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Impact of E-learning Platforms on Students' Interest and Academic Achievement in Data Structure Course

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Abstract

The study examines the impact of e-learning platforms on students' interest and academic achievement in Data Structure course. A total of 50 Computer Science students that were taking Data Structure course at tertiary institution level participated in the study. The sample was divided into two major groups: experimental group (n=25) and control group (n=25). The Experimental Group (EG) was taught using an e-learning platform, while the Control Group (CG) was taught using the traditional classroom approach. An achievement test on Data Structure was administered as pre-test and post-test to the two groups. While the hypotheses were tested using ANOVA. The post-test result showed a statistically significant difference between the Academic Achievements of the experimental group and the control group, in favour of the experimental group after the treatment. The mean score of the EG was statistically higher than the CG, showing that the EG outperformed the CG after the treatment. Also, the finding showed that the use of e-learning platforms had a statistically significant effects on the learning interests of the EG after the treatment. Thus, we conclude that the use of e-learning platforms should be encouraged, but the transition has to be gradual to enable the actors understand the new learning strategy, and how to maximize its potentials.

Keywords: E-learning, Online-learning, Ubiquitous-learning, Active-learning, Data Structure, Academic achievement.

1. Introduction

The evolutionary trends in technology has brought about rapid transformations in all facets of education, including the admission processes, content development and delivery, mode of instructions and assessment, result computation, student-teacher interactions, research, and staff

development programmes. The recent outbreak of Coronavirus Disease 2019 (COVID-19) reechoed the growing influence of technology on education. Many educational institutions across the world relied on the use of technologies to ensure continued education during the Coronavirus lockdown. Charles et al., (2020) reported that many institutions cancelled all their face-to-face classes, including labs and migrated to e-learning. The effects of school closures due to COVID-19 were mitigated by educational institutions that had supportive e-learning facilities during the crisis. For instance, Coal City University, Nigeria provided online education and trainings for her students and staff during the COVID-19 lockdown through the use of the institution's e-learning environment codenamed "myccu.ccu.edu.ng". The use of "myccu.ccu.edu.ng" platform provided opportunities for both students and staff of Coal City University to continue their normal teaching and learning activities during the COVID-19 lockdowns, thereby mitigating to large extent, the adverse effects of the lockdown on their staff and students.

According to Onyema (2019a), the integration of emerging technologies in teaching and learning process is no longer a choice but a need due to; the changing learning environment, demand for flexibility in methodology, and the need to enhance creativity and productivity in learning. Corinne (2018) opined that "emerging technologies have spawned the exponential development of software and AI-aided technology that aim to adapt learning methods and customize curricula to fit each student's ability to move forward at his or her own pace". For Onyema, Udeze, Chinecherem (2019), technology have modified teachers' method from traditional approach that often place them as dispensers of knowledge to a more flexible approach where they act more as facilitators, mentors and motivators to inspire students to participate and learn. The use of appropriate educational technologies increase the accessibility to learning resources and multiple learning approaches to meet the need of diverse learners (Onyema, *et al.*, 2019a). Educational technologies facilitate student-centred learning and problem-based education (Onyema et al, 2020). There are emerging trends in use of technology in learning. Nano-learning (n-learning) is the latest term in the natural progression: from distance learning (d-learning), flexible learning (f-learning), electronic learning (e-learning), blended learning (b-learning), and the recent addition, (mobile) m-learning (International Federation of Surveyors (FIG, 2010). There are also now ubiquitous and Agile learning, all of which are tailored towards learner-centered education, problem-based learning, and productivity in learning.

The current trends in education confirm that instructors are shifting away from authoritarian and non-interactive methods (Galy et al, 2011), to a more learner centered approach that includes the use of technology. The use of e-learning platforms is growing as the education industry move towards virtual or remote education. The transition to E-learning is fast becoming the new reality in global education systems. E-learning has become popular because of it provides more flexible access to content and instruction from any location (Means et al, 2009). According to Oye et al (2012), E-learning has become an increasingly popular learning approach in higher educational institutions. Today's modern classrooms, whether online or conventional-based,

uses e-learning tools and Learning Management Systems that capture student cognition and engages them in the learning process (Galy et al, 2011). With e-learning platforms, learners can learn on the go, defeating the barriers of distance, time and physical presence.

