3.4.5 Development of questionnaire on students' perception towards learning web design concepts using Schoology and Canvas ELPs (Q-SP)

Q-SP was developed and aimed to measure students' perception towards schoology and canvas platforms. It was an adapted self-report questionnaire that was measured on a 5-point Likert scale containing 18 items. Q-SP was ranked on the scale of 1 to 5 representing the following; 5; strongly agree, 4; agree, 3; uncertain, 2; disagree and 1; strongly disagree. Items on students' perception towards schoology and canvas was merged with students' learning engagement using schoology and canvas, which formed Section C of the Questionnaire that was administered to the students. In other words, sections A gathered students' personal information, Section B gathered information on students' learning engagement on schoology and canvas ELPs while Section C gathered information on students' perception towards the use of schoology and canvas ELPs.

The items on students' perception towards the use of schoology and canvas ELPs contained three constructs which was based on students' social presence, students' social learning interaction and students' learning experience using ELP. These items were administered to the students in the experimental groups both at pre-test and post-test stages of the study.

3.5 Validation of Research Instruments

3.5.1 Validity of schoology and canvas ELPs

Schoology and Canvas ELPs, were validated by one lecturer who is an expert in Educational Technology, one software developer, an expert from Computer Science Department and one system analyst who is an expert in Information Technology, all in

Federal University of Technology Minna, Niger State. The constructs that were validated by these experts include; suitability of the platform for instruction, clarity and simplicity of the platform, the suitability of the ELPs for teaching web design concepts, appropriateness of illustration of the concepts, background colour and suggestions for improving the platform. All the input made by the experts were followed and were used for the enhancement of the platforms.

3.5.2. Validity of web design achievement test (WDAT)

The items contained in Web Achievement Test (WAT) were validated by three experts who are lecturers from Computer Science Department and one expert lecturer from Educational Technology Department, all from Federal University of Technology, Minna, Niger State. The areas that were validated include; appropriateness of the instrument for the purpose it was designed for, clarity and simplicity for the level of the language used, suitability for the level of the targeted audience, the extent in which the items cover the topic it meant to cover, other grammatical or spelling error and other suggestions to improve the quality of the instrument. The errors and improvements pointed out by the experts have been effected by the researcher.

3.5.3 Validity of questionnaire on students' learning engagement using schoology and canvas platforms (Q-LE)

The items contained in the Q-LE were validated by three experts. They include one Social Psychologist from Psychology Department, Enugu State University of Science and Technology, Enugu State, one Guidance Counsellor from Guidance Counselling Department, College of Education Minna, Niger State and one Counselling Psychologist from Students Affairs Department, Federal University of Technology, Minna, Niger State. These experts observed and validated the appropriateness of the instrument for the purpose it was designed, clarity and simplicity for the level of the

language used, suitability for the level of the target audience, extent in which the items covered the topic it was meant to cover, the structuring of the questionnaire, grammatical errors, spelling errors and general overview of the instrument. All modifications made by the experts have been amended to suit the study.

3.5.4 Validity of questionnaire on students' perception toward learning web design concepts using Schoology and Canvas ELPs (Q-SP)

The items contained in Q-SP were also validated by three experts. One Social Psychologist from the Department of Psychology, Enugu State University Science and Technology, Enugu State, one Guidance Counsellor from Guidance Counselling Department, College of Education Minna, Niger State and one Counselling Psychologist from Students Affairs Department, Federal University of Technology, Minna, Niger State. These experts observed and validated the appropriateness of the instrument for the purpose it was designed, clarity and simplicity for the level of the language used, suitability for the level of the target audience, extent in which the item covered the topic it was meant to cover, the structuring of the questionnaire, grammatical errors, spelling errors and general overview of the instrument. All modifications made by the experts have been amended to suit the study.

3.6 Reliability of the Research Instruments

To determine the reliability coefficient of Web Design Achievement Test, Questionnaire on students' learning engagement and Questionnaire on students' perception on the two ELPs, a pilot test was carried out using students from a university that is part of the population but not part of the sampled schools for the study. The treatment and test instruments (WDAT, Q-LE and Q-SP) was administered to the students at a single administration and the result obtained from the WDAT was analysed

using Kuder Richardson 20 (K-R₂₀). Kuder- Richardson 20 formula was used to analyse WDAT because the items in the test had varying difficulty level and K-R₂₀ measures the reliability for binary variables in a test instrument. In other words, the answers to all the questions in the item do not have partially right or wrong answers but had only one correct answer. The scores for K-R₂₀ ranges from 0.00 to 1.00 with values of 0.6 and above indicating acceptability (Creswell, 2005).

While WDAT was analysed using K-R₂₀, the result obtained from Q-LE and Q-SP were statistically analysed using Cronbach Alpha. Cronbach's alpha coefficient was used to ascertain the reliability of items within the multiple Likert scale questionnaire. According to Sekaran and Bougie, (2016), a reliability coefficient between 0.65 and 0.8 or higher are considered acceptable while anything lower is unacceptable. The pilot test conducted in this study showed a reliability coefficient of 0.79 for WDAT and a reliability coefficient of 0.76 and 0.71 for Q-LE and Q-SP respectively. This outcome indicated that the instruments are reliable.

3.7 Method of Data Collection

The researcher visited the three schools that were used for the study on the first week with an introductory letter from the Department of Educational Technology, School of Science and Technology Education, in order to seek permission from the Heads of Department of the various schools to be used. On the second week, the researcher trained two research assistants from each of the three universities who assisted in the conduct of the study. These assistants were added to a platform where they had a training session with the researcher on the learning activities mapped out for the smooth conduct of the study as well as on how to navigate both schoology and canvas ELPs. They were given a self-study demo already embedded in the validated schoology and canvas ELPs to familiarize themselves with the platform. These demos took them on a

tour on how the platforms are navigated and at intervals into the demo, more explanations were offers by the researcher to the assistants so that they understand each step to be taken throughout the course of the study with the students.

The training was scheduled twice on the second week of data collection for each of the three groups and each session lasted for two hours. The training was needed in order to take care of teacher effect variable and also ensure that the research assistants key into the homogeneity of the teaching methods to which the lessons was delivered. It was also necessary to ensure that the students adhere strictly to the ethics of the study when the research commenced. On the third week, the researcher administered the pre-test to the three schools that were randomly assigned into experimental group 1 and II and control group. The pre-test enabled the researcher determine the similarities or differences in knowledge shared by the three groups before the treatment was administered. In the same week, the researcher oriented the students in the experimental groups on how to sign up and register on the platforms using the code generated by the researcher.

From the fourth week down to the eighth week, lessons for all the students commenced. Students in the experimental groups were scheduled to learn two times in a week using Schoology and Canvas ELPs while allowing them to also learn the modules covered at their own pace. There were three stages to learning for students in schoology and canvas ELPs as shown in Figure 3.6.

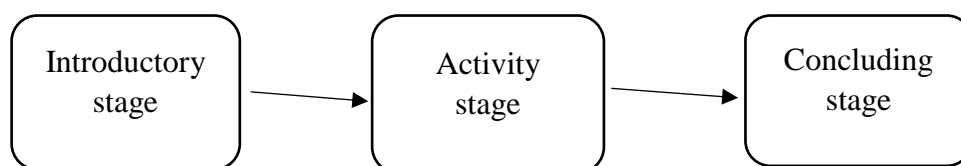


Figure 3.6: Learning Stages for Students in Schoology and Canvas ELPs

Source: Researcher (2023)

The connectivist and social constructivist approaches are advocates of students' centred learning and as such, the role of the teacher shifted from the source of knowledge to a facilitator towards students' activities to build competence while the students work together to discuss contents delivered in each module. At the introduction stage, the teacher explained to the students how learning activities were going to take place. The students were instructed to watch a prepared demo in the ELPs to familiarize themselves on how to access their learning materials and additional online links, view notifications and not miss updates, be part of discussion forums and answers quizzes. The activity stage involved the learning stage when active learning began. The teacher monitored, took attendance and ensured that the modules were made visible on timing basis each week, and students were encouraged to brainstorm, make contributions, share their views, give explanations to their peers where needed and ask questions. While the collaboration was taking place, the teacher offered feedbacks when the need arose, took note of the students who were actively participating and ensured that students lagging behind were carried along by the rest of the students.

This was done to ensure students reached their learning goals and achieve competence in their learning skills. At the end of the discussion of each module, additional links and videos were attached in order to buttress more on the lessons and also prepare the students in the platforms for quiz before they moved to the next module the following week. The late stage was the closing stage, where the teacher gave quizzes to evaluate what the students have assimilated so far.

The control group on the other hand, were also taught two times in a week on the same web design content but with the use of conventional method of teaching. In all, the entire students in the three groups were taught based on the same learning objectives. The 9th week was used for revision for all the three groups while the 10th week was used

for the re-administration of shuffled (post-test) WDAT as well as Q-LE and Q-SP on the groups. The time-line for the research is shown on Table 3.3.

Table 3.3: Time-line for the Research

1st week	visited schools for permission.
2nd week	trained research assistants
3rd week	pre-test administration of WDAT, Q-LE and Q-SP on all the groups and orientation for groups.
4th – 8th week	teaching commenced for the three groups
9th week	revision
10th week	post-test administration of WDAT, Q-LE and Q-SP on groups

3.8 Method of Data Analysis

Data collected from the fifty item questions on WDAT alongside the Q-LE and Q-SP at pre-test and post-test were analysed using descriptive and inferential statistics using Statistical Product and Service Solutions (SPSS) version 23. 00. Objective 1, 4, and 5 was achieved through the administration of web design achievement test, while objective 2, 3, 6 and 7 was achieved through the administration of questionnaire on students’ learning engagement and students’ perception towards learning web design concepts using Schoology and Canvas ELPs. The calculated group mean and standard deviation obtained were used to answer all research questions. For hypothesis 1, after finding a significant difference in the mean scores of the three groups using ANOVA at pretest, ANCOVA statistics was used for analysis at posttest with the pre-test scores serving as covariant. Also, to determine where the differences in scores laid in the three

teaching methods at posttest, post hoc (Sidak post hoc) test was used. For the analysis of hypotheses 2 and 3, ANOVA statistics was used to determine the significant difference in the group mean and standard deviation of the two groups at posttest. ANCOVA was used to determine the differences in the gender influence of hypothesis 4 after a significant difference was found in the pretest scores of the groups using ANOVA. Independent t-test was however used at posttest to analyse the significant difference in hypotheses 5, 6 and 7 when no significant difference in the gender scores was found at 0.05 alpha level at pretest. Figure 3.7 gives a general view of this study's research methodology process.

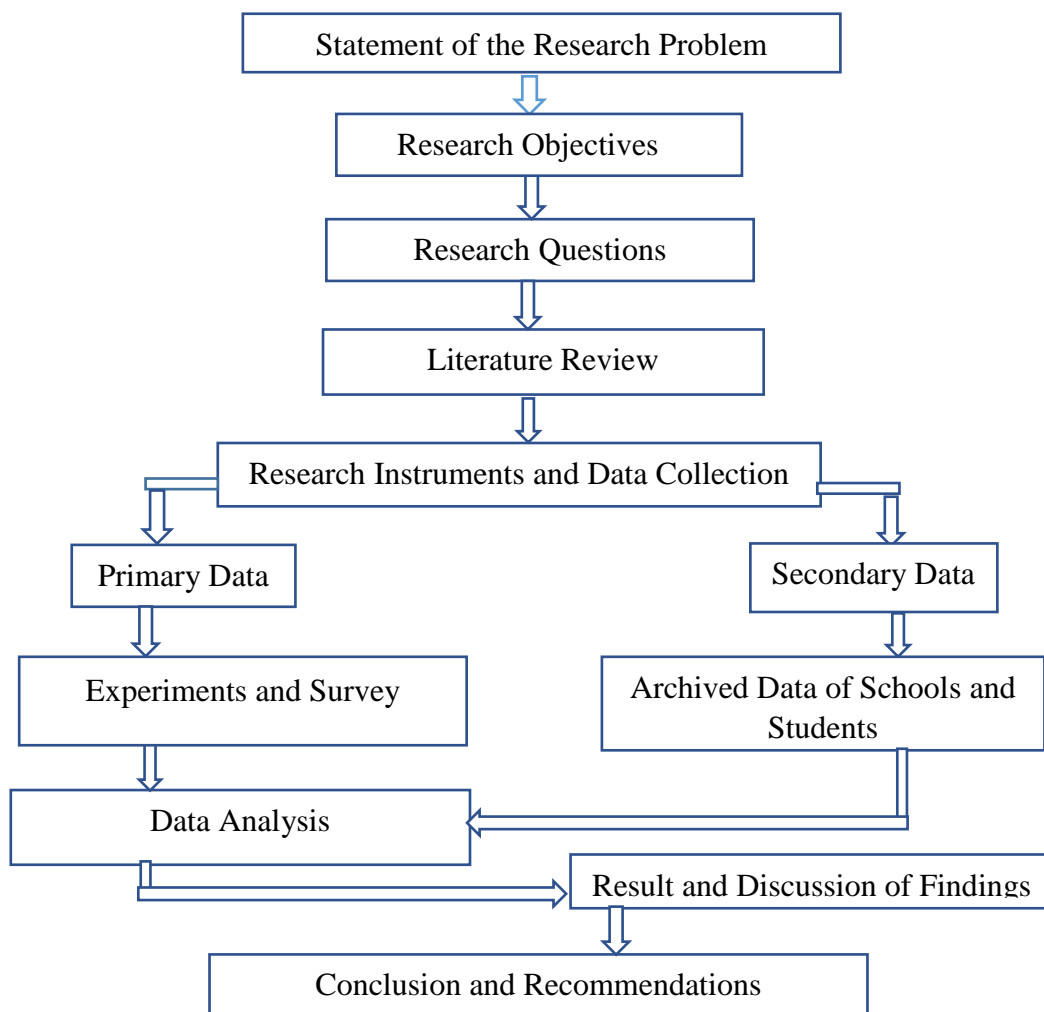


Figure 3.7: General process of Research Methodology

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 RESULTS

4.1.1 Pre-test result of experimental groups I, II and control group

ANOVA comparison was carried out to determine students' equivalence in relation to their entry knowledge before the treatment instrument was administered. This result is shown in Table 4.1

Table 4.1: ANOVA Result Comparing Pre-test Scores of Experimental Group I, Experimental Group II and Control Group

Source of variations	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	164.040	2	82.020	3.399	.035*
Within Groups	5621.838	233	24.128		
Total	5785.877	235			

*: Significant at 0.05

Table 4.1 displayed the ANOVA analysis of the pre-test scores of experimental group I, experimental group II and control group. The result from the above table conveyed that there was a significant difference between the three groups $F_{(2, 235)} = 3.399, p < 0.05$ which is an indication that the students in the three groups differed at entry stage before treatment was administered. Subsequent to the significant difference result obtained from the pre-test scores of these three groups, the hypotheses formulated from the research questions was tested using ANCOVA.

4.2 Research Questions

All the research questions raised in this study were answered using descriptive statistics (mean and standard deviation).

4.2.1 Research question one

What are the mean achievement scores of students taught web design concepts using Schoology ELP, Canvas ELP and Lecture method? The mean and standard deviation of the three groups (Schoology ELP, Canvas ELP and Lecture method) at pre-test and post-test were computed and mean differences shown in order to answer research question one and is presented in Table 4.2.

Table 4.2: Mean and Standard Deviation of Pre-test and Post-test Achievement Scores of Experimental Group I, Experimental Group II and Control Group

Groups	Pre-test			Post test		Mean Difference
	N	\bar{x}	SD	\bar{x}	SD	
Experimental Group I (Schoology)	75	35.04	10.64	70.56	11.69	35.52
Experimental Group II (Canvas)	91	31.16	9.12	72.79	9.21	41.63
Control Group (Lecture method)	70	32.03	9.79	63.60	10.47	31.57

Table 4.2, showed an increase in the mean and standard deviation of the three groups from pre-test to post-test. There were also differences in the mean scores of the three groups at post-test. Experimental group I had a mean score of 70.56 and standard deviation of 11.69. Experimental group II had a mean score of 72.79 and standard deviation of 9.21. Control group had a mean score of 63.60 and a standard deviation of 10.47. The scores recorded as mean difference across experimental group I, experimental group II and control group were 35.52, 41.63 and 31.57 respectively, meaning that experimental group II had a higher mean gain. In order to ascertain if the difference was significant, ANCOVA which takes into account the significant difference of the three groups at pre-test was used to test the corresponding hypothesis.

4.2.2 Research question two

What is the difference in the learning engagement of students taught web design concepts using Schoology and Canvas ELP? Research question two was presented in Table 4.3 where the mean and standard deviation of the two groups were computed and the mean differences compared.

Table 4.3: Mean and Standard Deviation of Learning Engagement Scores of Experimental Group I and Experimental Group II at Post-test

Groups	N	\bar{x}	SD	Mean Difference
Experimental Group I (Schoology)	75	57.12	6.15	
Experimental Group II (Canvas)	91	58.35	5.15	1.23

Post-test learning engagement scores of experimental groups I and II disclosed that there were differences in the mean and standard deviation of the two groups as shown in Table 4.3. While mean difference in the learning engagement of the two groups was shown to be 1.23, experimental group II can be observed to have caused the difference by earning a mean score of 58.35 and standard deviation of 5.15 as against experimental group I that had a lesser mean score of 57.12 and standard deviation of 6.15. This means that experimental group II taught web design using Canvas ELP had a higher learning engagement score than experimental group I who were taught web design concepts using Schoology ELP. The mean difference was analysed using ANOVA to determine the statistical significance while the corresponding null hypothesis was tested.

4.2.3 Research question three

What is the perception of students towards learning web design concepts using Schoology and Canvas ELPs? Mean and standard deviation were computed in order to

compared and establish the mean difference of the two groups and answer research question three as shown in Table 4.4.

Table 4.4: Mean and Standard Deviation Perception Scores of Experimental Group I and Experimental Group II at Post-test

Groups	N	\bar{x}	SD	Mean Difference
Experimental Group I (Schoology)	75	72.05	7.77	
Experimental Group II (Canvas)	91	74.1	5.9	2.05

The perception scores of experimental groups I and II answered using mean and standard deviation is shown in Table 4.4. It was observed from the table that there was a difference between the mean perception scores of the two experimental groups with experimental group II having a greater mean score of 74.1 and standard deviation of 5.9 when compared to experimental group I that had a lower perception mean score of 72.05 and standard deviation of 7.77. The table also signified that experimental group II taught web design concepts using Canvas ELP had a perception mean score difference of 2.05 as against students taught using Schoology ELP. The mean difference in the scores was analysed using ANOVA to determine whether the difference was statistical significance while testing the corresponding null hypothesis.

4.2.4 Research question four

What is the difference in the mean achievement scores of male and female students taught web design concepts using Schoology ELP? To answer research question four, the pre-test and post-test mean and standard deviation of the groups (males and females) were computed and compared to determine their mean differences and is shown in Table 4.5.

Table 4.5: Pre-test Post-test Mean Achievement Scores and Standard Deviation of Male and Female Students in Experimental Group I (Schoology)

Groups	Pre-test			Post test		Post-test Mean Difference
	N	\bar{x}	SD	\bar{x}	SD	
Male	48	33.17	10.09	70.42	11.13	0.39
Female	27	38.37	10.97	70.81	12.86	

The mean and standard deviation achievement scores of male and female groups at pre-test and post-test was shown in Table 4.5. The table revealed that there was an increase in the mean and standard deviation of the two groups from pre-test to post-test. The table also made it known that there was a difference in the mean scores of the two groups at post-test. While male students had a mean score of 70.42 and standard deviation of 11.13, the female students got a mean score of 70.81 and standard deviation of 12.86. This resulted to a mean difference of 0.39 in favour of the female group. To determine if this difference was significant, ANCOVA was used to test the corresponding hypothesis.