E-learning platforms facilitate continued education during unplanned school closures or pandemics, which go a long way to reduce graduation delays (Onyema et al., 2019b). The use of E-learning platforms provides opportunities for students to develop new skills and to structure their own learning trajectory (Benta et al, 2014). Transition to E-learning platforms facilitates virtual classes and remote learning which is gradually becoming the new normal amid COVID-19 lockdown. These Virtual classes are similar to offline classes in a lot of ways: an instructor provides an engaging educational experience through video, image, text, audio, and PDF files, and students follow along to take notes, perform exercises, and engage in discussions and complete exams to test their knowledge (Adamenfroy.com, 2020). Considering the potential benefits associated with e-learning, the present study examines its impact on student's learning interests and academic achievements.

2. Objectives of the Study

The main objective of the study is to examine the impact of E-learning platforms on students' interest and academic achievement in Data Structure course. Specifically, we also examined the benefits and challenges associated with the use of e-learning platforms.

3. Hypotheses

1. The use of e-learning platforms has no significant effects on students' learning in interests in Data Structure.
2. There is no significant difference between the academic achievement of students taught using e-learning platform and those taught using the conventional platform.

4.0. Review of Literature

4.1. The Concept of E-learning

E-learning is a generic term for all kinds of teaching and learning conducted in an electronic or online media, often with the aid of internet and other technological platforms, tools or devices. E-learning is a learning process created by interaction with digitally delivered content, network-based services and tutoring support (Markus, 2008). Oye et al (2012) defined E-learning as the use of information and communication technology (ICT), including Web-based learning, computer-based learning, virtual classrooms and digital collaboration to enhance teaching and learning. According to European Commission (2001), e-Learning is the use of new multimedia technologies and the Internet to increase learning quality by easing access to facilities and services as well as distant exchanges and collaboration. The advent of e-learning is part of the collaborative learning paradigm that includes Web 2.0 technologies such as wikis, blogs, podcasts, social networks, and video-sharing sites, which are widely used by students

(Galy et al, 2011). E-learning is bridging the gap between learning and work, workers can integrate learning into work more effectively by using the same tools and technology for learning as they use for work (Oye et al, 2012). E-learning does not necessarily replace the traditional teaching method, but it complements it.

According to Neema-Abooki and Alfred (2014), E-learning can be used in three main ways in educational settings: technology enhanced classroom teaching; distance education; and distributed learning. E-learning platforms are frequently used in various stages of educational processes (Oana et al, 2015). E-learning platforms are helping educational institutions to transit to the changing education environment and meet the need of new generation learners (digital Millennials). In the present study, we categorize e-learning into synchronous and asynchronous. The synchronous e-learning is real-time, and it requires both the instructor and the students to be virtually present (online) at the same time for the teaching and learning to take place. Synchronous e-learning can be done on Chat rooms or through live videoconferencing tools like ZOOM, Google Meet, GoToMeeting, Skype, Bluejeans and Jabber etc. Feedback is easy to get when using synchronous e-learning platforms. The asynchronous arrangement could be paused and resumed later. The teacher in the asynchronous e-learning arrangement can upload instructional materials at the platform at any given time, and then students can also download or view them at their own pace or time. Some asynchronous e-learning platforms have features that enable tutors to upload materials ahead of the class meetings, and then decide when to activate it to go public online for students to access. Asynchronous e-learning is more of learner-directed, but learners often do not get immediate feedbacks from the teacher.