4.2.5 Research question five

What is the difference in the mean achievement scores of male and female students taught web design concepts using Canvas ELP? Research question five was presented in Table 4.6 where the mean and standard deviation of the two groups at pre-test and post-test were computed and the mean difference compared and established.

Table 4.6: Pre-test Post-test Mean Achievement Scores and Standard Deviation of Male and Female Students in Experimental Group II (Canvas)

Groups	Pre-test			Post test		Post-test Mean Difference
	N	\bar{x}	SD	\bar{x}	SD	
Male	63	31.65	9.24	73.02	9.79	0.73
Female	28	30.07	8.92	72.29	7.88	

The mean and standard deviation achievement scores of male and female groups at pre-test and post-test was shown in Table 4.6. Revealed in the table was an increase in the mean and standard deviation of the two groups from pre-test to post-test. The table also showed a difference in the mean scores of the two groups at post-test. It was noted that at post-test, male students got a higher mean score of 73.02 and standard deviation of 9.79 while the female group got a mean score of 72.29 and standard deviation of 7.88. A mean difference of 0.73 was recorded in favour of the male students at post-test and to test the corresponding hypothesis, independent t-test was used to analyse the differences in the mean while testing the null hypothesis.

4.2.6 Research question six

What is the difference in the learning engagement of male and female students taught web design concepts using Schoology ELP? To answer research question six, mean and standard of the two groups were computed and the mean difference established and shown in Table 4.7

Table 4.7: Pre-test, Post-test Mean Learning Engagement Scores and Standard Deviation of Male and Female Students in Experimental Group I (Schoology)

Groups	Pre-test			Post test		Mean Difference
	N	\bar{x}	SD	\bar{x}	SD	
Male	48	45.38	8.65	57.01	5.73	0.05
Female	27	44.78	10.12	57.15	6.94	

Table 4.7 which unveiled the result of the mean and standard deviation learning engagement scores of male and female groups at pre-test and post-test presented an increase in the mean and standard deviation of the two groups from pre-test to post-test. The table also revealed a difference in the mean scores of the two groups at post-test. Male students at post-test procured a higher learning engagement mean score of

57.1 and standard deviation of 5.73 while their female counterpart acquired a lower mean learning engagement score of 57.15 and standard deviation of 6.94. This gave away a mean difference of 0.05 in favour of the female group. To determine whether the difference was statistically significant, hence independent t-test was used to test the corresponding hypothesis.

4.2.7 Research question seven

What is the difference in the learning engagement of male and female students taught web design concepts using Canvas ELP? To answer research question seven, mean and standard of the two groups were computed and the mean differences established and shown in Table 4.8.

Table 4.8: Pre-test, Post-test Learning Engagement Scores and Standard Deviation of Male and Female Students in Experimental Group II (Canvas)

Groups	Pre-test			Post test		Post-test Mean Difference
	N	\bar{x}	SD	\bar{x}	SD	
Male	63	46.22	9.59	58.94	5.03	1.9
Female	28	48.61	10.57	57.04	5.25	

Table 4.8 provided the mean and standard deviation learning engagement score result of male and female groups from pre-test to post-test. The table presented an increase in the mean and standard deviation of the two groups from pre-test to post-test and also revealed a difference in the mean scores of the two groups at post-test. It revealed that male students got a higher learning engagement mean scores of 58.94 and standard deviation of 5.03 at post-test while the female group acquired a lower mean learning engagement score of 57.04 and standard deviation of 5.25, giving the male group an edge over the female group with their mean difference of 1.9. To determine if this

difference was significant, Independent t-test was used to analyse the corresponding hypothesis.

4.3 Analysis of Null Hypotheses

4.3.1 Hypothesis one (H₀₁)

H₀₁: There is no significant difference in the mean achievement scores of students taught web design concepts using Schoology ELP, Canvas ELP and Lecture method. To determine if the difference between the mean scores of the three groups at post-test is significant, ANCOVA was used to test null hypothesis one and was presented in Table 4.9.

Table 4.9: ANCOVA Comparison of Post-test Scores of Experimental Group I, Experimental Group II and Control Group

Source	Sum of Squares	Df	Mean Square	F	Sig.
Corrected *Model	2620.674	3	873.558	44.223	.000
Intercept	12384.567	1	12384.567	626.950	.000
Pre-test	1745.227	1	1745.227	88.350	.000
Group	924.404	2	462.202	23.398	.000*
Error	4582.851	232	19.754		
Total	291008.000	236			
Corrected Total	7203.525	235			

*: Significant at 0.05

The result obtained from Table 4.9 shows the ANCOVA analysis comparing the post-test scores of students in experimental group I, experimental group II and control group. The analysis presented a significant difference of $F_{(2, 236)} = 23.398$, $p < 0.05$. This means that there was a statistical significant difference in the mean achievement scores of students taught web design concepts using schoology ELP, canvas ELP and lecture method. However, where the difference lie is unknown and to determine where the

differences lie among the three independent groups, Sidak post-hoc analysis was used and presented in Table 4.10.

Table 4.10: Sidak Post-hoc Analysis of Post-test Mean Achievement Scores in Experimental Group I, Experimental Group II and Control Group at Post-test

(I) lecture canvas schoolology	(J) lecture canvas schoolology	Mean Difference (I-J)	Std. Error	Sig.
Lecture	Canvas	-4.596*	.829	.000
	Schoolology	-3.480*	.866	.000
Canvas	Lecture	4.596*	.829	.000
	Schoolology	1.116	.813	.431
Schoolology	Lecture	3.480*	.866	.000
	Canvas	-1.116	.813	.431

*. Significant at 0.05 level.

Presented in Table 4.10 is sidak post-hoc test that revealed where the differences lie among the groups. The table showed a mean difference of 4.596 between Canvas ELP and lecture method at a significance level of .000 ($p < 0.05$) in favour of canvas ELP. The result implies that there was a statistically significant difference in the mean achievement scores of students taught web design concepts using Canvas ELP and those taught web design using lecture method. The table also revealed that there was a mean difference of 3.480 between Schoolology ELP and lecture method at a significance level of .000 ($p < 0.05$) in favour schoolology ELP. This means that there was a statistically significant difference in the mean achievement scores of students taught web design concepts using Schoolology ELP and those taught web design using lecture method. The table showed a mean difference of 1.116 between Schoolology and Canvas ELP which was however considered not significant at .431 ($p > 0.05$). This means that there was approximately no significant difference in the mean achievement scores of students

taught web design concepts using Schoology ELP and those taught using Canvas ELP. Null hypothesis one was therefore rejected based on this finding.

4.3.2 Hypothesis two (H₀₂)

H₀₂: There is no significant difference in the learning engagement of students taught web design concepts using Schoology and Canvas ELPs. To determine if the mean difference between the post-test learning engagement scores of students taught using Schoology and Canvas ELP was significant, ANOVA was used to test null hypothesis two and was presented in Table 4.11.

Table 4.11: Summary of Analysis of Variance (ANOVA) of Post-test Learning Engagement Scores for Students in Experimental Group I and II

Source of Variance	Sum of Squares	Df	Mean Square	F	P
Between Groups	10.209	1	10.209	.339 ^{NS}	.561
Within Groups	4944.134	164	30.147		
Total	4954.343	165			

^{NS}: Not Significant at 0.05 level

Table 4.11 reveals the ANOVA result on the post-test learning engagement scores for students in experimental group I (Schoology) and experimental group II (Canvas). This table showed a no difference between the mean scores of the two groups ($F_{(1, 165)} = .339, p > 0.05$). This implies that there was no statistically significant difference in the mean learning engagement scores of students taught using Schoology and Canvas ELP. Hence, null hypothesis two was retained.

4.3.3 Hypothesis three (H₀₃)

H₀₃: There is no significant difference in the perception of students towards learning web design concepts using Schoology and Canvas ELPs. To determine whether the difference between the mean perception scores of the two groups was significant, ANOVA was used to test null hypothesis three and was presented in Table 4.12.

Table 4.12: Summary of Analysis of Variance (ANOVA) of Post-test Perception Scores for Students in Experimental Group I and II

Source of Variance	Sum of Squares	Df	Mean Square	F	P
Between Groups	202.883	1	202.883	4.382	.038*
Within Groups	7593.919	164	46.304		
Total	7796.801	165			

*: Significant at 0.05 level

Table 4.12 reveals the ANOVA result on the post-test perception scores for students in experimental group I (Schoology) and experimental group II (Canvas). The table showed a significant difference in the mean perception scores of the two groups ($F_{(1, 165)} = 4.382, p < 0.05$). As a result of this finding, null hypothesis three was rejected, indicating that there was a statistically significant difference in the perception scores of students taught using Schoology ELP and those taught using Canvas ELP.

4.3.4 Hypothesis four (H₀₄)

H₀₄: There is no significant difference in the mean achievement scores of male and female students' taught web design concepts using Schoology ELP. To determine whether the difference between the mean achievement scores of the two groups was significant. ANCOVA was used to test null hypothesis four and was presented in Table 4.13.

Table 4.13: ANCOVA Comparison of Post-test Scores of Male and Female Students taught Web Design using Schoology ELP

Source	Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	852.738	2	426.369	18.291	.000
Intercept	3152.866	1	3152.866	135.253	.000
Pre-test	852.053	1	852.053	36.552	.000*
Group	37.136	1	37.136	1.593 ^{NS}	.211
Error	1678.382	72	23.311		
Total	95882.000	75	426.369		
Corrected Total	2531.120	74			

^{NS}: Not Significant at 0.05

The result obtained from Table 4.13 showed the ANCOVA analysis comparing the post-test scores of male and female students in experimental group I (Schoology). The analysis presented a significant difference of $F_{(1, 75)} = 1.593$, $p > 0.05$. This meant that there was no statistically significant difference in the achievement mean scores of male and female students taught web design concepts using schoology ELP. Consequent to this finding, null hypothesis four was retained.

4.3.5 Hypothesis five (H₀₅)

H₀₅: There is no significant difference in the mean achievement scores of male and female students taught web design concepts using Canvas ELP. To determine whether the difference between the mean achievement scores of the two groups was significant. Independent t-test was used to test null hypothesis five and was presented in Table 4.14.

Table 4.14: Result of Independent t-test Comparing the Mean Achievement Scores of Male and Female Students Taught Web Design Using Canvas ELP

Variables	N	Df	Mean	SD	t-cal	Sig.
Male	63	89	36.51	4.9	2.082 ^{NS}	.153
Female	28		36.14	3.94		

^{NS}: Not Significant at 0.05 level.

The result obtained from Table 4.14 revealed the analysis of independent t-test comparing the post-test scores of male and female students in experimental group II (Canvas). The table showed no significant difference of ($t_{1, 89} = 2.082, p > 0.05$). This means that there was no statistically significant difference in the achievement mean scores of male and female students taught web design concepts using canvas ELP. Hence, null hypothesis five was retained.

4.3.6 Hypothesis six (H₀₆)

H₀₆: There is no significant difference in the learning engagement of male and female students taught web design concepts using Schoology ELP. To determine whether the difference between the mean learning engagement scores of the two groups was significant. Independent t-test was used to test null hypothesis six and was presented in Table 4.15.

Table 4.15: Result of Independent t-test Comparing Mean Learning Engagement Scores of Male and Female Students Taught Using Schoology ELP

Variables	N	Df	Mean	S.D	t-cal	Sig.
Male	48	73	57.73	5.378	.958 ^{NS}	.331
Female	27					

^{NS}: Not Significant at 0.05 level.

Table 4.15 showed the result obtained from the analysis of independent t-test that compared the post-test learning engagement scores of male and female students in experimental group I (schoology). The table showed that there was no significant difference ($F_{1, 73} = 958, p > 0.05$), leading null hypothesis six to be retained. This means that there was no statistically significant difference in the achievement mean learning engagement scores of male and female students taught web design concepts using canvas ELP.

4.3.7 Hypothesis seven (H07)

H07: There is no significant difference in the learning engagement of male and female students taught web design concepts using Canvas ELP. To determine whether the difference between the mean learning engagement scores of male and female students in experimental group II (canvas) was significant. Independent t-test was used to test null hypothesis seven and was presented in Table 4.16.

Table 4.16: Independent t-test Result Comparing Mean Learning Engagement Scores of Male and Female Students Taught Using Canvas ELP

Variables	N	Df	Mean	SD	t-cal	Sig.
Male	63	89	58.94	5.03	.560 ^{NS}	.456
Female	28		57.04	5.25		

^{NS}: Not Significant at 0.05 level.

The analysis of independent t-test that compared the post-test learning engagement scores of male and female students in experimental group II (canvas) was shown in Table 4.16. The result obtained from the analysis on the table revealed a no significant difference at ($t_{1, 89} = .560, p > 0.05$). This implies that there was no statistically significant difference in the achievement mean scores of male and female students taught web design concepts using canvas ELP. Hence, null hypothesis six was retained.

4.4 Summary of Findings

The findings obtained from the analysis of covariance (ANCOVA), analysis of variance (ANOVA) and independent t-test on all the research hypotheses of this study were summarized as follows:

1. A statistically significant difference in the mean achievement score of students taught web design concepts using Schoology ELP, Canvas ELP and Lecture method was detected. Hence hypothesis one was rejected.

2. There was no statistically significant difference in the mean learning engagement scores of students taught web design concepts using Schoology ELP and those taught using Canvas ELP. Consequently, hypothesis two was retained.
3. A statistically significant difference was obtained from the mean perception scores of students towards the use of Schoology ELP and Canvas ELP. Hence hypothesis three was rejected.
4. Hypothesis four showed no statistically significant difference in the mean achievement scores of male and female students taught web design concepts using Schoology ELP. Thus, the hypothesis was retained.
5. Hypothesis five was retained as there was no statistically significant difference in the mean achievement scores of male and female students taught web design concepts using Canvas ELP.
6. There was no statistically significant difference in the mean learning engagement scores of male and female students taught web design concepts using schoology ELP leading hypothesis six to be retained.
7. No statistically significant difference was derived from the mean learning engagement scores of male and female students taught web design concepts using canvas ELP. Hence hypothesis seven was retained.

4.5 Discussion of Results

The following major findings in this study were discussed under these headings:

1. Learning achievement outcomes of computer science students taught web design concepts using schoology and canvas ELPs.
2. Learning engagement outcomes of students taught web design concepts using schoology and canvas ELPs
3. Perception outcomes of students towards the use schoology and canvas ELPs.

4. Influence of gender on the academic achievement outcomes of students taught using schoology and canvas ELPs.
5. Influence of gender on the learning engagement outcomes of students taught web design concepts using schoology and canvas ELPs.

4.5.1 Learning achievement outcomes of computer science students taught web design concepts using schoology and canvas ELPs

The result obtained from the treatment administered to experimental group I using schoology, experimental group two using canvas and control group using lecture method showed that students who were exposed to schoology and canvas ELPs performed better than students who were taught web design concepts using lecture method. The result showed that there was a significant difference in the mean scores of the three groups at 0.05 level of significance. The increased performances of students in schoology and canvas ELP could be attributed to the flexible interactive tools embedded in the platform which provided the students an on-demand availability of resources which enabled them to complete tasks with groups, read conveniently at any time with reduced stress and increased self-paced ability among themselves.

This finding is relevant to the finding of Dang and Robertson (2010) who reported that Moodle ELP supported students in their initiation to learning process, thereby allowing them to achieve higher level of autonomy in EFL. Not only that, there was an increased level of participation in learning activities and communication and information gathering was encouraging using Moodle ELP. The result obtained by Tegegne (2014) had a contrary outcome. The result obtained showed no significant difference in the achievement scores of students in the experimental group and in the control group. Tegegne (2014) reported that instead of the achievement scores of the students who used Moodle ELP to be increase, it rather decreased and challenge being that the

students were greatly affected by their lack of basic knowledge and skills to handle technology as well as an ineffective use of the computers. The findings of this study are relevant to the finding of Alhothii (2015) whose study proved that while 100% of students admitted that they liked using the platform for their studies, Moodle ELP helped 90% of the students to get organized with less or no supervision.

There was no significant difference in the achievement scores of students who were taught using Canvas ELP and those taught using lecture method as was report by Tosun (2015). According to the report of Tosun (2015), the blended electronic learning taught using Canvas ELP did not improve the vocabulary knowledge of the students and the loophole could possibly be that the students were administered a different test at pre-test and a different test at posttest instead of a reshuffled pretest to be taken as posttest. Although, the students were satisfied with the electronic learning, they still preferred to learn the vocabulary in a traditional based classroom.

Sicat (2015) agreed on the similar finding of no significant difference in the mean scores of students in the experimental group taught using schoology and control group taught using traditional method. According to Sicat (2015), more elaborate discussion on the concept taught to the students in the study was required by the teacher on a face-to-face basis and that could have explained why students who were taught using traditional method performed better. Also, the study of Borglum (2016) reported that there was no significant difference in the mean scores of students who used canvas ELP and those who were taught using lecture method.

The result according to Borglum (2016), indicated that while technology gets a lot of attention, it still does not correlate to students' critical thinking skills. Contrarily, Alexander (2016) proved that students who were taught using Canvas ELP performed

better than the students who were taught using lecture-based method and this is relevant to the result obtained in this study. According to Alexander (2016), students in the canvas class excel more due to the power that lie in imagery. Also, students were required to deliver a presentation to their peers which made them become more invested in the content than in the lecture-based method.

Feizabadi *et al.* (2016) reported a no significant difference between the achievement scores of the experimental and control groups. Ever though, Moodle has positive impact on students' English course, they were limited as a result of lack of computer equipment and lack of cooperation encountered between students and teachers. Dewi (2018) who compared the mean achievement scores of students taught using schoology and canvas ELPs revealed that there was a significant difference in the mean scores of the two groups.

Dewi (2018) admitted that both platforms succeeded in increasing students learning achievement from pretest to posttest and this report is proof of the effectiveness of the learning platforms as a means of sharing unlimited learning materials, which has the capacity to broaden students' scope in a subject area. The report of Garcia *et al.* (2018) was in support of the findings of this study. According to Garcia *et al.* (2018), Schoology allow students to adapt their work and learning pace and this provides them opportunities and cognitive challenge for deeper knowledge processing.

This was asserted when the study carried out by Garcia *et al.* (2018) showed that there was a significant difference in the scores of students who used schoology and lecture method. Wihastyanang and Latief (2018) study was challenged by inadequate infrastructure and Internet access which was considered to have resulted to the no significant difference obtained between written feedback and electronic feedback of the

students who studied using schoology. Wihastyanang and Latief (2018) opined that Schoology as e-feedback can yield better result if infrastructure and Internet access is provided adequately.

Enwere and Emeasoba (2019) reported that there was a significant difference in the achievement scores of students taught using Edmodo platform and those taught using conventional method, pointing out that conventional method of teaching in schools is ineffective and does not promote meaningful learning that promotes the academic performance of students. The finding of Sari *et al.* (2020) was relevant to the result obtained in this study because the result obtained showed that students taught using schoology had a higher mean score when compared to their students who were taught using lecture method. Sari *et al.* (2020) indicated that using schoology facilitated students learning materials and provide opportunity for practical learning for students who tend to like social media activities.

The study of Sobowale *et al.* (2020) also showed that the mean achievement scores of students in the experiential and control group was significant. Sobowale *et al.* (2020) pointed out that the higher score was as a result of student ability to learn at their own pace and get assistance from so many learning resources that were available in the ATutor platform. Pahamzah *et al.* (2021) who examined the impact of schoology on students' reading comprehension and writing skill also provided evidence to prove that schoology can improve students reading comprehension as well as their writing skill.

Onuoha and Yahaya (2021) reported from the outcome of their study that the use of schoology and canvas ELPs are useful tools to improve the academic achievement of students and even though students who used schoology performed better than students who used canvas ELP, the two groups were actively involved in the learning process as

well as in the specific learning tasks given which helped the students' progress in each learning activity. The study of Onuoha and Yahaya (2021), is relevant to this present study because the same increase in performance of students in Economics concepts was achieved in this present study even though it was in a different subject area which is in web design concepts. This is to show that schoology and canvas ELPs when used effectively improves learning.

Mustaqim *et al.* (2022), revealed that students who studied using the web performed better than students who were taught using schoology ELP. According to Mustaqim *et al.* (2022), we-b class may have yielded the higher score because the settings were more flexible to use than schoology which created enthusiasm for students who used the web.

The result of Rokhim *et al.* (2022) showed that the interest of the students in learning using schoology and Powtoon increased by 60% and their learning outcomes increased by 85.71% and while students and teachers had higher trust in the use of Powtoon because they considered it to be a media that was easy to use when compared to schoology, schoology was easily accessible for learning. Although the confidence in the use of technology generally for the students was not very high and that was attributed to limited facilities available in school as well as fewer teachers who were available to master how to use the platforms.

The findings reported which were in support of the findings obtained in this study are reinforced by Connectivist theory where it stated that the power of learning through networks is incisive because it assists the students in developing higher order thinking skills and also allows them to achieve richer and well-informed knowledge through shared exploration and shared goals. This means that social context provided by connectivism allows students to think critically, choose and review information as well

as set up new learning routes. In a connectivist learning environment, learners are not passive because they participate in the search for information, discussions, and exchange of ideas with their peers. In this way, knowledge is co-created and shared which helps them build a bond as their knowledge construction becomes dependent on each other's contributions and discussion.

Social constructivism in the same vein stresses the role of collaboration and interaction among learners with their peers and how it contributes to their cognitive development. Social constructivism in other words places emphasis on dialogue, as a means through which ideas are considered, shared and developed. Electronic learning is a means through which social construction occur which allow students and teachers co-construct knowledge through social processes, considering the type of students populating the present educational institutions who are tech-savvy and depend heavily on online social networking to communicate with others in order to access the latest information and trends.

Students, with the use of ELPs can work with their fellow students in order to evaluate one another's work, which is expected to help the students foster an understanding of the content given by the teacher. The result which revealed no significant difference in the achievement scores of students taught using schoology and canvas ELPs in this study therefore is an indication that ELPs are user friendly and promotes learning for students. It also confirms that ELPs give students the room to consolidate their understanding on several learning concepts at their own pace, thus allowing slow learners to meet up, without slowing down the fast learners. Again, since students can revisit e-learning materials anytime, ELPs provides students with more control over their learning contents compared to learning through conventional methods. In other words, both schoology and canvas ELPs allowed active participation of students in

learning activities and this may have given the students in experimental group I and II the edge over students in the control group to learn anywhere conveniently, and access their instructional materials through multiplatform (mobile phones, tablets, computers).

4.5.2 Learning engagement outcomes of students taught web design concepts using schoology and canvas ELPs

The result obtained from the questionnaire administered to experimental group I using schoology and experimental group II using canvas showed that students who were taught web design concepts using schoology and canvas ELPs were comparably engaged in their learning process and statistically, there was no significant difference in the mean scores of the two groups at 0.05 alpha level. The students' engagement using schoology and canvas ELPs could be attributed to students' passion to ask questions on different level of complexity that matched different tasks in targeted groups and while combining more investigative approaches to accelerate their understanding of the learning concepts right before them.

Their engagement then becomes an essential element that kept the students interacting with their course contents, teachers and peers respectively. This is in line with the statement Chen *et al.* (2010) who asserted that electronic learning has the capacity to promote high level of learning outcome and higher-order thinking abilities which is because it can actively engage students to learn anywhere and anytime. The finding is also in agreement with Lewis *et al.* (2011) who indicated that when students are highly engaged in their learning, they can improve their academic achievement which is the case with the increased performance obtained by the students who were exposed to schoology and canvas ELPs respectively. This finding Junco *et al.* (2011) is relevant to this study as the result obtained disclosed that students' learning engagement in the

experimental group was significantly higher when compared to the control group that had a lower mean score. Junco *et al.* (2011) pointed out that the result was obtained as a result of students' active and participatory roles while using the educational tools for learning.

The findings of Courtner (2014) were also relevant to this study as the result after the analysis revealed that the non-traditional students had higher mean score when compared to traditional students who had a lower score and it was as a result of the quality relationship that coexisted between the faculty for both the traditional and non-traditional students. Bolliger and Halupab (2018) also proves that students' studies using the online platforms were instrumental in engaging the students. According to Bolliger and Halupab (2018), 88.1% students in the Skills category thought of themselves as being organized using the platform and as such their reading and listening skills yielded high scores.

This finding is relevant to this study because it showed that students' coming together on an online discussion or activities was not due to a desire for socialization but to interactively put in effort so that they can obtain higher grades (Bolliger & Halupab, 2018). In line with this study, Arvind *et al.* (2019) revealed that there was a significant improvement in exam performance of students and this was attributed to their quick access to material on devices and the prompt peer feedback which increased the quality of discourse for both students and lecturer. The study of Yilian and Xia (2021) was no different as the findings from the study provided preliminary support for utilizing educational technology as a positive factor influencing student engagement.

The findings obtained by students exposed to Schoology and Canvas LMS in this present study could also explain why Connectivism theory stressed that meaningful learning

occurs when learners participate actively through connections within networks where sharing with group(s) of people is made easier. In other words, learning among students become an exchange and transfer of knowledge which becomes very useful because it is treated as a communication where continuous flow of new information acquired is further processed and assimilated.

Attributes leading to the students' equal engagement may have been due to the fact that Schoology and Canvas ELPs have dynamic features such as access to learning content, review of additional source of information through reading blogs, active discussion board forums, collaboration modes, mobile learning, automated alert and notification on threaded discussion board among others. Thus, students became involved while learning because they have a direct link to a learning forum that is active, convenient and targeted to offer them a more centralized and personal teaching and learning process that is seamless and up-to-date.

Social constructivism agrees and emphasized that for learning to be active and engaging, learning has to occur while students take part in a collaborative activity which allow them to share background information necessary for their academic growth. In other words, while students deliberate on the learning content through active involvement, they are also building or forming their own knowledge. For this reason, emphasis is placed by social constructivism theory on students rather than teachers because students according to social constructivism learn best when they actively construct their own understanding through social interaction with their peers. The high engagement result obtained may have been encouraged by the students as they used the ELPs to discover their own solutions through social interaction and were able to try out new ideas which explained their higher mean achievement scores when compared to students in the control group. In other words, the two platforms have sustainable tools to

absorb the students in active learning and keep the connected till their learning goal is achieved.

4.5.3 Perception outcomes of students towards learning web design concepts using Schoology and Canvas ELPs.

The perception result of students towards learning web design concepts using schoology and canvas ELPs showed that there was a statistically significant difference in the mean perception scores of students towards the use of Schoology ELP and Canvas ELP to study web design concepts. Possible reasons to the lower mean perception score recorded by experimental group I (schoology) could be attributed to technological constraints such as poor connectivity, slow connection, constraints on data or lack of access to Internet, which can sometimes exclude students from their electronic learning platform classes or make accessing course/materials on the platform frustrating.

These constrains according to Makumane (2021), can have adverse consequences on the perceptions of students towards the use of ELPs. That is to so that the flexible use of technology as well as the ease to use the platform can influence students in producing new or relevant knowledge, as this may have favoured the students in experimental group II who were more receptive to their learning environment using canvas ELP.

The higher perception mean score by students who used canvas ELP is in line with the statement made by Buzzetto-More (2018), that students' perception toward technology or online learning is influential in determining the educational benefits of electronic learning resources and experiences. Osgerby (2013) has a contrary view when he asserted that students have preference for a more traditional style of teaching, indicating that students appeared to have a positive viewpoint for the adoption of well-resourced ICT based learning process, yet they still preferred face-to-face lectures. However,

Yilmaz and Yurdugul (2013) reported differently by submitting that the perception of students learning using asynchronous online discussion in a study carried out was positively high.

Juha-Matti (2014) on the other hand had a mixed finding. The findings showed that students have high tendencies to adopt LMS as a learning tool but were affected by sociological and technology factors. Meaning that if the ELP had corresponded with the students' expectations in terms of their perceived ease to use, perceived usefulness and in the way the teacher interacted with them while they used the platform their perception would have been a positive one.

This aligns with the statement of Roehm and Bonnel (2019), who argued that the role of teachers and the educational institution is very vital in providing useful experience for students' impactful learning using the ELPs. Eldeeb (2014) had a rather positive report on students' perception towards the use of ELPs as the findings showed that the platform helped 91% of the students identify their knowledge gaps in the course and enabled them focus during the course of their study. The findings were in line with the finding of Tseng (2020) who reported a high perception score among students who used ELPs. Almahasees *et al.* (2021) concurred by reporting a finding which showed that students found online learning useful, saves cost and is convenient, flexibility and easy to use.

Social constructivist theory explained the high perception mean score recorded by experimental group II to be attributed to students means of knowledge construction which is described to be both cognitive and social. This means that students' perception of their learning environment or the level of their engagement is influenced by personal experiences within particular educational contexts. Social constructivism is of the view

that students interpret and construct new information based on what they perceive from their learning environment which in turn is dependent on their active involvement or collaboration with the tools or people in their learning environment.

This in other words, makes significant impact on students' behaviour and satisfaction which can either inspire or dampen their efforts towards academic achievement. This explains why students' perceptions towards their learning environment is an important factor that helps to reshape students' e-learning materials in order to tailor the components of learning to meet students' needs. Thus, when students perceive their learning environment positively, they express a higher critical thinking ability which invokes problem-based learning, social construction of knowledge, peer interaction and high performance.

Social constructivism posits that interaction or dialogue is part of an overall process through which students deliberate on the knowledge they have acquired and are able to also think, reconsider and enhance their knowledge. In other words, communicating with others become a vehicle through which student's perception is linked to their learning environment and academic achievement. These students become connected in a community network where acquired information is constantly shared and expanded.

Meanwhile, Connectivist theory explained that effective learning takes place in an environment where students are able to assert their individual views as well as communicate with their peers and teachers. They have to perceive themselves as independent thinkers who can function effectively with the tools availed to them in their learning environment. This is enabled in an electronic learning platform; direct communication is interceded through the use of technology where students become aware of the presences of their peers when they learn together. In other words, students

begin to see themselves as a chain through which nodes of information is assembled, discussed and shared and can impact positively on students' learning outcomes.

Giving that electronic learning platform include not only courses that can be taught primarily online but also creates an avenue where students can get the chance to interact with their teachers and classmates anytime and wherever with variety of instructional materials in the form of text, pictures, sound, and video, through the Internet. These features and the ease to use the platform must have sustained the preference of the students in canvas ELP more.

4.5.4 Influence of gender on the academic achievement outcomes of students taught using schoology and canvas ELPs

The result obtained on the influence of gender on the academic achievement of students taught web design using schoology and canvas ELP showed that there was no significant difference in the mean scores of the two groups. Schoology and canvas ELPs are flexible and supportive learning tools which might have encouraged deeper understanding of learning content as well as provided an environment where collective learning among students strived. In other words, schoology and canvas ELPs instilled a sense of responsibility on the students since the students can learn independently and also collectively through reviewing and discussing course materials, as well as observing and demonstration. These platforms thus provided students with an outlet to connect with their peers and teachers in order to share content and get engaged and with the support systems that is present in form of sounds, pictures, audio, videos, blogs, forums, students stayed connected and active. This finding was in line with finding of Adigun *et al.* (2015). The result obtained revealed that there was no significant difference male and female academic achievement.

The study of Borglum (2016) was also in agreement with this finding as there was no influence of gender in the academic performance of the students. However, Abdu (2017) has a contrast finding as male students performed better than females in mathematics, science and social sciences while female in exception of Arts where the females did better. Ugwoko *et al.* (2018) also has similar findings and reported that there was a significant difference in the mean scores of male and female students who were taught accounting using flipped classroom on ELP.

Garcia *et al.* (2018) reportedly obtained similar result and asserted that the ELP helped the male students to better improve their academic performance more than the female students. The finding of Onuvughe *et al.* (2018) otherwise revealed a different result and this time, there was no significant difference in the scores of male and female students taught reading comprehension using Generative Instructional Strategy. In a contrary report, Enwere and Emeasoba (2019) revealed that male students were better impacted by the platform more than the female students when taught business studies using the ELP.

The findings of Falode *et al.* (2019) proved that gender had no influence in the academic achievement scores of male and female students taught using ELP. This finding was also in agreement with the findings of Onyenma and Nnoduka (2020) who reported that the performance of the students was not dependent on gender. Ogbonna *et al.* (2021) also had same result as there was no significant interaction effect between male and female students' cognitive academic achievement. In agreement, the finding of Ahmed *et al.* (2021) revealed that the performance of male and female students exposed to Facebook-based learning enhanced their learning significantly and no gender effect.

These results that showed no gender influence in students' academic performance is clear evidence that ELPs is able to increase the activities and performance of both male and female students by allowing them to explore their learning materials either together as peers on the platform or individually and independently at their own pace.

Social constructivism supports this finding by making reference to the important role dialogue play as a channel through which ideas are developed, considered and shared. This form of interaction is associated to ELPs because they serve as a means through which social construction of ideas is collaborated through discussion board, chats forums, blogs, text, video among others. Social constructivism is of the belief that acquisition of knowledge is expressed and extended through the exchange of verbal symbols and social interaction. Interaction is a necessary communication in learning and has to be coincidental with the ability to be understood by the rest of the students.

This may explain why the mean achievement scores of both male and female students in experimental group I and experimental group II was equivalent after treatment. The outcome of this findings for both male and female students who used schoology and canvas ELPs is also in agreement with Zhang (2013) who stated that electronic learning tools enhance teaching power and student's learning experience, saving more time and effort and allowing greater focus on other priorities.

ELPs allows students to work together, discover their virtual hands-on content quickly and efficiently based on teacher sharing and through ready and flexible tools that students can easily access to make quick reference to audio or video file for instructions, submission or feedback. This means that students can immediately access the content of their courses as long as they have access to the Internet. In this study, it meant that irrespective of gender, the students were carried along in their learning process and

towards achieving their learning goal without leaving anyone behind. The performance of the students was explained when Kukla (2010) while explaining social constructivism described ELP as a collaborative electronic approach that enable students in knowledge construction and in solving problems through mutual engagement of two or more learners in a coordinated effort.

Connectivist theory in agreement, also posits that learning is a social process of progressive knowledge acquisition which can be shaped by individuals as a result of their interaction with others who as well contribute to new ideas, opinions and experiences in in networked environment. This explains why students are regarded as nodes who connect to other people or learning tools such as books, webpages or learning platforms as the case may.

So, instead of learning from teachers and textbooks only, laptops, smartphones and other mobile devices serve as a medium through which students process information and remain in constant connectedness with opportunities that enable them make choices about their learning. This may have explained the performance of the students in both experimental groups because according to Siemens (2004), learners are not passive but are required to be active in the process of knowledge acquisition as they participate in the search for information, discussions, and exchange of opinions with their peers.

The result obtained from both groups after treatment was therefore a confirmation that the two ELPs are gender friendly and while students learnt using the platform, they were able to participate consistently towards achieving their learning goal regardless of gender. The result might have been obtainable because of the gender-balanced access to technology among the groups and the electronic learning platform which gave both male and female students technical skills and impacted positively on their perception to

use technology and enhanced their academic achievement. Together with that, schoology and canvas ELPs having created a proactive environment where active interaction with instruction, among peers and the teacher was stimulated.

4.5.5 Influence of gender on the learning engagement outcomes of students taught web design concepts using schoology and canvas ELPs

The findings on the influence on gender on the students' learning engagement using schoology and canvas ELPs showed that there was no significant difference between the two groups. This could be attributed to the fertile learning ground created by schoology and canvas ELP for both male and female students to enhance their learning by collaboratively and interactively been involved in the teaching and learning process. Schoology and canvas ELP are seen as learning tools facilitated and supported through the utilization of information and communication technologies, hence the benefit they delivered in terms of increasing the scores of students when taught using the platforms as shown in this study.

Schoology and canvas ELP bring changes in the learning process, because it is no longer just students listening to the description of the material from their teacher, rather, it also involves the participation of students performing through their learning activities such as observing, doing, demonstrate and coaching their classmates. In essence, these ELPs can be considered as instructional tools that can provide ease to learning process by allowing students gain access to learning content at any time and place as well as make learning more interesting through various forms of media. In agreement, Ahmed *et al.* (2021) stressed that the use of technology by students promises to allow them not just to acquire subject specific knowledge but also become lifelong learners in a digitally linked world. Learning environment according to Furlong and Christenson

(2018), play a significant role in shaping how engaged students become and this includes class activities and interaction.

Canvas ELP creates room for discussions that boost learning engagement among students. Discussion page is a very important aspect of canvas ELP which provides an integrated system for topics to be deliberated on. A teacher can use discussion to follow-up on unlimited questions asked by students or engage the students using discussion forum by assigning them to groups so as to test their understanding about particular information or allow them debate over ideas presented by a student among themselves in a supervised setting.

This may have caused gender not to have an influence on the students' learning engagement and as Furlong and Christenson (2018) included; that students' engagement is highly influenced by contextual factors such as proactive support that comes from teachers and peers in a given learning environment. In agreement with the research findings, the findings of Little-Wiles and Hutson-Stone (2014) and Arlene (2016) in their respectively studies showed that there was no gender influence on the learning engagement scores of the students taught using ELPs.

Rodgers (2018) had a contrary report which was followed by the result that revealed that the female students were more engaged and spent on average 4 hours longer learning than their male counterparts, and as such, performed better than the male students. The report provided by Korlat *et al.* (2021) on the other hand showed that male and female students have equal levels of perceived abilities in digital learning using technologies and technical equipment to complete their academic tasks. This can be explained based on the higher academic competence belief and the higher

engagement that was recorded by the girls what cause a no gender influence on the students learning engagement.

Social constructivism theory, in line with the result obtained by male and female students in Experimental group I (Schoology) and experimental group II (Canvas) describes electronic learning as a medium through which students construct their new understanding and knowledge during the process of social interaction with others. In other words, social constructivism advocates for both the cooperative and collaborative forms of learning and because learning process using ELP is a learner-centered, students acquire deeper understanding and opportunities that exposures them to multiple perspectives and interpretations.

In this scenario however, the role of the teacher is to act as a guide in the learning process. The teacher poses questions for the students to think about and also helps students navigate toward answers and this allow the students to gains knowledge through meaningful social interaction with their peers. By interaction and help from more knowledgeable peers, students are able to develop more profound comprehension away from their individual capacity.