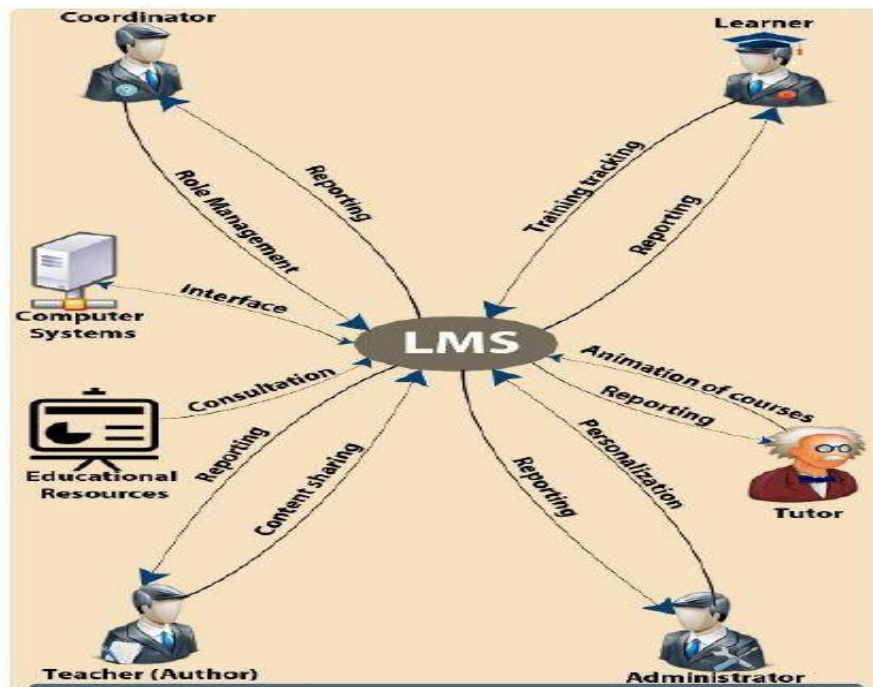


Fig. 1: General Architecture of an e-learning platform Learning Management System (LMS).
(Source: Ouadoud et al, 2016).

Each of these actors (teacher/tutor, Learner, Coordinator and Administrator), as seen in figure1 has to play their individual role to enhance the effectiveness and success of e-learning activities. The teacher has to ensure that the students are not overloaded with course materials or lengthy talks to avoid it from becoming boring. The content to be uploaded by the teacher has to be standard and concise. Nevertheless, while trying to make the materials to be concise, the teacher must ensure that the quality of the course content is not compromised. Pictures or videos can be included to enhance students' understanding of concepts. On the other hand, the learner has to download the materials promptly and ask relevant questions during or after the class. Learners should not abuse the availability of uploaded materials or remote nature of e-learning to perpetually absent from scheduled classes or discussions with the teacher. They are rather expected to go through the materials and prepare questions to be asked during the session with the teacher. Students' participation and attendance in an e-learning platform is sacrosanct to the success of e-learning activities. Even though, e-learning encourages self-directed or independent learning, teachers' guidance and facilitation is critical to achieving its goals. Figure 2 shows some of the examples of e-learning platforms.

Udemy	Vedamo
Coursera	TED-Ed
Edx	Codeacademy
Easyclass	Alison
Blackboard	Myccu.ccu.edu.ng
DigitalChalk	Treehouse
Moodle	Teachable
Sakai	WizIQ
Canvas	Ruzuku
Educadium	Learnworlds
Thinkific	Coursecraft
Skillshare	Edmodo
Podia	Academy of mine
Learnopia	Khanacademy
Schoology	Peer 2 Peer University

Figure 2: Examples of E-learning Platforms (own)

4.2. Benefits of E-learning Platforms

E-learning platforms offer ubiquitous education opportunities to educators and students. E-learning has transformed the everyday life of teachers and students (Ouadoud et al, 2016). e-learning is considered among the best methods of education, and it focus on the needs of individual learners (Valentina and Nelly, 2014). Research has shown that the use of e-learning platform improves students' perception towards homework and its importance in the educational process (Benta et al, 2014). e-learning creates interactive environment for students to freely express themselves with more confidence than they do in a traditional classroom. When students use e-learning platforms, it can enhance their confidence and ability to lead discussions, think critically to contribute productively or respond to given topics or discussions.

E-learning platforms have become a way to empower workforce with the skill it needs to turn change to an advantage (Oye et al, 2012). Britain's Open University's study found that producing and providing e-learning courses consumes an average of 90% less energy, and produces 85% fewer CO2 emissions per students than conventional face-face learning (Britain Open University, 2005). According to Shiftelearning.com, e-learning increases students' retention rate from 25-60% compared to 8-10% during face-face learning in the physical classroom and it typically requires 40-60% less time than learning the same materials in a traditional classroom setting (Shiftelearning.com, 2016).

E-learning platforms were very useful for students and teachers during the COVID-19 lockdown, as many institutions depended upon it for remote education. The potential of e-learning industry is huge, and it is estimated that by 2022, the size of the industry shall amount to whopping \$ 243 billion (Marry, 2018). The typical planning, preparation, and development time for a fully e-learning university course is Six to Nine months before the course is delivered (Charles et al, 2020). This means that for educational institutions to effectively implement e-learning activities, they have to introduce the changes gradually, train the actors as seen in figure 1 to enable them understand the various functions of the e-learning platform and their expected roles as well. The present study summarizes the benefits of e-learning as follows:

Supports Learners with disabilities: E-learning provides opportunities for special learners to access education resources at their convenience. The barriers of physical presence or movement to classrooms are eliminated particularly for those with mobility disabilities. With the aid of mobile devices, special learners can enroll in programmes or courses in e-learning platforms without much stress as obtained in conventional learning.