Meanwhile the enhanced learning engagement among students in experimental group I (Schoology) and experimental group II (Canvas) was probably the essence for the explanation given by Siemens (2004) in Connectivism theory that opinion that information is a series of interrelated web that hold students in a social interaction, and these pieces of information can either be from their personal experiences, experiences of others or from their digital observations. Thus, knowledge production is not dependent on the knowledge of one individual but reside in a diversity of opinions and experiences of all the parties involved in the learning process. As a result of this, the

interconnectedness of the students' knowledge broadens and lead to more active involvement and in turn more learning.

In addition, when the students are aware that communicating enables them to build on their existing knowledge, they find themselves keeping abreast to checking their notifications prompts in order not to be left behind in the discussion trends. Considering the rapid growth of information, connectivism explains why modern technologies is needed to provide new possibilities for students to communicate in networks, and to aggregate varied information streams. This is because for students to be able to learn effectively in a technology-driven environment, they need to be well-informed about new information that would keep them up-to-date on new ideas and skills as they become relevant on tasks given to them, as well as on their area of expertise.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Based on the results obtained from this study, it was gathered that Schoology and Canvas ELPs are useful and flexible learning platforms that provides students with learning tools that are adept in stimulating, engaging and promoting their academic achievement more than lecture method of teaching. The perception of students taught web design concept using schoology and canvas ELPs which varied significantly signified that students perceived canvas ELP platform to have created a better atmosphere for learning more than students who learned web design concepts using schoology ELP.

The performance and learning engagement of male students taught web design using schoology and canvas ELPs which did not vary significantly from their female counterparts is an indication that the two learning platforms are gender friendly. Meaning that schoology and canvas ELPs create room for students to be participate actively through personalized learning that increased their curiosity and helped them develop self-confidence, solve problems and increase positive cooperative pattern between themselves and their teacher.

Schoology and canvas ELPs also gave the students the credence that they are critical thinkers who are capable of contributing their own quota through a flexible channel that encouraged them to persist on their academic task till they succeeded. This outcome derived is relevant because it has shown that schoology and canvas ELPs are effective pedagogical approaches that are instrumental in enhancing student' academic performance, students' learning engagement and students' perception towards learning. Thus, these platforms should be embraced by Nigerian Universities.

5.2 Recommendations

The findings and conclusions of this study enabled the researcher to make the following recommendations:

1. Since schoology and canvas ELPs enhanced students' performance, Higher Institutions in Nigeria should key into the use of these electronic learning platforms to boost the academic achievement of the students.
2. Teachers should always look for innovative ways to engage students using ELPs in order to sustain their enthusiasm to use the platforms.
3. To take care of students' perception towards the use of ELPs, constant monitoring and improvement on observed short comings on students learning, access to their learning resources and ease to use the platforms should not be taken for granted.
4. Teachers should always monitor the learning activities of both male and female students in these platforms to ensure that each individual regardless of their gender is carried along in active participation and learning.
5. School management should ensure that when there is newly introduced technology learning tools, capable hands should also be on ground to groom both male and female students to be ever reader to handle such learning tools and avoid been left behind in the teaching and learning process.
6. Educational institutions should provide Internet enabling environment for students and teachers to have an uninterrupted and seamless teaching and learning activities that would keep the students updated and engaged with their learning resources and peers.
7. Activities geared towards utilization of ELP tools for problem-solving, collaboration and discussions should be encouraged. This is to give both male and female students a sense of belonging and a feeling of connectedness that leave them engaged throughout their learning activities.

5.3 Limitations of the Study

1. The study commenced immediately after the nearly one-year strike embarked upon by the Academic Staff Union of Universities (ASSU) and Covid-19 pandemic. This brought a lot of pressure on the students to meet up with loads of academic activities as their respective schools went into top gear to make up for lost times in the academic calendar. The pressure also took a toll on their learning activities on the electronic learning platforms because there were other courses in their Departments that they also needed to give their attention too.
2. Students who had low or bad Internet connection due to their location or challenge access their learning contents due to insufficient data bundle were also affected and sometimes frustrated with the learning platforms.
3. Irregular power supply was a challenge and discouragement for some students to login and sometimes would have to wait till they have powered their phones or systems to be able to access their learning content on the platform.

5.4 Contributions to the body of Knowledge

The hypothetical model of this study has shown new dimension to teaching and learning. Also, this study has created awareness for both students and teachers to be e-ready which helps off-sets work conveniently. Furthermore, the successful adoption and modification of schoology and canvas ELPs in this study have added to the fore of research and literature. It has also provided evidence that student can become active participants towards their learning experience as seen in their positive outlook towards the platforms and their better performance when compared to their counterparts who studied without the platforms. Schoology and Canvas ELPs also provided evidence that gender had insignificant effect on students' academic performance as well as their learning engagement while using the platforms. In essence, ELPs enables male and

female students to look beyond their physical attributes and consistently improved on their academic performance.

5.4 Suggestions for Further Studies

Based on the findings and experience gathered while conducting this research, these suggestions were made:

1. A repeat of the experiment should be considered through longitudinal design.
2. This study explored the use of two ELPs on different schools to determine the effect, but would like to suggest that further studies be conducted using different ELPs on same school on different intervals in order to determine which one was more effective and why.
3. From the literature review, it was observed that limited concepts in computer science have been tapped into using ELPs and those other areas should be researched on.

REFERENCES

- Abadi, M. (2018). Eleven dramatic ways the world has changed in the last 20 years alone. Retrieved on 8th June, 2019 from <https://www.businessinsider.com/progress-innovation-since-1998-2018-3>.
- Abas, M. C. & Imam, O. A. (2016). Graduates' competence on employability skills and education. *IJERE*, 5 (2). 119-125.
- Abdellah, A. (2016). The effect of a blended learning programme using schoology LMS in developing EFL pre-service teachers teaching knowledge and reducing their writing anxiety. *Journal in Research in Curriculum, Instruction and Educational Technology*, 2(3), 45-55.
- Abdu, R. (2017). Influence of gender on secondary school students' academic performance in South-West, Nigeria. *Journal of Social Sciences*, 31(1), 93-98.
- Adigun, J., Onihunwa, J., Irunokhai, E., Yusuf, S. & Adesina, O. (2015). Effect of gender on students' academic performance in Computer Science in secondary schools in New Bussa, Borgu Local Government of Niger State. *International Journal of Information Science*, 2(2), 23-33.
- Agyemang, B. K. & Dadzie, B. (2010). Providing Information Communication Technology support to distance education students in University of Ghana, Legon. *Turkish Journal of Distance Education*, 11(3), 1302-6488.
- Ahmed, I. I., Mohammed, J. A., Ochayi, O., Adenike, A. O. & Gbadebo, T. E. (2021). Effect of Facebook-Based learning on students' performance in educational technology concept. *Indonesian Journal of Multidisciplinary Research* 1(2), 207-218.
- Aina, J. K. (2013). Integration of ICT into physics learning to improve students' academic achievement: Problems and solutions. *Journal of Open Education*, 1(4), 118-120.
- Akinsowon, O. A. & Osisanwo, F. Y. (2014). Enhancing interest in Science, Technology and Mathematics (STEM) for the Nigerian female folk. *International Journal of Information Science*, 4 (1), 8-12.
- Al-Ammary, J. (2012). Educational technology: A way to enhance student achievement of the University of Bahrain. *The Online Journal of New Horizons in Education*, 3, (3) 33- 45.
- Alexander, J. C. (2016). Flipping one-shot Library Instruction using canvas and pecha-kucha for peer teaching. *Journal of Medical Library Association*, 104 (2), 6.
- Algahtani, A. F. (2011). *Evaluating the effectiveness of the e-learning experience in some Universities in Saudi Arabia from male students' perceptions*. Unpublished thesis Durham, Durham University.

- Alhothii, N. I. (2015). *Investigating the Impact of using Moodle as an electronic learning tool for students in English Language Institute*. Graduate students' Theses, Dissertation and Professional Papers, 4524. Available at <https://scholarworks.umt.edu/etd/4524>.
- Almahasees, Z., Mohsen, K. & Amin, M. O. (2021). Faculty's and students' perceptions of online learning during COVID-19. *Frontiers Education*, 6 (6), 38-70. doi: 10.3389/feduc.2021.638470.
- Almeida, F. (2017). The role of responsive design in web development. *Webology*, 14(2), 157. Available at: <http://www.webology.org/2017/v14n2/a157.pdf>.
- Almeida, F. & Monteiro, J. (2017). Approaches and principles for UX web experiences. *International Journal of Information Technology and Web Engineering*, 12(2), 49-64.
- Amiya, A. O. (2014). Integrating new technologies into office technology and management curriculum: Challenges and strategies. *Nigerian Journal of Business Education*, 1 (3) 101-114.
- Anderson, T. (2014). Toward a theory of online learning. In T. Anderson & F. Elloumi (Eds.) *Theory and practice of online learning* (2nd Ed.). Athabasca, Canada: Athabasca University. Retrieved on 27th August, 2019 from http://cde.athabascau.ca/online_book/index.html.
- Anderson, T. (2008). Toward a theory of online learning. Retrieved on 16th August, 2019 from <http://www.connectivism.ca/?cat=3>.
- Anderson, T. & Dron, J. (2014). Three generations of distance education pedagogy. *International Review of Research in Open and Distance Learning*, 12(3), 80-97.
- Anekwe, J. U. & Williams, C. (2014). Educational technology in Nigeria Universities. *International Journal of Science and Technology*, 3 (1), 128-149.
- Arlene, A. P. (2016). The effect of gender and perceived control on student engagement. Retrieved on 15th September 2019 from <http://www.researchgate.net/publication/>.
- Armstrong, J. S. (2019). Using quasi experimental data to develop empirical generalizations for persuasive advertising. *Journal of Business Research*, 64, (16), 699-706.
- Arshavskiy, M. (2017). How to create next generation e-learning: Learning development and design. Retrieved on 4th June, 2019 from <https://www.elearningindustry.com>.
- Arvind, S., Sean, R, Akash, P. & Craig, J. R. (2019). Improving student engagement in teaching electric machines through blended learning. *Transactions on Education*, 2 (1), 99.

- Australia's Science Channel, (2018). Gender differences for intelligence perception in the classroom. Retrieved from <https://www.australiascience.tv/gender-differences-for-intelligence-perception-in-the-classroom/> on 10th August, 2019.
- Ayo, O. (2015). An empirical investigation on students' acceptance of Technology for teaching and learning. *International Journal of Emerging Technology in Learning*, 15, (4), 158-178.
- Azvedo, R. (2015). Defining and measuring engagement and learning in science: Conceptual, theoretical, methodological, and analytical issues. *Educational Psychologist*, 50(1), 84–94. doi:10.1080/00461520.2015.1004069.
- Babagbemi, A. P. (2011). *Human capacity building through information and communication technology in educational technology*. A published paper presented at the 2011 International Conference of Nigeria Association for Educational Media and Technology (NAEMT) at Imo State University, Owerri from 19-23 September.
- Baldwin, R. (2019). Technology in education: Current trends in Higher Education. Retrieved; <https://www.education.stateuniversity.com/pages/2496/technology-in-higher-education.html> on 10th August, 2019.
- Bali, S. & Liu, M. C. (2018). Students' perceptions toward online learning and face-to-face learning courses. *Journal of Physics: Conference Series* 1108. Available at doi:10.1088/1742-6596/1108/1/012094.
- Basioudis, I. G., De Lange, P., Suwardy, T. & Wells, P. (2012). Accounting students' perceptions of a learning management system: An international comparison. *Accounting Research Journal*, 25(2), 72-86.
- Ben, J. F. (2013). Understanding and using educational theories (2nd Edition). *Sage Publications Limited*.
- Bennett, S., Bishop, A., Dalgarno, B., Waycott, J. & Kennedy, G. (2012). Implementing web 2.0 technologies in higher education: A collective case study. *Computers and Education*, 59(2), 524-534.
- Beschorner, B. & Hutchison, A. (2013). iPads as literary teaching tools in early childhood. *International Journal of Education in Mathematics, Science and Technology*, 1(1), 16-24.
- Bigatel, P. M., Ragan, L. C., Kenan, S., May, J. & Redmond, B. F. (2012). The identification of competencies for online teaching success. *Journal of Asynchronous Learning Networks*, 16(1), 59-77.
- British Council, (2014). *Gender Equality in Nigeria*, British Council: Abuja.
- Bolliger, D. U. & Halupab, H. (2018). Online student perceptions of engagement, transactional distance, and outcomes. *Distance Education*, 3, 2-18. DOI: 10.1080/01587919.2018.1476845.

- Booth, J. (2019). 20 big ways the world has changed since 1999. Retrieved 8th June, 2019 from [www.https://www.insider.com/how-life-has-changed-in-the-last-20-years/](https://www.insider.com/how-life-has-changed-in-the-last-20-years/).
- Bordar, F. (2010). English teachers' attitudes toward computer-assisted language learning. *International Journal of Language Studies*, 4(3), 179-206.
- Borglum, R. N. (2016). The effects of blended learning on critical thinking in a high school earth science class. Electronic Theses and Dissertations. Access available at [www.https://scholarworks.uni.edu/etd/236](https://scholarworks.uni.edu/etd/236).
- Boyi, A. A. (2019). Education and sustainable national development in Nigeria: Challenges and way forward. *International Letters of Social and Humanistic Sciences*, 14, (1), 65-72.
- Brhanu, A. & Mulugeta, H. (2015). Conceptual framework to adopt cloud-based m-learning for higher education institution. *Ethiopian Perspective*, 4(11), 33-56.
- Brower, H. H. (2013). On emulating classroom discussion in a distance delivered OBHR course: Creating an on-line learning community. *Academy of Management Learning and Education*, 2(1), 22-36.
- Brown, J. M. (2011). *Does the use of technology in the classroom increase students overall academic performance?* An unpublished thesis presented to the Faculty in communication and organizational leadership studies, Gonzaga University. Washington.
- Buzzetto-More, N. A. (2018). Student perceptions of various e-learning components. *Interdisciplinary Journal of E-Learning and Learning Objects*, 4(1), 113-135.
- Cambridge Dictionary, (2019). Electronic; Cambridge English corpus. Retrieved on 2nd June, 2019 from <https://www.dictionary.cambridge.org>.
- Canvas, (2017). Home page. Retrieved from <http://www.canvaslms.com> on 16th June 2019.
- Carwile, J. (2007). A Constructivist approach to online teaching and learning. *Inquiry*, (12)1,68-73. Retrieved from <http://files.eric.ed.gov/fulltext/EJ833907.pdf> on August 16th, 2019
- Chee, K. H., Pino, N. W. & Smith, W. L. (2015). Gender differences in the academic ethic and academic achievement. *College Student Journal*, 39(3), 604-618.
- Chen, P. S. D., Lambert, A. D. & Guidry, K. R. (2010). Engaging online learners: The impact of web-based learning technology on college student engagement. *Computer Education*, 54, (4), 1222-1232.
- Cho, M. H. & Cho, Y. (2014). Instructor scaffolding for interaction and students' academic engagement in online learning. Mediating role of perceived online class goal structures. *International Higher Education*, 21, (1), 25–30.

- Chong, E. K. (2010). Using blogging to enhance the initiation of students into academic research. *Computers and Education*, 55(2), 798-807.
- Christie, P. (2018). *Globalization, the knowledge economy and education*. Heinemann. Johannesburg, South Africa.
- Church, M. (2018). Talking point. The evolution of education. Retrieved 10th February, 2019 from <https://www.mattchurch.com/talkingpoint/education-evolution>.
- Coates, H., James, R., & Baldwin, G. (2015). A critical examination of the effects of learning management systems on university teaching and learning. *Tertiary Education and Management*, (11), 19-36.
- Coe, R. (2014). *What makes great teaching: Review of the underpinning research*. London: The Sutton Trust. <http://www.suttontrust.com/researcharchive/great-teaching/>. Retrieved August 18, 2019.
- Coleman, B. (2019). Definition of e-learning. Retrieved on 24 June, 2019 from <https://www.m.economictimes.com/definition/e-learning>.
- Conner, J. & Pope, D. (2013). Not just robot students: Why full engagement matters and how schools can promote it. *Journal of Youth & Adolescence*, 42(9), 1426–1442. <https://doi.org/10.1007/s10964-013-9948-y>.
- Courtner, A. (2014). Impact of student engagement on academic performance and quality of relationships of traditional and non-traditional students. *International Journal of Education*, 6 (2), 3-10.
- Creswell, J. W. (2005). *Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research*. Upper Saddle River, New Jersey: Peason Education.
- Dang, T. & Robertson, M. (2010). Impact of learning management system on learner autonomy in EFL learning. *International Education Studies*, 3 (3), 3-11. DOI: <http://dx.doi.org/10.5539/ies.v3n3p3>.
- Dawson, C. (2011). There are alternatives to Blackboard and Moodle: Instructure canvas goes open source. Retrieved from <https://www.zdnet.com/article/Instructure-canvas-goes-open-source/> on 4th August, 2019.
- Dewi, Y. (2018). The usage of schoology and canvas as media based blended learning. *Anglo-Saxon*, 9 (1), 82-91.
- Dixson, M. D. (2010). Creating effective student engagement in online courses: What do students find engaging? *Journal of Scholarship of Teaching and Learning*, 10(2), 1–13. Retrieved from <http://josotl.indiana.edu/article/view/1744> on 4th August, 2019.

- Domenech, B. F., Abellan, R. L. & Gomez, A. A. (2017). Self-efficacy, satisfaction and academic achievement. The mediator role of students' expectancy-value beliefs. *Educational Psychology*, 55, 155-164.
- Domjan, M. (2010). *Principles of learning and behaviours* (6th Edition.) Belmont, CA: Wadsworth/Cengage.
- Doolittle, P. E. & Camp, W. G. (1999). Constructivism: The career and technical education perspective. *Journal of Career and Technical Education*, (16)1, 12-15. Available at <http://dx.doi.org/10.21061/jcte.v16i1.706>.
- Downes, S. (2007). What connectivism is. Retrieved on 16th August, 2019 from <http://halfanhour.blogspot.com/2007/02/what-connectivism-is.html>.
- Duggan, M., Ellison, N., Lampe, C., Lenhart, A. & Smith, A. (2015). *Social media update 2014*. Washington, D.C.: Pew Research Center.
- Eassey, U. K. (2018). Education has changed over the years. Retrieved from <https://www.ukessays.com/essays/education/education-has-changed-over-the-years-education-essay-php> on 10/02/2019.
- Education Quality and Policy Office, (2019). Learning aims and outcomes. Retrieved on 11th April, 2019 from <https://www.educationpolicy-admin.com.ac.uk>.
- Eldeeb, R. A. (2014). Students' perceptions to e-learning. *Journal of Research and Method in Education*, 4 (3), 33-36.
- EITartoussi, I. (2019). *Networked readiness in the United Arab Emirates*, The 2nd annual forum on e-learning excellence in the Middle East, Dubai.
- Enwere, J. & Emeasoba, N. C. (2019). Effect of Edmodo learning platform on the students' achievement in Business Studies in secondary school. *Online Journal of Arts, management & Social Sciences*, 4(1), 54-65.
- Falode, M. E.1., Alabi, T. O., Nsofor, C. C., & Alhassan, J. K. (2019). Effects of Wiziq and Moodle learning platforms on students' academic achievement in undergraduates' Educational Technology concepts. *Journal of Science, Technology, Mathematics and Education (JOSTMED)*, 15(1), 242-252.
- Feizabadi, N., Aliabadi, K. W., Nili, A. M. R. (2016). Impact of English learning software Moodle. *International Journal of Humanities and Cultural Studies*, 27(33),1427-1437.
- Fenton, W. (2017). Instructure canvas learning management system. Retrieved from <https://www.pcmag.com/review/337442/instructure-canvas-lms> on 4th August, 2019.
- Firat, M. (2016). Determining the effects of learning management system behaviours on academic achievement in learning analytic perspective. *Journal of Information Technology Education Research*, 15 (1), 75-87.

- Flynn, D. (2014). Baccalaureate attainment of college students at 4-year institutions as a function of student engagement behaviours: Social and academic student engagement behaviours matter. *Research in Higher Education*, 55(5), 467–493.
- Forbes, J. (2019). Teachers then and now. Retrieved on 11th February, 2019 from <https://www.roomschoolhouse.ca/teachers-then-and-now.html>.
- Franklin-Guy, S. & Schnorr, D. (2016). Student engagement in schools: Examination of a construct for effective Instructional and educational practices. *The International Journal of Pedagogy and Curriculum*, 23(4), 17-23.
- Fredricks, J. A., Blumenfeld, P. C. & Paris, A. H. (2014). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, 74(1), 59-109.
- Fredricks, J., McColskey, W., Meli, J., Mordica, J., Montrosse, B. & Mooney, K. (2011). *Measuring student engagement in upper elementary through high school: A description of 21 instruments*. Regional educational laboratory program. Accessed on 29th August, 2019. Available online at <http://ies.ed.gov/ncee/edlabs>.
- Freire, I. & Paulo, S. (1997). *Pedagogy of the Oppressed*. The continuum publishing company: New York.
- Furlong, N. J. & Christenson, S. (2018). Engaging students at school and with learning: A relevant construct for all students. *Psychology in all Schools*, 45, 365-368.
- Garett, R., Chiu, J., Zhang, L. & Young, S. (2016). A literature review: Website design and user engagement. *Online Journal of Communication and Media Technologies*, 6 (3), 15-20.
- Garcia, R. A. & Al-Safadi, L. A. (2014). Intervention strategies for the improvement of students' academic performance in data structure course. *International Journal of Information and Education Technology*, 4, (5), 230-290.
- Garcia, L. F. S., Sebastia-Amat, S., Garcia, N. M. & Colomina, S. S. (2018). *Schoolology as an alternative to traditional teaching tools for university students*. EDULEARN18 Proceedings; A conference paper from the 10th International Conference on Education and new Learning Technologies, Palma, Mallorca, Spain.
- Gardner, B. S. (2011). Responsive web design: Enriching the user experience. *Inside the Digital Ecosystem*, 11(1), 13-19.
- Garland, D., & Martin, B. N. (2015). Do gender and learning style play a role in how online courses should be designed? *Journal of Interactive Online Learning*, 4(2), 67-81.
- Gay, G. (2012). *ATutor LMS: a case study. Open-source option for education*. London: Spence Limited.

- Giannakos, M. N. (2014). Exploring students' intention to study Computer Science and identifying the differences among ICT and programming based courses. *The Turkish Online Journal of Educational Technology*, 13 (3), 1-17.
- Goldsmith, L., Snider, D. & Hamm, S. (2010). Student perception of their online learning experience. Retrieved from <http://cnx.org/content/m35740/latest/> on 16th August, 2019.
- Google.com, (2015). Analytics help. Retrieved 2nd September, 2019, from <https://support.google.com/analytics/answer/1009409?hl=en>.
- Grönlund, Å. & Islam, Y. M. (2012). A mobile e-learning environment for developing countries: The Bangladesh virtual interactive classroom. *Information Technology for Development*, 16(4), 244-259.
- Gül, H., İnce, M. & Turan, A. (2011). University students' quality expectations from academics: The Case of the Karamanoğlu Mehmetbey University. *European Journal of Economics, Finance and Administrative Sciences*, 7(30), 21-27.
- Gunuc, S. & Kuzu, A. (2015). Student engagement scale: Development, reliability and validity. *Assessment & Evaluation in Higher Education*, 40(4), 587–610.
- Harel, D. (2014). *Algorithmic, the spirit of computing*. Springer Berlin. ISBN 978-3-642-44135-6.
- Hawi, H. (2013). Causal attributions of success and failure made by undergraduate students in an introductory-level computer programming course. *Computers & Education*, 54, (7), 1127–1136.
- Higgins, S., Hall, E., Wall, K., Woolner, P. & McCaughey, C. (2014). *The impact of school environments: a literature review*. The centre for learning and teaching, school of education, communication and language science, University of Newcastle; Accessed from: <http://www.ncl.ac.uk/cflat/news/DCReport.pdf> on August 14, 2019.
- Hrastinski, S. (2009). A theory of online learning as online participation. *Computers & Education*, 52, (2), 78–82.
- Husamah, H. (2015). Blended project-based learning: Metacognitive awareness of Biology education new students. *Journal of Education and Learning*, 9, (94), 274–281.
- Idogho, J. A. (2014). *Towards a student-centred learning in Nigerian schools: Drama-in-education and progressive pedagogy*. London: Fulton Publisher.
- Instructure, (2011). Grow from the first day of school to the last day of work. Accessed from <https://www.instructure.com> on the 4th of August, 2019.
- Instructure, (2018). Our story; Canvas learning management system. Retrieved on 8th April, 2019, from <https://www.canvaslms.com.about-us>.

- Internet Use over Time, (2014). Retrieved September 4, 2019, from <http://www.pewinternet.org/data-trend/internet-use/internet-use-over-time/>.
- Irawan, V. T. & Widiyanti, E. S. (2017). Blended learning based on schoology: Effort of improvement learning outcome and practicum chance in vocational High school. *Cogent Education*, 4, (1), 1-10.
- Isaacs, S. & Hollow, D. (2012). *The elearning Africa 2012 Report*, ICWE, Germany.
- Jamson, H. (2018). Online classes vs traditional classes: Is traditional education dying? Accessed from <https://edtechreview.in/news/3154-online-classes-vs-traditional-classes-is-traditional-education-dying> on 14th August 2019.
- Juha-Matti, S. (2014). Students' perception of learning management system. *Bachelor of Information System Thesis*: epubli, University of Gothenby. ISSN: 1651-4769.
- Junco, R., Heiberger, G. & Loken, E. (2011). The effect of twitter on college student engagement and grades. *Journal of Computer Assisted Learning*, 79, (9), 540–563. Available at doi:10.1111/j.1365-2729.2010.00387.x.
- Kahu, E. R. (2013). Framing student engagement in higher education. *Studies in Higher Education*, 38(5), 758–773.
- Kandemir, C. M. (2013). The evolution and diffusion of learning management systems: The case of canvas LMS. 1st *International Instructional Technology and Teacher Education Symposium*, 386-392. Trabzon: Karadeniz Technical University.
- Kane, E. (2018). Gender differences in learning and education essay. Retrieved on 13th April, 2019 from <https://www.bartleby.com/essay/gender-differences-in-learning-and-education/html>.
- Katai, T. & Toth, L. (2013). Technologically and artistically enhanced multi-sensory computer-programming education. *Teaching and Teacher Education*, 26, (3), 244–251.
- Kemp, N. & Grieve, R. (2014). Face-to-face or face-to-screen? Undergraduates' opinions and test performance in classroom vs. online learning. *Educational Psychology*, 5, (4), 1-14.
- Khan, M. A., Vivek, I., Nabi, M., K. & Khojah, M. (2021). Students' perception towards e-learning during COVID-19 in India: An Empirical study. *Sustainability*, 13(57), 2-14.
- Kibin, (2022). The computer and its benefits in the modern world. Retrieved on 9th February, 2022 at <https://www.kibin.com/essay/the-importance-of-computer-and-its-benefits-in-the-modern-world-ROSavXe>.

- Kistow, B. (2019). E-learning at the Arthur Lok Jack graduate school of business: A survey of Faculty members. *International Journal of Education and Development Using Information and Communication Technology*, 5 (4), 14-20.
- Kop, R. & Hill, A. (2008). Connectivism: Learning theory of the future or vestige of the past? *The International Review of Research in Open and Distance Learning*, 9 (3). Retrieved from <http://www.irrodl.org/index.php/irrodl/article/view/523> on 4th August, 2019.
- Korlat, S., Kollayer, M., Holzer, J., Luftenegger, M., Pelikan, E.R., Schober, B. & Spiel, C. (2021). Gender differences in digital learning during Covid-19: Competence belief, instinsic value, learning engagement and perceived teacher support. *Front. Psychology*, 12(6),37-76. doi: 10.3389/fpsyg.2021.637776.
- Kreijns, K., Kirschner, P. A., Jochems, W. & Van Buuren, H. (2017). Measuring perceived sociability of computer-supported collaborative learning environments. *Computers and Education*, 49(2), 176– 192; <http://dx.doi.org/10.1016/j.compedu.2005.05.004>.
- Kpolivie, P. J., Joe, A. I. & Okoto, T. (2014). Academic achievement prediction; Role of interest in learning and attitude towards school. *International Journal of Humanities Social Sciences and Education*, 11, (6), 73-100.
- Kukla, A. (2010). *Social Constructivism and the Philosophy of Science*. New York: Routledge.
- Landoy, A., Pope, D., & Repanovici, A. (2020). *Teaching learning methods: Collaboration in Designing a Pedagogical Approach in Information Literacy*. Springer Texts in Education. Springer, Cham. https://doi.org/10.1007/978-6_10.
- Lawson, A. E. (1978). The development and validation of a classroom test of formal operations. *Journal of Resource in Science Teaching*, 15, (12), 11-24.
- Lee, R. & Anderson, J. (2017). The future of jobs and job training; Internet and technology. Retrieved on 7th June, 2019 from <https://www.pewinternet.org/the-future-of-jobs-training/>.
- Lee, Y., & Kozar, K. A. (2012). Understanding of website usability: Specifying and measuring constructs and their relationships. *Decision Support Systems*, 52(2), 450-463.
- Liaw, S. S. (2018). Investigating students' perceived satisfaction, behavioural intention, and effectiveness of e-learning: A case study of the Blackboard system. *Computers and Education*, 51(2), 864–873.
- Liaw, S. S. & Huang, H. M. (2017). Exploring the World Wide Web (www) for on-line learning: A perspective from Taiwan. *Educational Technology*, 40(3), 27–32.

- Linways Team, (2017). ICT enabled education: The alchemy of mixing technology and education. Retrieved on 30th May, 2019 from <https://www.stories.linways.in/ict-enabled-education-d190bcc91bfo>.
- Littlefield, J. (2018). Canvas Instructure review. Accessed on 5th August, 2019 from <https://www.thoughtco.com/canvas-instructure-review-109896>.
- Little-Wiles, J. M. & Hutson-Stone, A. D. (2014). Students' engagement online: Does gender make a difference? A pilot study in one Engineering and Technology course. 2014 IEEE Frontiers in Education Conference Proceedings 1-4.
- Lewis, A. D., Huebner, E. S., Malone, P. S. & Valois, R. F. (2011). Life satisfaction and student engagement in adolescents. *Journal Youth Adolescence*, 4, (15), 249–262.
- Lewis, B. A. & MacEntee, V. M. (2005). Learning Management Systems comparison. Proceedings of Informing Science and IT Education Joint Conference. Retrieved on August 16, 2019, from <http://www.informingscience.org/proceedings/InSITE2005/P03f55Lewis.pdf>.
- Lizzio, A., Wilson, K. & Simons, R. (2012). University students' perceptions of the learning environment and academic outcomes: Implications for theory and practice. *Studies in Higher Education*, 27(1), 27-52.
- Lowenthal, P. R., Bauer, C., & Chen, K-Z. (2015). Student perceptions of online learning: An analysis of online course evaluations. *American Journal of Distance Education*, 3(2), 234-256.
- Lwoga, E. (2012). Making learning and web 2.0 technologies work for higher learning in situations in Africa. *Campus-Wide Information Systems*, 29 (2), 90-107.
- Maguire, J. (2019). Emerging technologies in cloud technologies. Retrieved October 1, 2019 from <https://datamation.com/cloud/emergency-technologies-in-cloud-computing/>.
- Makokha, G. L. & Mutisya, D. N. (2016). Status of e-learning in Public Universities in Kenya. *International Review of Research in Open and Distributed Learning*, 17(3), 35-55.
- Makumane, M. A. (2021). *Students' perceptions on the use of LMS at Lesotho university amidst the Covid-19 pandemic*. Taylor & Francis Group, UK Limited.
- Marriott, N., Marriott, P. & Selwyn, N. (2014). Accounting undergraduates' changing use of ICT and their views on using the Internet in Higher education: A research note. *Accounting Education*, 13(4), 117-130.
- Mazenko, E. (2019). Canvas review. Retrieved on 5th August, 2019 from <https://www.betterbuys.com/lms/reviews/canvas/>.

- Mbaeze, A., Ukwandu, S. & Anugu, O. (2012). The influence of information and communication technologies on students' academic performance. *International Journal of Research and Technology*. 2, (16), 54-79.
- Mendo, S. (2018). Learning by redesigning: Improving the mobile experience of my school's LMS. Retrieved from <https://www.thoughtco.com/canvas-instructure-review-1098196> on 3rd August, 2019.
- Mohorovicic, S. (2013). Implementing responsive web design for enhanced web presence. In information & communication technology electronics & microelectronics (MIPRO), 36th International Convention, 1206-1210, IEEE.
- Moller, L., Robison, D. & Huett, J. (2012). *Unconstrained learning: Principles for the next generation of distance education*. In L. Moller & J. B. Huett (Eds.). The next generation of distance education, 1–19. Boston, MA: Springer.
- Moran, G. (2010). *The rise of the virtual classroom*. Entrepreneur magazine. Irvine, California.
- Mosa, A. A., Naz'ri, B. M., & Ibrahim, R. (2016). Technological aspects of e-learning readiness in higher education, *Computer and Information Science*, 9(1), 113.
- Mtebe, M. & Kondoro, G. (2016). Factors affecting teachers' use of information and communications technology: A review of the literature. *Journal of Information Technology for Teacher Education*, 9(3), 319-342.
- Mustaqim, B., Sibuea, A. M. & Amin, M. (2022). Effectiveness of using elearning: Course on research methodology students of electronic engineering education. *Research in Technical and Vocational Education Training*, 1(1), 1-7.
- National Education Technology Plan, (2015). Uses of technology in teaching and learning. Retrieved on 9th February, 2019 from <https://www.gov/oii-new/uses-technology-in-teaching-and-learning>.
- National Policy on Education, (2018). *Educational Research and Development Council*. Lagos, Nigeria. NERDC Press.
- Nawaz, A., Awan, Z. & Ahmad, B. (2013). Integrating educational technologies in higher education of the developing countries. *Journal of Education and Practice*, 2(2), 1-13.
- Nsofor, C. C., Bello, A., Umeh, A. E. & Oboh, C. O. (2015). The future of educational technology in the 21st century Nigeria: Changing educational landscape through emerging technologies. *Journal of Educational Policy and Entrepreneurial Research*, 2 (3), 28-37.
- Nurulafizan, (2012). Concept of academic achievement. Retrieved from <https://www.edu725nurule.blogspot.com> on 11/4/2019.

- Odetunde, C. (2012). The state of higher education in Nigeria. Retrieved from https://www.nigeriadeltacongress.com\.state_of_higer_education_in_nig.htm on 5th August, 2019.
- Odu, K. O. (2011) Universal basic education and human resource development and utilization in technical education in Nigeria. Kamla-Raj 2011, *International Journal of Education Science*, 3(2), 145-150.
- Ogbonna, C. G., Ibezim, N. E. & ObiI, C. A. (2021). Synchronous versus asynchronous e-learning in teaching word processing: An experimental approach. *South African Journal of Education*, 39 (2), 21-30.
- Ogunade, C. A. (2019). Eradicating the challenges faced by the programming community in Nigeria. Retrieved November, 2021 from http://dev.to/winsom_ade/eradicating-the-challenges-faced-by-the-programming-community-in-nigeria-aj69.
- Ogwo, E., Maidoh, N. E. & Onwe, C. E. (2015). Computer Studies and its impact on secondary schools in Umuahia North Local Government Area of Abia State, Nigeria. *I. J. Modern Educational and Computer Science*, 6, (14), 16-23.
- Okiki, C. O. (2011). Information Communication Technology support for an elearning environment at University of Lagos, Nigeria. *Library Philosophy and Practice*, 6 (10), 33-45.
- Okoro, S., Nyeche, I., Utibe, J., & Ugwulebo, J. E. (2017). Technology integration in education: A catalyst for sustainable national development in Nigeria education system. *International Journal of Social Sciences and Management Research*, 1 (3), 8-16.
- Olatunbosun, O., Olusoga, F. A. & Samuel, O. A. (2018). Adoption of e-learning technology in Nigeria tertiary institution of learning. *British Journal of Applied Science & Technology*, 10(2), 1-15.
- Oliveira, L., Pereira, F., Misoczki, R., Aranha, D. F., Borges, F., Nogueira, M. W., Wu, M. & Liu, J. (2018). The computer for the 21st century: Present security and privacy challenges, *Journal Internet Service*, 9, (24) 65-77.
- Onifade, O. J., Ilevbare, E. O. & Adelowo, C. M. (2021). Perception of appropriateness of Nigeria: Computer Science students' curriculum in providing technical skills and knowledge for the labour market. *International Journal of Educational Research*, 9(1), 28-48.
- Onuvughe, O. G., Adeiwura, A. I. & Olusegun, O. O. (2018). Gender balance in generative instructional strategy. *Elixir International Journal*, 1(1) 7-13.
- Onuoha, J. C. & Yahaya, J. (2021). Effects of schoology and canvas blended Instruction tools on students' achievement and interest in Economic concepts in FCT colleges

- of education Zuba, Abuja. *International Journal of Education and Social Science*, 4(2), 286-296.
- Onyenma, C. & Nnoduka, O. C. (2020). Effect of blended learning on students' retention of Physics in Federal Colleges of education in South East, Nigeria. *International Journal of Education, Learning and Development*, 8 (1), 66-76.
- Ong, C. S. & Lai, J. Y. (2006). Gender differences in perceptions and relationships among dominants of e-learning acceptance. *Computers in Human Behaviour*, 22(5), 816-829.
- Organization for Economic Co-operation and Development, (2010). *Are the new millennium learners making the grade? Technology use and educational performance in PISA*: Centre for educational research and innovation, OECD.
- Osakwe, R. N. (2012). Challenges of information and communication technology in Nigerian educational institutions. *Education Research Journal*, 2 (12), 388-391.
- Oskerby, J. (2013). Students' perceptions of the introduction of a blended learning environment: An exploratory case study. *Accounting Education*, 22(1), 85-99.
- Oviawe, R. & Oshio, E. (2011). The impact of Information and Communication Technologies on teaching and learning ability of education students. *Journal of Library and Information Studies*, 2(2), 48-59.
- Papas, C. (2013). Learning management systems comparison checklist of features. Available online at <http://elearningindustry.com/learningmanagement-systems-comparison-checklist-of-features>. Retrieved 30th July 2019.
- Pahamzah, J., Masrupi, S. & Yohaningsih, N. (2021). Impact of schoology on students' reading comprehension and writing skills for senior high school. *International Journal of English Language and Linguistics Research*, 9 (5), 1-9.
- Pardemean, B. & Suparyanto, T. (2014). A systematic approach to improving elearning implementation in High schools. *The Turkish Online Journal of Education Technology*, 13 (3), 19-26.
- Paul, R. C., Swart, W., Zhang, A. M. & MacLeod, K. R. (2015). Revisiting Zhang's scale of transactional distance: Refinement and validation using structural equation modelling. *Distance Education*, 36, (44), 364–382.
- Piaget, J. (1972). Intellectual development from adolescence to adulthood. *Human development*, 15, 1-12.
- Priyatno, A. (2017). Promoting learner autonomy through schoology m-learning platform in an EAP class at an Indonesian University. *Teaching English with Technology*, 17(2), 55-76.