Interactivity: e-learning platforms are often user-friendly, and it promotes users interaction with the platform or tutors. Instantaneous interactions can take place in synchronous e-learning environment, giving students the opportunity to interact directly with teachers, and also obtain answers to their questions.

Ubiquitous/Distributed learning: e-learning enhances ubiquitous or distributed learning. E-learning promotes learners' freedom to learn from any place and time. Lectures can be fixed and conducted on the go without much interruptions or preparations. With e-learning, there is no boundary to when and where teaching and learning can take place.

Mobility and Portability in learning: E-learning platforms are portable and compatible on handheld, portable or mobile devices like Smartphones and other Personal Digital Assistants (PDAs). This makes it easier for learners to use and learn while on the move. Mobile learning activities are facilitated by e-learning platforms and applications. The use of mobile technology devices increases the access to e-learning platforms or services. (Onyema, 2019b).

Staff Professional Development: The use of E-learning platforms such as; Udemy, Moodle, Teachable, Thinkfic and many others, help staff members to upgrade their skills virtually. With e-learning, a staff can engage in international research collaborations and trainings. Also, the

constant use of e-learning platforms by students and staff enhances their digital literacy skills and ability to create valuable contents online.

Continued Education: E-learning facilitates continued education especially during unplanned school closures or pandemic lockdowns. Even though, schools may be closed down physically for several reasons, but e-learning platforms offer solutions to bridge the gap in school closures by ensuring continued education online.

4.3. Disadvantages of E-learning

Despite the enormous benefits associated with e-learning, it also has some demerits. Hasty transition to e-learning methods could affect student's performance in a course. E-learning may not be totally suitable to address science education or any form of education that involves experiments and practical. Some courses require the use of practical laboratories, onsite visits and field trips which may not be possible in e-learning platforms. It may be difficult for teachers to teach courses that requires field experiences or practical sessions online. Even though virtual labs are emerging, but they seem not widespread or good enough to replace the use of physical practical laboratories. According to Valentina and Nelly (2014), e-learning is more appropriate in Social Sciences and Humanities than in Medical or Pure Sciences, where there is the need to develop practical skills. The researchers further stated that "since tests or examinations in e-learning platforms are possibly done with the use of proxy, it will be difficult, if not impossible to control or regulate bad activities like cheating (Valentina and Nelly, 2014). E-learning may not address the challenges of learners who experience difficulties in certain areas, and would require more guidance or attention from the teacher. E-learning is solely dependent on technology, which means that any disruption in the technology particularly the internet technology could have adverse effects on the users. There are also issues of security or privacy concerns in the use of e-learning platforms.

4.4. Challenges of E-learning Implementation

The transition to e-learning or remote learning platforms are often challenging for both students and teachers, particularly for those without previous knowledge of digital learning. It requires a lot of time and attention. Both students and teachers usually struggle to adapt to the new changes especially when the transition is made hurriedly. According to Sylwia (2016), E-learning is an innovative method of education, but it should be introduced gradually to enable students and teachers adapt it properly. The gradual adoption could reduce the challenges. Some of the major challenges of e-learning implementation include:

Energy/Electricity supply Issues: Energy supply issues hinder e-learning implementation. Lack of constant electricity supply poses serious concern to all advocates of e-learning, and in extension online education. This is because large percentage of potential users of e-learning platforms often depends on public power source to charge their electronic gadgets, such as laptops, mobile phones, tablets, and other Personal Digital Assistants (PDAs) that facilitate their access and usage of e-learning platforms. Therefore, poor electricity could jeopardize their

engagement in e-learning activities. Epileptic energy supply constitutes a big threat to the success of e-learning platforms (Onyema, 2019b).

Availability and Accessibility issues: The problem of digital divide is real. Unequal access and availability of technologies or infrastructures that support the use of e-learning platforms limits the use of e-learning platforms. For instance, students and educators in the rural areas and other disadvantaged groups like the special people and those from poor backgrounds often do not have equal access to e-learning facilities like their counterparts in the urban schools or advanced climes. This makes it difficult for this category of people to maximize the potentials of e-learning platforms.