- Raman, A., Don, Y., Khalid, R. & Rizuan, M. (2014). Usage of learning management system (Moodle) among postgraduate Students: UTAUT Model. *Asian Social Science*, 10(14), 1911-2025.
- Ratheeswari, K. (2018). Information communication technology in education. *Journal of Applied and Advanced Research*, 3, (1) 45-50.
- Raza, S. A., Qazi, W., Khan, K. A. & Salam, J. (2021). Social isolation and acceptance of the learning management system in times of Covid-19 pandemic: An expansion of the UTAUT Model. *Journal of Educational Computing Research*, 59 (2), 183-208.
- Reynolds, J. R. & Burge, S. W. (2017). Educational Expectations and the Rise in Women's Post-Secondary Attainments. *Social Science*, 33 (2), 444-654.
- Rodgers, T. (2018). Student engagement in the e-learning process and the impact on their grades. *International Journal of Cyber Society and Education*, 21(1), 43-156.
- Roehm, S. & Bonnel, W. (2019). Engaging students for learning with online discussions. *Teaching and Learning in Nursing*, 4, (1), 6-9.
- Rokhim, D. A., Kuiniawan, C. S. A., Ula, Q. & Saddiq, I. H. (2022). Needs analysis of the development of schoology and powtoon-based learning media to increase learning motivation and student learning outcomes. *Journal Pendidikan Dasar*, 14(1), 8-16.
- Ross, S. M. (2010). Educational technology research past and present: Balancing rigor and relevance to impact learning. *Contemporary Educational Technology*, 3(3), 97-102.
- Rovai, A. P., Ponton, M. K. & Baker, J. D. (2018). *Distance learning in higher education: A programmatic approach to planning, design, instruction, evaluation, and accreditation*. New York, NY: Teachers College Press.
- Sadan, Y. & Kumbhar, R. (2012). Elearning experience using open-source software: Moodle. *Journal of Library and Information Technology*, 32 (5), 409-416.
- Salihu, D. & Ago, Q. (2016). Undergraduate students' failure in programming courses in institutions in higher education in developing countries: Nigerian Perspective. *Electronic Journal of Information System in Developing Counties*, 76, (8), 1-18.
- Salisbury, M. H., Paulsen, M. B. & Pascarella, E. T. (2010). To see the world or stay at home: Applying an integrated student choice model to explore the gender gap in the intent to study abroad. *Research in Higher Education*, 51(7), 615-40.
- Salmon, G. (2014). *E-moderating: The key to teaching and learning online*. Taylor and Francis Group, New York.

- Sarrab, M. Elbasir, M. & Alnaeli, S. (2016). Towards a quality model of technical aspects for mobile learning services: An empirical investigation. *Computer Human Behaviour*, 55, (11), 100–112.
- Sawant, S. P. & Rizvi, S. (2015). Study of passive didactic teacher centred approach: An active students centred approach in teaching anatomy. *Journal of Anatomy and Research*, 3 (3),1192-1197.
- Schell, G. P. & Janicki, T. K. (2013). Online course pedagogy and the constructivist learning model. *Journal of the Southern Association for Information Systems*, (1)1, 7-11.
- Schoology, (2014). What is schoology? Retrieved on 26th June, 2019 from <https://sites.google.com/site/farmingtongschoology/what-is-schoology>.
- Schoology, (2015). Schoology named finalist in higher education and K-12 education technology in CODiE awards (press release). Retrieved on 8th April, 2019 from <https://www.schoology.com/news/codie-finalist-2015>.
- Schoology, (2019). What makes schoology great? Retrieved on 30th July, 2019 from <https://www.schoology.com>.
- Schoology, (2019). Simplifying the online learning experience. Retrieved on 29th July 2019, from <https://mobile-learning.educationtechnologyinsights.com/vendor/schoologysimplifying-the-online-learning-experience-cid-125-mid-20.html>.
- Scott, K. M. (2013). Does a university teacher need to change e-learning beliefs and practices when using a social networking site? A longitudinal case-study. *British Journal of Educational Technology*, 44 (4), 571–80.
- Sekaran, U. & Bougie, R. (2016). *Research methods for business. a skill-building approach* (7th Ed): Haddington: John Wiley & Sons.
- Sicat, A. S. (2015). Enhancing college students' proficiency in business writing via schoology. *International Journal of Education and Research*, 3(1), 23-34.
- Siemens, G. (2004). Connectivism: A learning theory for the digital age. Retrieved on 16th August, 2019 from <http://www.elearnspace.org/Articles/connectivism.htm>.
- Sife, A., Lwoga, E. & Sanga, C. (2017). New technologies for teaching and learning: Challenges for higher learning institutions in developing countries. *International Journal of Education and Development using ICT*, 3(2), 33-76.
- Sinclair, J. K. (2014). In empirical investigation of student satisfaction with college courses. *Asia Pacific Education Review*, 22, (12), 1-21.
- Smith, M. K. (2015). What is education? A definition and discussion. The encyclopaedia of informal education. Accessed from <http://infed.org/mobi/what-is-education-a-definition-and-discussion/>. Retrieved; August, 2019.

- So, H. J. & Brush, T. A. (2017). Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors. *Computers and Education*, 1 (19), 22-30.
- Sobowale, F. M., Chukwuemeka, E. J., Babatunde, A. E. & Dominic, S. (2020). Effect of ATutor platform on learning outcomes in Agricultural Science among University students in North-Central, Nigeria. *European Journal of Interactive multimedia & Education*, 1(1), 5-6.
- Sorebo, O., Halvari, H., Gulli, V. F. & Kristiansen, R. (2019). The role of self-determination theory in explaining teachers' motivation to continue to use e-learning technology. *Computers and Education*, 53, (14), 1177-1187.
- Spears, L. R. A. (2012). Social presence, social interaction, collaborative learning, and satisfaction in online and face-to-face courses (Doctoral dissertation, Iowa State University) Retrieved on 14th August, 2019 from <http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=3983andcontext=etd>.
- Ssekakubo, G., Suleman, H. & Marsden, G. (2013). Designing mobile LMS interfaces: *learners' expectations and experiences*, 10 (2), 147–167.
- Stansifer, R. (2017). Introduction to Computer Science. Retrieved on 29th May, 2019 from <https://www.cs.fit.edu/~ryan>.
- Stantchev, V., Colomo, I., Palacios, R., Soto-Acosta, P. & Misra, S. (2014). Learning management system and cloud file hosting services: A study on students' acceptance. *Computer in Human Behaviour*, 31, (4) 612-619.
- Stephenson, C. R., Bonnes, S. L., Sawatsky, A. P. (2020). The relationship between learner engagement and teaching effectiveness: A novel assessment of students' engagement in continuing medical education. *BMC Med. Educ.*, 20 (1), 403-407.
- Suleiman, A. A., (2012). Essentialities for e-learning: The Nigerian tertiary institutions in question. *Academic Research International Journal*, 1(2), 20-40.
- Sari, L., Sulisworo, D., Toifur, M. & Rahman N. H. A. (2020). Effect of schoology online cooperative learning on leaning achievement. *Journal of scientific & Technology Research*, 9 (2), 99-102.
- Sulisworo, D. (2012). Designing the online collaboration learning using the Wikispace. *International Journal of Educational Technology*, 7 (1), 54-63.
- Swan, K. & Shih, L. F. (2015). On the nature and development of social presence in online courses. *Journal of Asynchronous Learning Network*, 9 (3), 115-136.
- Sweeney, J. & Ingram, D. (2011). A comparison of traditional and web-based tutorials in marketing education: An exploratory study. *Journal of Marketing Education*, 23 (1), 55-62.

- Tagoe, M. (2012). Students' perceptions on incorporating e-learning into teaching and learning at the university of Ghana. *International Journal of Education and Development using Information and Communication Technology*, 8, (1), 91-103.
- Techopedia, (2019) Computer Science. Retrieved on 7th August, 2019 from <https://www.techopedia.com/definition/592/computer-science>.
- Tegegne, K. M. (2014). The influence of e-learning on the academic performance of mathematics students in fundamental concepts of algebra course: The case in Jimma University. *Ethiopia Journal Education & Science*, 9 (2), 23-30.
- Tempelaar, D. T., Vander-Loeff, S. S., Gijsselaers, W. H., & Nijhuis, J. F. (2011). On subject variations in achievement motivations: A study in business subjects. *Research in Higher Education*, 52(4), 395–419.
- Tennyson, R. D. & Volk, A. (2015). *Educational paradigm*. Retrieved on 8th June 2019 from <https://www.sciencedirect.com/topics/computer-science/educational-paradigm>.
- Tosun, S. (2015). The effects of blended learning on EFL students' vocabulary enhancement. *Social Behaviour Science*, 199, (7), 641- 647.
- Treleaven, L. (2013). A new taxonomy for evaluation studies of online collaborative learning. In T. Roberts (Ed), online collaborative learning. Queensland: *Information Science Publishing*, 160-180.
- Trilibis (2014). Responsive web design: Why image optimization is crucial for a mobile-friendly customer experience. Retrieved October 1, 2019, from http://www.trilibis.com/files_/Trilibis_RWD_survey_APR_2014.pdf.
- Tseng, H. (2020). An exploratory study of students' perceptions of learning management system utilization and learning community. *Research in Learning Technology*, 28, (2), 23-24.
- Tung, L. C. (2012). Proactive intervention strategies for improving online student retention in a Malaysian distance education institution. *Journal of Online Learning and Teaching*, 8(4), 312–323.
- Tunmibi, S., Aregbesola, A., Adejobi, P. & Ibrahim, O. (2015). Impact of elearning and digitalization in primary and secondary schools. *Journal of Education and Practice*, 6 (17), 53-58.
- Ugwoko, E. O., Udeh, N. I. & Ezemma, J. C. (2018). Effect of flipped classroom on learning management systems and face-to-face learning environments on students' gender, interest and achievement in accounting. *Library Philosophy and Practice*, 2 (3), 444-576.
- Umeh, A. E. (2015). *Instructional Design and Technology*. Evi-cole Publishers, Ibadan.
- UNESCO, (2010). The education of girl: The Ouagadougou Declaration and Framework for Action. Pan African conference on the education for girls. Accessed from

http://www.unesco.org/education/information/nfsunesco/pdf/OUAGAD_E.PDF.
on 30th August, 2019,

- UNESCO, (2015). Education 2030: Declaration and frame for action-towards inclusive and equitable quality education and lifelong learning. A Planning guide, USA: Division of Higher education.
- Usoro, A. & Abid, A. (2015). Delivering quality higher education through e-learning: A conceptual view. *Higher education in the twenty first Century Issues and Challenges*, 2 (2), 163–176.
- Veresova, M. & Foglova, L. (2016). Academic self-efficacy, heteronomous and autonomous evaluation of academic achievement of adolescents. *The European Proceedings of Social and Behavioural Sciences*, 16, (7), 877-885.
- Wallace, A. (2014). Social learning platforms and flipped classroom. *International Journal of Information and Education Technology* 4 (4), 293–296.
- Wallace, L. & Young, J. (2010). Implementing blended learning: Policy implications for universities. *Online Journal of Distance Learning Administration*, 13 (4), 33-37.
- Weimer, M. (2012). 10 ways to promote student engagement. Retrieved on 11th of September, 2019 from <https://www.facultyfocus.com/articles/effective-teaching-strategies/10-ways-to-promote-student-engagement/>.
- Wihastyanang, W. D. & Latief, M. A. (2018). The impact of electronic feedback on students' writing quality. *Online Journal of New Horizons in Education*, 8 (4), 11-22.
- Winthrop, R., McGivney, E., Timothy, P. W. & Shankar, P. (2016). *Innovation and technology to accelerate progress in education*. A report to the international commission on financing global education opportunity. Retrieved on 11th June, 2019 from <https://www.brookings.edu/wp-content/uploads/global/innovation-and-technology.pdf>.
- World Bank, (2019). The education crisis: Being in schools is not the same as learning. Retrieved November, 2021 from <https://www.worldbank.org/en/news/immersive-story/>.
- Yakubu, N. & Dasuki, S. (2018). Measuring e-learning success in developing countries: applying the updated DeLone and McLean model. *Journal of Information Technology Education*, 2 (1), 35-54.
- Yang, T. C., Hwang, G. J., Yang, S. J. H. & Hwang, G. H. (2015). A Two-Tier Test-based Approach to Improving Students' Computer-Programming Skills in a Web-Based Learning Environment. *Educational Technology and Society*, 18 (1), 198–210.

- Yilian, T. & Xia, W. (2021). Effect of two educational technology tools on students' engagement in Chinese EFL courses. *International Journal of Educational Technology in Higher Education*, 18 (1), 27-32.
- Yilmaz, E. O. & Yurdugul, H. (2013). Students' perception of learning in asynchronous online discussion. *Social and Behavioural Science*, 83 (3), 776-780.
- York, T., Gibson, C. & Rankin, S. (2015). Defining and measuring academic success. *Practical Assessment, Research and Evaluation*, 5, (1), 1-20.
- Zainnuri, H. & Cahyaningrum, D. (2017). Using online peer review through discussion via schoology to enhance college students' proficiency in argumentative writing: A case study. International conference on teacher training and education. *Advances in Social Science, Education and Humanities Research*, 2 (3), 158-166.
- Zhang, W. (2013). Entering the 3rd generation of e-learning: Characteristics and strategies. *Journal of Educational Technology Development and Exchange*, 6(1), 1-12.

APPENDIX A

WEB DESIGN ACHIEVEMENT TEST (WDAT)

INSTRUCTION: Please read the instructions carefully before filling them in.

Time: 1hr

Name of School.....

Gender

Tick the option that you consider most appropriate in each question. Choose from the option provided from A-D below.

1. What does CSS stand for?
 - A. Current Style Sheets
 - B. Current Sheets Style
 - C. Cascading Style Sheets
 - D. Cascading Sheets Style
2. Which of the following statements is false?
 - A. You can make a website without using HTML
 - B. You can make a website without using PHP
 - C. You can make a website without using CSS
 - D. You can make a website without using JavaScript
3. You can create a new folder in Atom by?
 - A. Right-clicking the file
 - B. Selecting query language
 - C. Selecting new folder
 - D. None of the above
4. Which of the following is true about JavaScript?
 - A. It is a server-side scripting language
 - B. It is client-side scripting language
 - C. It is a Software
 - D. It is a database
5. Which of the following is true?
 - A. You need a server to host your website files
 - B. You don't need a server to host your website files

- C. You can create a website without using HTML
 - D. You can't create a website without a CMS
6. Which of the following is true?
- A. You need a server to host your website files
 - B. You don't need a server to host your website files
 - C. You can create a website without using HTML
 - D. You can't create a website without a CMS

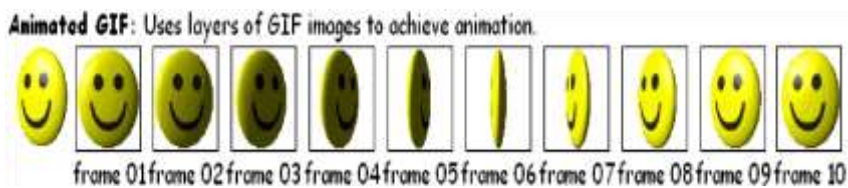
7. Links are created with the Element?

- A. `<s>`
- B. ``
- C. `<c>`
- D. `<a>`

8. Which of the following statements is true?

- A. The web designer shouldn't just be concerned about the looks but also about user interface
- B. Usability is very important in web design
- C. a and b
- D. None of the above

Answer question 9 and 10 using the diagram below?



9. GIF means?

- A. Graphic Internet Focus
- B. Graphics Interchange Format
- C. Grammatical interconnected Forum
- D. None of the above

10. GIF images use _____ and can be used to create images for use on the Internet?

- A. Bullets
- B. Palettes
- C. Tags
- D. Banner

11. Apart from `` tag, what other tag makes text bold?

- A. `<fat>`
- B. ``
- C. `<black>`
- D. `<emp>`

12. What should be the first tag in any HTML document?

- A. `<head>`
- B. `<title>`
- C. `<html>`
- D. `<document>`

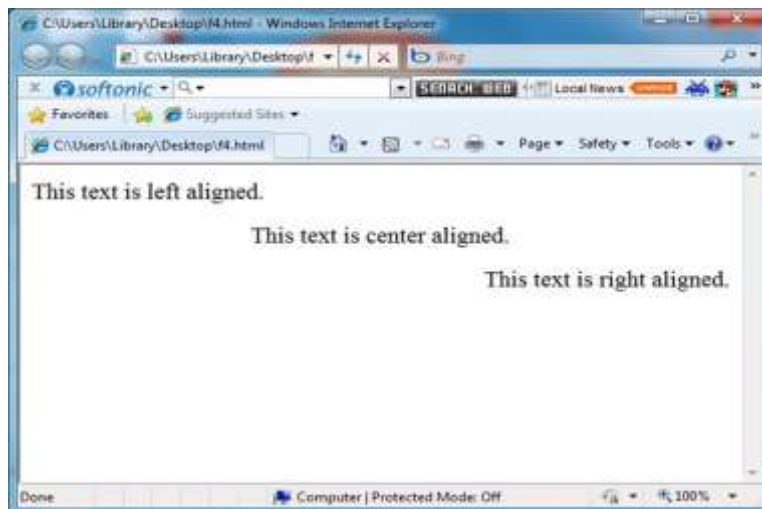
13. What tag is used to display a picture in a HTML page?

- A. picture
- B. image
- C. img
- D. src

14. _____ images are designed for handling large colour palettes?

- A. Empty
- B. Server
- C. JPG
- D. Body

15. From the diagram below, the text displayed on the page represents?



- A. Text Alignment Attribute
- B. Text Navigator
- C. Window Text Page
- D. Web Text Page

16. HTML tags is surrounded by which type of brackets?

- A. Curly
- B. Round
- C. Square
- D. Angle

17. Tags and test that are not directly displayed on the page are written in _____ section?

- A. <head>
- B. <title>
- C. <body>
- D. <html>

18. One of these is not an example of image formats?

- A. JPG

- B. GIF
- C. IMAGE
- D. PNG

19. Images are included in web pages with the?

- A.
- B. <figure>
- C. <hr/>
- D.

20. GIFs is seen as option for?

- A. Colour palette
- B. Simple animations
- C. Pixels
- D. None of the above

21. In emphasis (Italic) elements, block-level elements are also known as?

- A. Italic Processor
- B. Markup Processor
- C. Pre-processor
- D. Flow content

22. A element in an element will give you text that is?

- A. Strong and emphatic.
- B. Strong and encompassing
- C. Strong and enveloping
- D. Strong and emphasized

23: HTML markup should provide semantic information about your _____?

- A. Idea
- B. Content
- C. Course
- D. Literature

24. How can you make a bulleted list with numbers?

- A. <dl>
- B.
- C. <list>
- D.

25. HTML web pages can be read and rendered by _____?

- A. Compiler
- B. Server
- C. Web Browser
- D. Interpreter

26. Which of the following tag is used to mark a beginning of paragraph?

- A. <TD>
- B.

- C. <P>
- D. <TR>

27. The <hr/> element is a?

- A. Horizontal rift
- B. Horizontal roadmap
- C. Horizontal rule
- D. All of the above

28. Markup tags tell the web browser?
- A. How to organize the page
 - B. How to display the page
 - C. How to display message box on page
 - D. None of these
29. What are Empty elements and is it valid?
- A. No, there is no such terms as Empty Element
 - B. Empty elements are element with no data
 - C. No, it is not valid to use Empty Element
 - D. None of these
30. Two elements called <head> and <body> are found inside?
- A. <html>
 - B. len
 - C. page title
 - D. all of these
- 31 Web pages starts with which of the following tag?
- A. <Body>
 - B. <Title>
 - C. <HTML>
 - D. <Form>
32. While <p> is a blocked-level element_____is an inline element?
- A. <el>
 - B. <by>
 - C.

D. none of the above

33. <DT> tag is designed to fit a single line of our web page but <DD> tag will accept a _____?

A. line of text

B. full paragraph

C. word

D. request

34. Character encoding is?

A. method used to represent numbers in a character

B. method used to represent character in a number

C. a system that consists of a code which pairs each character with a pattern, sequence of natural numbers or electrical pulse in order to transmit the data

D. none of these

35. Correct HTML to left align the content inside a table cell is?

A. <tdleft>

B. <td ralign = "left" >

C. <td align = "left">

D. <td leftalign>

36. The tag which allows you to rest other HTML tags within the description is?

A. <TH>

B. <TD>

C. <TR>

D. <CAPTION>

37. Can the element <First> be replaced with <first>?

A. No, they represent different elements altogether

- B. Both are same
 - C. First is correct only
 - D. first is only correct
38. <INPUT> is?
- A. format tag
 - B. empty tag
 - C. both (a) and (b)
 - D. none of these
39. The latest HTML standard is?
- A. XML
 - B. SGML
 - C. HTML 4.0
 - D. HTML 5.0
40. The web standard allows programmers on many different computer platforms to dispersed format and display the information server. These programs are called?
- A. Web Browsers
 - B. HTML
 - C. Internet Explorer
 - D. None of these
41. The <nav> element (Navigation Element) defines?
- A. A set of graphics
 - B. A set of websites
 - C. A set of navigation pages
 - D. A set of navigation links
42. tag makes the enclosed text bold. What is other tag to make text bold?

- A.
- B. <dar>
- C. <black>
- D. <emp>

43. Tags and text that are not directly displayed on the page are written in _____ section?

- A. <html>
- B. <head>
- C. <title>
- D. <body>

44. Which of the following is an attribute related to font tag?

- A. size
- B. case
- C. colour
- D. All of the above

45. The HTML <canvas> tag is used to?

- A. Draw graphics on the fly via scripting
- B. Create frames on the fly via scripting
- C. Draw graphics on the basis of HTML code
- D. Create forms for input user information.

46. Which of the following is not a valid alignment attribute?

- A. Left
- B. Right
- C. Top
- D. All of above

47. Which attribute is used within tag to display the text if image could not load in browser?

- A. description
- B. name
- C. alt
- D. id

48 Tags and text that are not directly displayed on the page are written in _____ section?

- A. <html>
- B. <head>
- C. <title>
- D. <body>

49. Which attribute is used to name an element uniquely?

- A. class
- B. id
- C. dot
- D. all of above

50. What is the full form of HTML?

- A. Hypertext markup language
- B. Hyphenation text markup language
- C. Hyphenation test marking language
- D. Hypertext marking language

Marking Scheme for WDAT

1. C	26. C
2. A	27. C
3. A	28. B
4. B	29. B
5. A	30. A
6. A	31. C
7. D	32. C
8. C	33. B
9. B	34. C
10. B	35. C
11. B	36. D
12. C	37. B
13. C	38. B
14. C	39. D
15. A	40. D
16. D	41. D
17. A	42. A
18. A	43. B
19. A	44. D
20. B	45. C
21. D	46. C
22. D	47. C
23. B	48. B
24. B	49. B
25. C	50. A

APPENDIX B

QUESTIONNAIRE ON STUDENT ENGAGEMENT AND PERCEPTION TOWARDS THE USE OF ELECTRONIC LEARNING PLATFORMS

The following questions ask about students' engagement and perception towards the use of electronic learning platform (ELP). There are no right or wrong answers, just answer as accurately as possible as your contribution to this research. The questions are meant to generate reliable information and your honesty is highly solicited.

SECTION A: Student's Personal Information

1. Name of Higher Institution.....
2. Gender
3. Number of courses taken via electronic learning platforms.....

SECTION B: Please state your agreement by crossing the appropriate box on the following scales using the following keys:

(SA) Strongly Agree, (A) Agree, (UC) Uncertain (D) Disagree, (SD) Strongly Disagree

	LEARNING ENGAGEMENT USING ELP	SA	A	UC	D	SD
1	Learning with ELP increases my interest in learning					
2	I am motivated to study when I take classes on ELP					
3	I tend to apply the knowledge I have learnt in ELP to real life situations.					
4	I often ask the teacher about the contents of the lesson.					

5	I approach new concepts introduced in ELP from a new perspective.					
6	I take part in discussion forums after online classes on ELP.					
7	I can derive new interpretations and ideas from the knowledge I have learned in ELPs.					
8	I try to answer questions that other students ask on ELP discussion forum.					
9	I work with other students on projects or assignments given by the teacher on ELP.					
10	I can judge the value of the information related to the knowledge learned in ELP classes.					
11	I ask other students for help when I cannot understand any concept taught in ELPs.					
12	I manage my own learning on ELP using my computer system/mobile device					
13	I plan my learning schedule to enable me stay active on ELP.					
14	I study related learning contents by myself after taking lessons on ELP.					

	PERCEPTION TOWARDS ELP	SA	A	UC	D	SD
1	ELP is an excellent means of social interaction					
2	As a result of my experience, I would like to participate in ELP classes in the future.					
3	The instructor creates a feeling of community during ELP classes					

4	I feel comfortable interacting with other students while learning in ELP					
5	I feel comfortable conversing through text-based medium in ELP					
6	The discussions with other students in ELP are in-depth and comprehensive.					
7	ELP make me put a great deal of effort to learn in order to participate in discussion forums					
8	The language students use in expressing themselves while learning in ELP is stimulating					
9	I believe the language that I use to express myself while interacting with other students in ELP is easily understood.					
10	Communication in ELP is impersonal					
11	ELP is technically reliable					
12	ELP offers me useful learning experience.					
13	The teacher facilitates discussion in the ELP					
14	ELP allows me to build more caring relationship with my mates while learning.					
15	My point of view is acknowledged by other students in an ELP.					
16	Learning activities of EPL meets my learning expectation.					
17	I am comfortable with the use of computer/mobile phones to access my learning					

	materials on ELP					
18	As a result of my learning experience in ELP, I have made acquaintances from students from other parts of Nigeria.					

APPENDIX C

SAMPLE LESSON PLAN FOR EXPERIMENTAL GROUP

Lesson 1

Subject	Computer Science		
Level	200L		
Topic	Concepts of HTML, CSS and JavaScript		
Duration	1 hr, 30 minutes		
Behavioural Objective	By the end of this lesson, the students should be able to ○ Explain the concepts of HTML, CSS and JavaScript		
Stages	Teacher's activities	Students' activities	Time
Introduction	Teacher welcomes the students to ELP class and begins by engaging the students on a brainstorming activity on their thoughts about what makes up a web	Students embark on a brainstorming activity by giving their own understanding.	15 minutes
Step I	Teacher takes note of their responses and then directs the students to module I for the lesson of the day	Students go to module I and opens it	5 minutes
Development	Teacher introduces the lesson of the day by presenting the concepts on HTML, CSS and JavaScript to the students and instructs them to read the lesson presented as each student will be required to explain in their own terms as to what they understand in the lesson as part of their evaluation.	Students follow the teacher on the lesson by reading the concepts covered on HTML, CSS and JavaScript.	35 minutes
Online Activities	Teacher asks the student to do brainstorming activities using the links provided to explaining to themselves in their own words, what they have gathered from the lesson	Students uses the discussion group to share their ideas as to the meaning of HTML, CSS and JavaScript	20 minutes
Evaluation	Teachers takes note of their responses and prepares assessment questions based on their discussions.	Students respond	15 minutes
Closure	Teachers gives the students online exercises for further	Students goes to the links attached to their	

	reading and discussion.	module for further reading in preparation for class quiz.	
--	-------------------------	---	--

Lesson 2

Subject	Computer Science
Level	200L
Topic	Basic Web Pages
Sub-Topic	Structure of a web page
Duration	1 hr, 30 minutes
Behavioural Objective	By the end of this lesson, the students should be able to <ul style="list-style-type: none"> ○ Explain Basic Web Pages

Stages	Teacher's activities	Students' activities	Time
Introduction	Teacher welcomes the students to ELP web design class and engages them on a brainstorming activity on their idea on Basic Web Pages	Students embark on a brainstorming activity by giving their own understanding to the concepts.	15 minutes
Step I	Teacher directs the students to module II for the lesson the lesson of the day	Students go to module II and opens it	5 minutes
Development	Teacher introduces the lesson of the day by presenting the lesson on Basic Web Pages to the students and instructs them to read the module as each student will be required to explain in their own terms as to what they understand in the lesson as part of their evaluation.	Students follow the teacher on the lesson by reading the meaning of basic Web Pages	35 minutes
Online Activities	Teacher will ask student do a brainstorming activity using the links provided to explaining to themselves in their own words, what they have gathered from the lesson	Students uses the discussion group they are assigned to share their understanding on Basic Web Pages	20 minutes
Evaluation	Teachers takes not of their responses and prepares the assessment questions based on their discussions.	Students respond	15 minutes
Conclusion	Teachers gives the students online exercises further	Students goes to the links attached to their	

	reading	module for further reading in preparation for class quiz.	
--	---------	---	--

Lesson 3

Subject	Computer Science
Level	200L
Topic	Links and Images
Duration	1 hr, 30 minutes
Behavioural Objective	By the end of this lesson, the students should be able to <ul style="list-style-type: none"> ○ Explain Links and Images

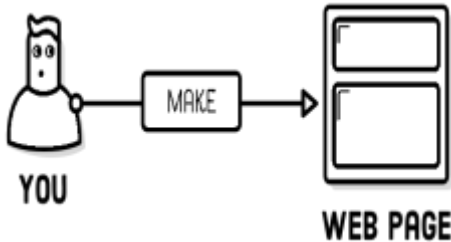
Stages	Teacher's activities	Students' activities	Time
Introduction	Teacher welcomes the students to ELP class and then engages them on a brainstorming activity on their idea on Links and Images in a web page	Students embark on a brainstorming activity by giving their own understanding to the concepts.	15 minutes
Step I	Teacher directs the students to module III for the lesson the lesson of the day	Students go to module III and opens it	5 minutes
Development	Teacher introduces the lesson of the day by presenting the meaning of links and images to the students and instructs them to read the module as each student will be required to explain in their own terms as to what they understand in the lesson which will form part of their evaluation.	Students follow the teacher on the lesson by reading the meaning of links and images	35 minutes
Online Activities	Teacher asks the student do brainstorming activities using the links provided to explaining to themselves in their own words, what they have gathered from the lesson	Students uses the discussion group they are assigned in order to discuss what they have gathered form the lesson.	20 minutes
Evaluation	Teachers takes not of their responses and asks the student questions based on their contributions.	Students respond	15 minutes

Conclusion	Teachers gives the students online exercises further reading	Students goes to the links attached to their module for further reading in preparation for class quiz.	
------------	--	--	--

APPENDIX D

SAMPLE LESSON PLAN FOR CONTROL GROUP

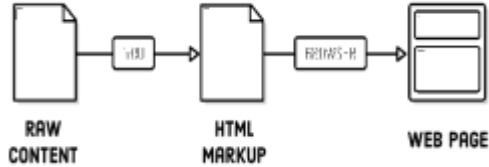
Lesson 1


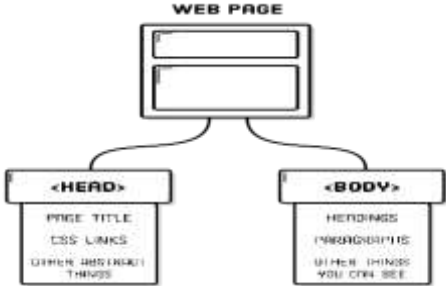
Subject	Computer Science		
Level	200L		
Topic	Concepts of HTML, CSS and JavaScript		
Duration	1 hr, 30 minutes		
Behavioural Objective	By the end of this lesson, the students should be able to <ul style="list-style-type: none"> ○ Explain the concepts of HTML, CSS and JavaScript 		
Previous knowledge	The students are familiar with using computers/phones to search the web.		
Stages	Teacher's activities	Students' activities	Learning Points
Introduction	The teacher begins the lesson by asking the students (a) what they have searched for using a web site (b) what they think that makes up the web that makes it possible to browse through it	The students listen and then give the teacher what they feel is the correct answers	Navigating the web
Presentation	The teacher explains concepts that make up the web in the form of; HTML, CSS and JavaScript	Students listen attentively	Meaning of HTML, CSS and JavaScript
Step I	 <p>Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), and JavaScript are the languages that run the web. They're very closely related, but they're also designed for very specific tasks. Understanding how they interact will go a long way towards becoming a web developer. We'll be expanding on this throughout the module, but the gist of it is:</p> <ul style="list-style-type: none"> • HTML is for adding meaning to raw 	Students continues to listen to the teacher explain the note	Students have learnt the meaning of HTML, CSS and JavaScript

	<p>content by marking it up.</p> <ul style="list-style-type: none"> • CSS is for formatting that marked up content. • JavaScript is for making that content and formatting interactive. 		
Step II	The teacher interacts with the students on the necessary steps to develop websites using HTML, CSS and JavaScript.	Students listen carefully	Students learn more about HTML, CSS and JavaScript
Step III	The teacher demonstrates by showing the students the steps using the computer	Students observe the teacher demonstrates.	Students learn hands-on knowledge on steps to develop HTML, CSS and JavaScript
Evaluation	Teacher asks the students to; Explain the concepts of HTML, CSS and JavaScript	Students respond to the questions	Students have learnt the concepts of HTML, CSS and JavaScript and answered the questions.
Conclusion	The teacher concludes the lesson by giving a summary, followed by class work	Students pay attention to the summary and take down the class work.	

Lesson 2

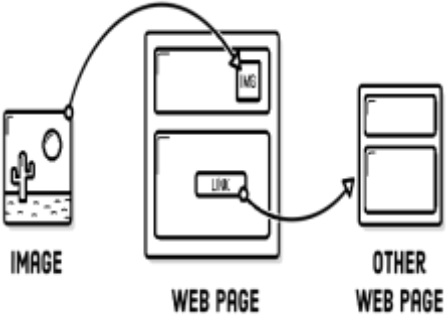
Subject	Computer Science
Level	200L
Topic	Basic Web Pages
Sub-Topic	Structures of the Web Page
Duration	1 hr, 30 minutes
Behavioural Objective	<p>By the end of this lesson, the students should be able to</p> <ul style="list-style-type: none"> ○ Describe the web page ○ State structures of the web page
Previous	The students have learnt the concepts of HTML, CSS and JavaScript and

knowledge	an introductory part of designing a web page		
Stages	Teacher's activities	Students' activities	Learning Points
Introduction	The teacher begins the lesson by asking the students questions on HTML, CSS and JavaScript to refresh their memories	The students respond by give the teacher the correct answers	Mastery on the concepts of HTML, CSS and JavaScript
Presentation	The teacher describes the web page to the students.	Students listen attentively	Students acquire knowledge on web pages
Step I	<p>HTML defines the content of every web page on the Internet. By “marking up” your raw content with HTML tags, you are able to tell web browsers how you want different parts of your content to be displayed. Creating an HTML document with properly marked up content is the first step of developing a web page.</p>  <p>Setup</p> <p>Let's get started by creating a new project with Atom called basic-web-pages. Then, make a new file called basics.html in that folder. This HTML file represents a single web page, and it's where we'll put all our code for this module.</p>	Students continues to listen to the teacher explain the note	Students have learnt the part to creating web page

	 <p>The teacher interacts further with the students on basic web pages</p>		
Step II	<p>The teacher explains structures of the web page</p>  <p>The teacher goes further to explain the tags in the development of web pages.</p> <pre> <!DOCTYPE html> <html> <head> <!-- Metadata goes here --> </head> <body> <!-- Content goes here --> </body> </html> </pre>	Students listen carefully	Students learn structures of web page
Step III	The teachers desmostrates by showing to the students the structure using the computer	Students observes while the teacher demonstrates.	Students learn hands-on knowledge on basic web pages
Evaluation	Teacher asks the students to; <ul style="list-style-type: none"> o Describe the web page 	Students respond to the questions	Students have learnt web pages and

	○ State structures of the web page		answered the questions.
Conclusion	The teacher concludes the lesson by giving a summary, followed by class work	Students pay attention to the summary and take down the class work.	

Lesson 3

Subject	Computer Science		
Level	200L		
Topic	Links and Images		
Duration	1 hr, 30 minutes		
Behavioural Objective	By the end of this lesson, the students should be able to ○ Describe links and Images		
Previous knowledge	The students have learnt web pages and structures of web page.		
Stages	Teacher's activities	Students' activities	Learning Points
Introduction	The teacher begins the lesson by asking the students questions on basics of web pages to refresh their minds on the previous lesson	The students listen and give the teacher the correct answers	Mastery on basics of web pages
Presentation	The teacher explains links and images to the students	Students listen attentively	
Step I	 <p>Links and images are fundamentally different from those elements in that they deal with <i>external</i> resources. Links point the user to a different HTML document, and images pull another resource into the page.</p>	Students continue to listen to the teacher explain the note	Students have learnt the meaning of links and images.
Step II	The teacher demonstrates further using	Students listen carefully and	Students learn hands-on

	the computer system	observes the teacher demonstrate.	knowledge on links and images.
Evaluation	Teacher asks the students to; <ul style="list-style-type: none"> ○ Describe links and Images 	Students respond to the questions	Students have learnt the links and images and also answered the questions.
Conclusion	The teacher concludes the lesson by giving a summary, followed by class work	Students pay attention to the summary and takes down the class work.	

APPENDIX E

ALL COMPUTER SCIENCE STUDENTS FROM SEVEN PUBLIC UNIVERSITIES IN NORTH-CENTRAL, NIGERIA

S/No	Number of Universities	Male	Female	Total
1	Federal University of Technology Minna	344	67	411
2	University of Jos, Plateau State	557	265	822
3	Kogi State University, Kogi State	158	104	262
4	Ibrahim Badamasi, University	356	78	434
5	Nasarawa State University	569	169	738
6	University of Ilorin, Kwara State	365	125	490
7	University of Abuja	352	154	506
Total		2,701	962	3,663

Source: Author

Sample size; 200 LEVEL COMPUTER SCIENCE STUDENTS (2020/2021)

S/N	Name of University	Male	Female	Total
1.	Ibrahim Badamasi, University	63	28	91
2.	University of Abuja	44	26	70
3.	University of Ilorin	48	27	75
	Total	155	81	236

Source: Computer Science Departments of the respective Universities, 2020/2021

APPENDIX F

Validation Form for Schoology Platform

VALIDATION OF SCHOOLGY ELECTRONIC LEARNING PLATFORM (SELP)

Dear sir/ma,

I OHADUGHA, Rosemary Ogechi (Ph.D./SSTE/2018/7807) a student from the Department of Educational Technology, Federal University of Technology, Minna, do request your assistance in validating this research instrument. The researcher has created an online learning medium using an electronic learning platform called Schoology. The essence of this platform is to enable the researcher teach web design concepts to computer science students in the universities online. This validation is necessary as a pre-requisite before the commencement of the lessons in order to ascertain it's suitability for online instruction.