Affordability issues: This includes cost or monetary issues. Most often students may not afford data subscriptions needed to actively participate in e-learning activities, while some educational institutions also find it difficult to run e-learning platforms. Students and educators may find it too expensive to maintain their presence and attendance in e-learning platforms. However, these challenges could be minimized in an environment where there is free internet connectivity like campus Wifi.

Network Issues: Network strength is critical for easy access and use of e-learning platforms. Sometimes, the network might not be strong enough to facilitate real-time participation in classes or discussions on e-learning platforms. Bad network could frustrate both students and teachers efforts in organizing pedagogical engagements or virtual meetings on e-learning platforms.

Insufficient skills or expertise: Lack of e-learning experiences by both teachers and students could hamper the smooth implementation of e-learning activities. This also includes poor digital literacy among students and teachers.

Attitudinal issues: The attitudes of both students and the teacher are critical to the success of any e-learning activity. If any of the parties are not committed, it could affect the level of success in using e-learning platforms. Lack or delay responses or feedback from the teacher could discourage students' interest. Also, lackadaisical attitudes such as; poor attendance or low participation in scheduled activities by the teacher or poor completion of tasks by students could affect the quality of e-learning outcomes. There is a drop-off in participation in online discussions as the course progresses (Hubble, 2009). Research also show that students are often reluctant to take part in online discussions in e-learning platforms, and many tend to find it difficult to complete their given tasks or assignments (Sylwia, 2016).

Time Constraints: Time is another issue that poses challenge to both students' and teachers' in e-learning platforms. Sometimes, teachers can be overloaded with courses and other activities which could increase the pressure on them and limit their presence in e-learning platforms. Teachers may also find it difficult to create materials for both synchronous and asynchronous consumption by learners. Also, most working class students are often on self-sponsorship,

which means that they have to work and learn. These set of students may be preoccupied with work, and may not devote the needed time to e-learning activities.

Resistance to Change: This could be as a result of the fear of the unknown. Changes are often new to most people which make it even harder to accept. The transition to e-learning could be resisted in some situations by students or teachers. This could be as a result of many reasons, including lack of supportive infrastructures that could aid the implementation of the e-learning activity. Also, people tend to be comfortable with the traditional system which they are use to for long, and may find it difficult to adapt to sudden changes that are often perceived as being difficult or inappropriate.

4.5 Ways to promote Students' participation in e-learning platform

Low participation of students in institutional e-learning platforms has become a source of concern to many stakeholders in education. Although, poor participation of students in institutional e-learning platforms might not be a problem in advanced climes, but it is a challenge in many developing countries. This could be attributed to number of factors as discussed in previous section of the present study. Onyema et al (2019a),suggested the provision of good internet infrastructures at the campus/students' accommodation areas, and grading of students' attendance to promote their participation in e-learning platforms. Educators need to scaffold student motivation by being explicit about expectations and ground rules for online discussion forums, for this sets the framework for interaction, peer collaboration and dialogue (Xia et al, 2013).

E-learning requires immediacy, and teachers have to devote more time to provide responses or feedback to students. The provision of prompt answers to specific questions would stimulate students' interests and participation in e-learning platforms. Teachers have to be creative in their content creation and identify ways to make them attractive to students, and accommodate diverse learners or styles. The course guides and learning objectives has to be clearly stated in line with the expectation of the students. The culture of abstinence in e-learning classes has to be checked by institutional policies. Provision of supportive infrastructures like good internet facilities and electricity could enhance learners' participation (Onyema et al, 2019a). Many have suggested the award of marks to stimulate students' participation in e-learning activities (Waleed et al, 2019; Onyema et al., 2019a). However, Hubble (2009), found that the allocation of marks for participation in e-learning activities can, but doesn't always increase students' participation. Despite the introduction of assessments and grading in e-learning platforms, many students may not still be interested in participating. Therefore, there is need for more training and orientations of students to enable them understand and appreciate the importance of e-learning adoption and participation.