Your constructive criticism and inputs would be highly appreciated.

Schoology Electronic Learning Platform (SELP)

1. Suitability of the platform for instruction
The platform is suitable for the intended purpose
2. Clarity and simplicity of the platform
clear and text and simple to use.
3. Appropriateness of illustration of the concepts
Satisfactory.
4. Background colour
This can be improved upon to capture attention
5. Audibility
None available.

Continuation on validation form of schoology platform

6. Suggestion for improving the platform

Details about the course should be included.
Improved on content, add objectives and
the there should be caption for the package

Name of Specialty: Educational Technology

Rank: Lecturer

Area of Specialty: Dr. O.C. Folorunso

Institution : F.U.T. Minna


Signature: 

Date: 27/04/2020

THANK YOU

APPENDIX G

Validation Form for WDAT



FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF EDUCATIONAL TECHNOLOGY

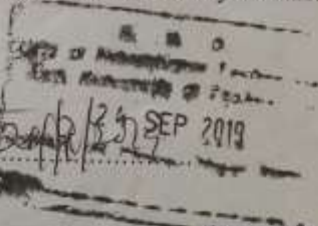
Dear Sir/Madam,

Instrument Validation Form

The bearer is a student of the above named University and Department. She/he is conducting a research and you have been selected as one of those with requisite expertise to validate his/her instrument. Kindly grant him/her all necessary assistance to make the exercise a success.

Your competency and expertise was considered as factors that will serve to improve the quality of his/her research instrument. We therefore crave for your assistance in validating the instrument. The completion of the form serves as evidence that the student actually validated the instrument

Thanks for your anticipated assistance.



Dr. ABU, Thoma Dauda [Signature] [Date: 29 SEP 2019]

Head of Department (Signature, Date & Official Stamp)

Student's Surname... OTADUGHA Other Names... ROSEMARY

Registration Number..... Programme... Ph.D

Title of the Instrument... WEB DESIGN ACHIEVEMENT TEST

ATTESTATION SECTION

Summary of the Remark on the Instrument. This instrument is well structured. It provides questions and answers that are required for basic teaching and learning of Computer Science

I hereby attest that the above named student brought his instrument for validation

Name of Attester... Engr. Isah Abdulkasim

Designation... Lecturer

Name and Address of Institution... FUT, Minna, Niger State

Phone Number... 08033118443 E-Mail... a.o.abd@futminna.edu.ng

Continuation on WDAT validation form

Please comment on the following

1. Appropriateness of the instrument for the purpose it's design for. *The instrument is well in accordance with the concept of the record*
2. Clarity and simplicity for the level of the language used. *The language was clear and simple.*
3. Suability for the level of the targeted audience. *It's suitable because the instrument take into cognisance basic knowledge of Computer Science*
4. The extent in which the items cover the topic it meant to cover. *The items fully cover the topic.*
5. The structuring of the Questionnaire. *The questionnaire was well structured.*
6. Others (grammatical errors, spelling errors and others). *These are very minimal and within acceptable range.*
7. General overview of the Instrument. *The instrument will help to improve teaching and learning concept of the subject.*

Suggestions for improving the quality of the Instrument


1. *Pictorial and graphical representations are necessary.*
2. /
3. /
4. /
5. /

Name of Validator. *Engr. Iqbal AbdulKadir*
Area of Specialization. *Cyber Security, Software and Forensics*
Name of Institution. *F.U.T. Miana* Designation. *Lecturer*
Signature. *[Signature]* Date. *25.02.2020*

Thank You

APPENDIX H

Validation Form on Students' Learning Engagement and Perception using ELP



FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF EDUCATIONAL TECHNOLOGY

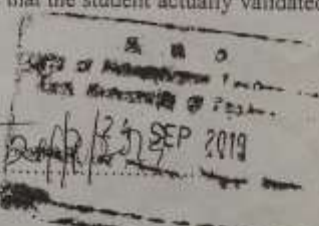
Dear Sir/Madam,


Instrument Validation Form

The bearer is a student of the above named University and Department. She/he is conducting a research and you have been selected as one of those with requisite expertise to validate his/her instrument. Kindly grant him/her all necessary assistance to make the exercise a success.

Your competency and expertise was considered as factors that will serve to improve the quality of his/her research instrument. We therefore crave for your assistance in validating the instrument. The completion of the form serves as evidence that the student actually validated the instrument

Thanks for your anticipated assistance.



Dr. A. B. I. Thomas Donatayo 

Head of Department (Signature, Date & Official Stamp)

Student's Surname... Chardolph Other Names: Rosemary

Registration Number..... Programme Ph.D

Title of the Instrument Questionnaire on students engagement & perception

ATTESTATION SECTION

Summary of the Remark on the Instrument... The instrument covered the topic and its usage suitable for its expected target

I hereby attest that the above named student brought his instrument for validation

Name of Attester... Dr. Anthony Ugodunke

Designation... Lecturer (Guidance & counselling)

Name and Address of Institution... C.O.E Minna

Phone Number... 09036019231 E-Mail... Thomas9113@gmail.com

Continuation on Students' Learning Engagement and Perception using ELP form

Please comment on the following

1. Appropriateness of the instrument for the purpose it's design for... *Appropriate*
2. Clarity and simplicity for the level of the language used... *Simple*
3. Suability for the level of the targeted audience... *it is good for their level*
4. The extent in which the items cover the topic it meant to cover... *To a great extent*
5. The structuring of the Questionnaire... *Good but I strongly suggest that the questionnaire be merged*
6. Others (grammatical errors, spelling errors and others)... *Some corrections had been made but very few*
7. General overview of the Instrument... *The instrument is adequate for the topic*

Suggestions for improving the quality of the Instrument

1. *The instruments should be merged to be one*
2. *Corrections given should be implemented*
3.
4.
5.

Name of Validator... *Dr. Anthony Ugochukwu*

Area of Specialization... *Counselance & counselling*

Name of Institution... *C.O.E.M.T* Designation... *Head of counselling unit*

Signature... *[Signature]* Date... *9/12/2019*

Thank You

APPENDIX I

PILOT STUDY RESULT FROM WDAT

Case Processing Summary

		N	%
Cases	Valid	40	100.0
	Excluded ^a	0	.0
	Total	40	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.790	.791	50

Item Statistics

	Mean	Std. Deviation	N
QST1	.90	.304	40
QST2	.40	.496	40
QST3	.28	.452	40
QST4	.30	.464	40
QST5	.78	.423	40
QST6	.62	.490	40
QST7	.55	.504	40
QST8	.60	.496	40
QST9	.82	.385	40
QST10	.38	.490	40
QST11	.80	.405	40
QST12	.60	.496	40
QST13	.82	.385	40
QST14	.88	.335	40
QST15	.48	.506	40
QST16	.72	.452	40

QST17	.32	.474	40
QST18	.70	.464	40
QST20	.78	.423	40
QST21	.18	.385	40
QST22	.48	.506	40
QST23	.78	.423	40
QST24	.50	.506	40
QST25	.68	.474	40
QST26	.82	.385	40
QST27	.60	.496	40
QST28	.60	.496	40
QST29	.58	.501	40
QST30	.70	.464	40
QST31	.58	.501	40
QST32	.42	.501	40
QST33	.52	.506	40
QST34	.48	.506	40
QST35	.72	.452	40
QST36	.60	.496	40
QST37	.42	.501	40
QST38	.20	.405	40
QST39	.72	.452	40
QST40	.42	.501	40
QST41	.60	.496	40
QST42	.62	.490	40
QST43	.65	.483	40
QST44	.40	.496	40
QST45	.35	.483	40
QST46	.78	.423	40
QST47	.55	.504	40
QST48	.22	.423	40
QST49	.92	.267	40
QST50	.85	.362	40

APPENDIX J

PILOT STUDY RESULT FROM STUDENTS' LEARNING ENGAGEMENT

Case Processing Summary

		N	%
Cases	Valid	40	100.0
	Excluded ^a	0	.0
	Total	40	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.758	.767	14

Item Statistics

	Mean	Std. Deviation	N
Learning with ELP increases my interest in learning	4.15	.834	40
Motivated to study with ELP	3.82	.958	40
Application of knowledge learnt in ELP	4.28	.751	40
Asking about the contents of the lesson	3.15	1.210	40
Approaching new concepts introduced in ELP	3.92	.971	40
Taking part in discussion forums after online classes	2.98	1.025	40
Deriving new interpretation and ideas from ELP	4.32	.859	40
Answering questions asked by others in ELP discussion	3.60	.982	40
Working with others on projects given on ELP	3.80	1.137	40
Judging the information on knowledge learnt	3.95	1.011	40
Asking for help resulting from not understanding	4.15	1.075	40
Managing own learning using my devices	4.52	.679	40
Planning learning schedule to stay active	3.48	1.012	40
Studying related contents after lessons	4.18	.903	40

APPENDIX K

PILOT STUDY RESULT FROM STUDENTS' PERCEPTION

Case Processing Summary

		N	%
Cases	Valid	40	100.0
	Excluded ^a	0	.0
	Total	40	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.713	.723	18

Item Statistics

	Mean	Std. Deviation	N
QST1	4.25	.954	40
QST2	4.08	1.023	40
QST3	3.85	.893	40
QST4	3.68	1.141	40
QST5	3.92	.917	40
QST6	3.50	1.013	40
QST7	3.75	.927	40
QST8	4.02	.891	40
QST9	3.90	.955	40
QST10	3.55	1.131	40
QST11	4.02	.768	40
QST12	4.28	.751	40
QST13	3.48	.987	40
QST14	3.45	1.218	40
QST15	3.42	.984	40
QST16	4.18	.844	40
QST17	2.72	1.396	40
QST18	3.90	.955	40

APPENDIX L

HOMEPAGE OF SCHOOLGY ELP

The screenshot shows the Schoology ELP interface for a course titled "Computer Science: Web Design" at the Federal University of Technology Minna. The page features a left-hand navigation menu with options like "Materials", "Updates", "Gradebook", "Grade Setup", "Badges", "Attendance", and "Members". A green box displays the access code "JXTD-7MND-4543B" with a "Reset" link. The main content area includes a "WELCOME TO SCHOOLGY!" message, a group photo of students, and a video player showing a welcome message: "Welcome to our Awesome WEBSITE!".

Computer Science: Web Design
Federal University of Technology Minna

Notifications

Course Options

Materials

- Updates
- Gradebook
- Grade Setup
- Badges
- Attendance
- Members

Access Code
JXTD-7MND-4543B
Reset

Add Materials Options All Materials

WELCOME TO SCHOOLGY!

HII I AM EXCITED TO WELCOME YOU ALL TO MY SCHOOLGY ONLINE CLASS.


MY NAME IS ROSEMARY AND I WILL BE YOUR INSTRUCTOR FOR THE COURSE; WEB DESIGN. I AM A Ph.D STUDENT AND RESERACHER FROM THE FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA. I AM HOPEFUL THAT WE WILL BE LEARNING SO MUST FROM THIS PLATFORM BECAUSE WEB DESIGN IS A COURSE THAT ALLOWS YOU TO CREATE USER FRIENDLY WEBSITES.

- ENJOY THIS SHORT VIDEO ON BASIC OF WEB DESIGN

Animation Video - Website De...
Welcome to our Awesome WEBSITE!

APPENDIX M

HOMEPAGE OF CANVAS ELP



A vertical sidebar on the left side of the page containing various navigation icons and text links. The icons include a globe, a person, a clock, a document, a calendar, a list, a clock, a refresh arrow, a notification bell with '10', and a right-pointing arrow. The text links are: Home, Announcements, Assignments, Discussions, Grades, People, Pages, Files, Syllabus, Outcomes, Rubrics, Quizzes, Modules, BigBlueButton (Conferences), Collaborations, Attendance, New Analytics, and Settings.



HI! I AM EXCITED TO HAVE YOU ALL HERE!



MY NAME IS ROSEMARY, A Ph. D STUDENT CARRYING OUT A RESEARCH USING CANVAS. I WILL BE YOUR INSTRUCTOR TAKING YOU ON THE COURSE; WEB DESIGN. WEB DESIGN IN THE SIMPLEST TERM ALLOWS YOU TO BUILD USER FRIENDLY WEBSITES.



APPENDIX N

PICTURES OF EXPERIMENTAL GROUP I (SCHOOLOGY) AT PRETEST



APPENDIX O

SAMPLE STUDENTS WHO PARTICIPATED IN SCHOOLGY ELP

The screenshot displays the Schoology interface for a course titled "Computer Science: Web Design". The top navigation bar includes "COURSES", "GROUPS", "RESOURCES", and "MORE :". A "Notifications" button is visible in the top right. On the left, a sidebar contains "Course Options" with sub-items: Materials, Updates, Gradebook, Grade Setup, Badges, Attendance, and Members. Below this is an "Access Code" box showing "JXTD-7MND-4S43B" and a "Reset" link. The main content area is titled "Members" and features tabs for "All", "Members", "Admins", and "Inactive". A search bar is located above the member list. The member list consists of 20 entries, each with a profile picture, name, and a settings gear icon. The names listed are: Rosemary Ohadugha, Yusuf Adebiji, Gbemi Adekoya, Habeeb Adeniyi, Daniel Adewara, Kehinde Adeyemi, plus agboola, Miracle Ajayi, Oluwasefunmi Akomolafe, Joseph David, Ebum David-suberu, Oluwafunwato Edward, Enuodu Emmanuel, Adeyemi Faruq, Daniel Ibisagba, Oreoluwa Idowu, Ganiyu Idris, Anastatia Igbojindu, and Anastatia Igbojindu. On the right side, there are options to "Organize members into Grading Groups", "Group discussion", and another "Access Code" box with the same code "JXTD-7MND-4S43B" and a "Reset" link, along with a "Require approval" checkbox.

Member Name	Settings
Rosemary Ohadugha	⚙️
Yusuf Adebiji	⚙️
Gbemi Adekoya	⚙️
Habeeb Adeniyi	⚙️
Daniel Adewara	⚙️
Kehinde Adeyemi	⚙️
plus agboola	⚙️
Miracle Ajayi	⚙️
Oluwasefunmi Akomolafe	⚙️
Joseph David	⚙️
Ebum David-suberu	⚙️
Oluwafunwato Edward	⚙️
Enuodu Emmanuel	⚙️
Adeyemi Faruq	⚙️
Daniel Ibisagba	⚙️
Oreoluwa Idowu	⚙️
Ganiyu Idris	⚙️
Anastatia Igbojindu	⚙️
Anastatia Igbojindu	⚙️

APPENDIX P

SAMPLE RESPONSES OF STUDENTS IN SCHOLOGY ELP CLASS

The screenshot shows a Schoology interface for a course titled "Computer Science: Web Design". The main content is a discussion titled "Discussion video on HTML". The discussion was posted on Thursday, April 22, 2021, at 9:20 am. The due date is Friday, April 23, 2021, at 12:00 am. The instructor has posted a video and a message encouraging students to share what they have learned and contribute to the discussion. The video player shows a film strip icon and a play button. Below the video is a comment box with the text "Write a comment". There are 4 posts in the discussion. The first post is by Rosemary Ohadugha on Thursday, April 22, 2021, at 9:37 am, saying "Your contributions matter. Thank you." and has one reply. The second post is by Ganiyu I. on Friday, April 23, 2021, at 11:34 pm, saying "A simple quick easy to learn fundamentals on HTML, a great way to start the journey into HTML. Quite Explanatory." and has one reply. The third post is by Muhammad S. on Friday, April 23, 2021, at 6:29 pm, saying "This looks good, just learning something about Web dev Now, but I do hear people say learning wordpress is easier than the conventional html css stuff, please how true is this?" and has one reply. The fourth post is by Rosemary Ohadugha on Friday, April 23, 2021, at 11:04 pm, saying "All of them play vital role in web development, which of course shou WordPress seem easier because of the advanced web functionalities w/ All in all, have a pretty good knowledge of how to use HTML, CSS, J:" and has one reply.

APPENDIX Q
SAMPLE PICTURES OF EXPERIMENTAL GROUP II (CANVAS) AT
PREREST



APPENDIX R

SAMPLE STUDENTS WHO PARTICIPATED IN CANVAS ELP

WELCOME TO CANVAS, YOUR ONLINE CLA... > People <- 63 Student View

- Home
- Announcements
- Assignments
- Discussions
- Grades
- People**
- Pages
- Files
- Syllabus
- Outcomes
- Rubrics
- Quizzes
- Modules
- Conferences
- Collaborations
- Attendance
- New Analytics
- Settings

Everyone Group discussion + Group Set

All Roles ▾

+ People

	Name	Login ID	SIS ID	Section	Role
	Shafaatu Adamu	Shafaatu Adamu		WEB DEVELOPEMENT	Student
	Adamu Adewole	Adamu Adewole		WEB DEVELOPEMENT	Student
	Basiru Ahmad	Basiru Ahmad		WEB DEVELOPEMENT	Student
	Daniel Habila	Daniel Habila		WEB DEVELOPEMENT	Student
	Michael James	Michael A. James		WEB DEVELOPEMENT	Student
	Chidalu Ngozi	Chidalu Ngozi		WEB DEVELOPEMENT	Student
	Ibe Chioma Nora	noralious97@gmail.com		WEB DEVELOPEMENT	Student
	Rosemary Ohadugha	webdesignclasselp@gmail.com		WEB DEVELOPEMENT	Teacher
	Goodness Oliver	Goodness Oliver		WEB DEVELOPEMENT	Student
	Julius	Julius Sunday		WEB	Student

APPENDIX S

SAMPLE RESPONSES OF STUDENTS IN CANVAS ELP CLASS

Assignments

Discussions

Grades

People

Pages

Files

Syllabus

Outcomes

Rubrics

Quizzes

Modules

Conferences

Collaborations

Attendance

New Analytics

Settings



Hello guys,

Rosemary Ohadugha

All Sections

May 6 at 5:51pm

3 4

I want to welcome some of you who joined us recently. I would love to hear what you think about learning using this platform.

Don't forget to please go through the content on module one at your own time. As the activity on that will some come to an end. Our next event will be a discussion on what you have learnt from the module. For in-depth understanding, there are links attached. A YouTube video will also be coming up to make your learning experience worthwhile.

[Topic Podcast Feed](#)

Search entries or author

Unread



← Reply

○



Chidalu Ngozi

Friday

Okay ma

(1 like)

← Reply

○



Goodness Oliver

5:13pm

Learning through this means is very easy. It allows me learn at my own pace.

(1 like)

○



Hamza Umar

5:58pm

I agree with Goodness. Learning is easy in the sense that I can have access to my learning content even when I am on the go

APPENDIX T
SAMPLE PICTURES OF CONTROL GROUP AT PRETEST