4.6. Blended Learning

Blended learning is also known as hybrid learning, and it involves the mixture of both digital learning (e-learning) approach and conventional approach (face-face classroom) approach. Blended learning is an arrangement in which a traditional class can be assigned both print-based and online materials, and has online mentoring sessions with their teacher (Muhammad et al, 2015). Blended learning accommodates different categories of learners by ensuring that all learners are exposed to both e-learning and traditional learning. It provides opportunities for students and teachers to combine both physical learning (face-to-face) and electronic learning, thereby optimizing the benefits offered by both techniques. Students who are exposed to blended learning are more likely to blend easily with their peers and adapt to changing learning situations and environment (Onyema et al, 2019b). E-learning enhances blended learning, and Blended learning complements e-learning. The use of blended learning method can fill some of the teaching gaps in e-learning which may require the use of other techniques to be taught.

4.7. Data Structure

Data structure is one of the required courses that students who study Computer Science at the tertiary institution level are often expected to take as part of their programme. It deals with how data is organized, stored or retrieved in the computer. A good data structure enhances the capability of the computer to access, store or fetch instructions, and efficiently implement algorithms. With the evolution of Bigdata, data structure would play a bigger role in data management, indexing and development of different modern applications, and augmentation of Big data technology.

5. Materials and Method

5.1. Research Design

The study adopted a quasi-experimental design - “Equivalent control group with pre-post test” (Campbell & Stanley 1963; Berg & Latin, 1994; Zahara & Anowar, 2010) as represented in table 1. From table 1, the A₁ represents the pre-test while the post test is represented as A₂ for the Experimental Group (EG) and Control Group (CG) respectively. The e-learning platform approach treatment is represented as X. A teacher guided both the experimental and control group for one month.

Groups	Pre-Test	x	Post-Test
Experimental Group (n-25)	A ₁	X	A ₂
Control Group (n = 25)	A ₁	X	A ₂

Table 1: The Research design pattern

5.2. Sample

The sample consists of fifty students (25 students for EG and the other 25 students for CG). The participants were made up of Second Year Computer Science students at the University who were taking Data Structure tutorials at Genuine Group Tutorial Centre, Ogun State, Nigeria. The sample was selected through purposive random sampling technique, and they were shared into 2 groups: Experimental Group (EG) and Control group (CG) as contained in table 1.

5.3. Procedure

A Computer Science teacher with teaching experiences on Data Structure at the University level engaged the students during the exercise which lasted for a month. He highlighted the importance of e-learning platforms to the experimental group, and also taught them how to maximize it to improve their interests and achievements in Data Structure course. The experimental group was taught using an e-learning platform, while the control group was taught using the traditional classroom approach. The teacher organized some of the synchronous classes with the experimental group using Google meet and Zoom Videoconferencing tools. An achievement test on Data Structure was administered as pre-test and post-test to the two groups to examine the differences in their learning interests and academic achievement in Data Structure course. The content validity of the study was checked by 2 Senior instructors of Data structure at the University level, and the Cronbach's alpha reliability was found to be 0.82. Also, the hypotheses were tested using ANOVA.

6. Results

The pretest and Post-test was conducted to assess the impact that e-learning had on students learning interest and Academic achievement and the ANOVA results are given below:

Descriptive with 95% confidence interval for Mean

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
						Lower Bound	Upper Bound		
Pretest	Control Gp	25	57.5600	14.51459	2.90292	51.5687	63.5513	33.00	76.00
	Experimental Gp	25	57.5200	14.93352	2.98670	51.3557	63.6843	38.00	76.00
	Total	50	57.5400	14.57452	2.06115	53.3980	61.6820	33.00	76.00
Interest in Data Structure	Control Gp	25	30.6400	5.82294	1.16459	28.2364	33.0436	16.00	40.00
	Experimental Gp	25	34.2000	5.02494	1.00499	32.1258	36.2742	22.00	40.00
	Total	50	32.4200	5.67519	.80259	30.8071	34.0329	16.00	40.00
Achievement Post-test	Control Gp	25	58.2800	13.20833	2.64167	52.8279	63.7321	33.00	76.00
	Experimental Gp	25	66.3600	13.60723	2.72145	60.7432	71.9768	38.00	79.00
	Total	50	62.3200	13.88501	1.96364	58.3739	66.2661	33.00	79.00

Table 2: Descriptive with 95% confidence interval for Mean

ANOVA RESULT

		Sum of Squares	df	Mean Square	F	Sig.
Pretest	Between Groups	.020	1	.020	.000	.992
	Within Groups	10408.400	48	216.842		
	Total	10408.420	49			
Learning Interest in Data Structure	Between Groups	158.420	1	158.420	5.356	.025
	Within Groups	1419.760	48	29.578		
	Total	1578.180	49			
Achievement Post-test	Between Groups	816.080	1	816.080	4.539	.038
	Within Groups	8630.800	48	179.808		
	Total	9446.880	49			

Table 3: ANOVA Result

As seen in table 2 and 3, both groups before the treatment came from the same population, showing no significant difference since the p-value of the ANOVA 0.992 at 48 df is higher than the hypothesized $\alpha = 0.05$. Also, the mean of the experimental group 57.52 slightly exceeded by that of the control group 57.56. Therefore, there is no statistical difference in the learning interests and the academic achievements of the groups studied until the treatment effect was examined.

6.1. Hypotheses

H₀₁: The use of e-learning platforms has no significant effects on students' learning in interests in Data Structure.

As seen in table 2 & 3, the experimental group that were taught using e-learning platform showed a significant difference in their learning interests in Data Structure, since the p-value of the ANOVA 0.025 at 48 df is lower than the hypothesized $\alpha = 0.05$. Also, the mean score (34.20) of the experimental group exceeds that of the control group which is 30.64. This implies that, there is a higher gain of students' learning interest in Data structure due to the use of e-learning platforms than in the traditional classroom. This is consistent with the finding of Benta et al (2014), which shows that students proved to be more interested and willing to solve more complex homework when using e-learning platform. Valentina and Nelly (2014) also found that e-learning motivates students to interact with each other and to develop learning interests.

H₀₂: There is no significant difference between the academic achievement of students taught using e-learning platform and those taught using the conventional platform.

As seen in table 2 & 3, the experimental group showed a significant difference in academic achievement in Data structure, since the p-value of the ANOVA 0.038 at 48 df is lower than the hypothesized $\alpha = 0.05$. The mean score (66.36) of the Experimental group exceeds that of the

control group (58.28). Therefore, this implies that there is a higher gain of students' academic achievement in Data Structure due to their engagement in the e-learning platform compare to those taught in the conventional classroom. The result is consistent with the finding of Onyema (2019a), which shows that the integration of emerging technologies in teaching and learning process increase the interest of learners, and the quality of outcomes. It is also in agreement with the finding of Neema-Abooki and Alfred (2014) which showed that the use of e-learning strategies positively impacted on students' academic performance at the Strathmore University, Kenya. Also, Oye et al (2012) found that students in higher educational institutions that engaged in E-Learning performed better than those in face-to-face courses. The result also supports the earlier studies by Keshavarz et al (2013), which found that e-learning has a positive impact on academic achievements of students and that of Cheng et al (2011) and Holley (2002) which found that students who participated in e-learning activities achieved better grades than those who studied using the traditional approach.

7. Discussion

The results of the study indicate that the students in the experimental group had significant improvement in their learning interest and academic achievement after the treatment. The mean score of the experimental group (66.36) which is higher than that of the control group (58.28), proves that the use of e-learning platform had positive effects on the academic achievements of the students compared to those in the control group. Also, an increase in students' learning interests was observed as seen in table 2 & 3. From the analysis of the students' learning interests, the experimental group had a mean score (34.20) as against that of the of the control group which is 30.64. The results indicates that students who were taught using e-learning platform had increased interests in the Data Structure course and also outperformed those who were taught in the traditional classroom. Therefore, we infer that e-learning has the potential to enhance active learning and ubiquitous learning, and if properly harnessed, it can assist students to develop more interests in a given course and also acquire the confidence and skills they need to enhance their academic achievements. The use of e-learning platforms should be encouraged, but the transition has to be gradual to enable the actors understand the new learning strategy, and how to maximize its potentials. Education authorities must do more to provide the necessary infrastructures that enhance smooth transition to e-learning. Also, students have to brace up for digital education, and prepare themselves to adapt to other emerging changes and challenges that technology or other occurrences might bring to education.

8. Conclusion

The study highlights the potentials of e-learning platforms in improving students' interests in learning and academic achievements. The use of e-learning platforms was found to have significant positive effects on students' learning interests and academic achievements. However, there are some concerns about hasty transition to e-learning platforms which could be counterproductive. Hence, there is need for proper planning, preparation, trainings, and

orientations of all actors to enhance the effectiveness of e-learning implementation. The transition to e-learning or remote learning has to be planned and gradually implemented to avoid multiple complications. The study is limited by the size of the sample/scope, and may not be generalized in more diverse settings.

9. Future Work

We are working on a project to investigate the effects of virtual learning on Science education and on students' behaviours.

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