Virtual learning and academic performance of junior secondary school students in ojo local government area in Lagos state

By

Ajana, O. Enitan; Abanum. I. Collins; Afolabi, T. Kelvin
oenitan5@gmail.com; abanum.collins@gmail.com; afolabit.kelvin@gmail.com

Department of Educational Foundations and Counselling Psychology, Faculty of Education, Lagos State University, Ojo

Abstract

The study examined the effect of virtual learning on academic performance, autonomy and response rate of Basic Science students in JSS 2 in Ojo Local Government Area of Lagos State. Two hypotheses were tested using pre-test post-test non-equivalent quasi-experimental design. Simple random sampling technique was used to select 90 JSS 2 students from Junior Secondary Schools in Ojo Local Government Area from. A self-designed multiple-choice Achievement Test in Basic Science (ATBS) which measures the academic performance, response rate and autonomy of the students with 30 items was used for data collection. The instrument was tested for item difficulty index, discrimination index. The Kuder Richardson (KR-20) value was 0.78. The item was reduced to 20 items after the item analysis. The outcome of the analyses revealed that students taught using VLE outperformed those taught using the CLE. Based on the findings, It was recommended that all schools should introduce virtual learning classrooms to ensure a continuous interaction of the learners anywhere-anyplace with each other, the content and the instructor or teacher.

Keyword: Academic Performance, Virtual Learning Environment, Traditional Talking and Chalking

Introduction

The speed at which today's world changes is phenomenon as information - the sole agent of change - travels at the speed of light. We are witnessing today, a force powered by Information and Communication Technology (ICT). The world is being reduced to a global village through the use and proliferation of information and communication technology. Thus, ICT promotes globalization, cultural diffusion, global and national development. In defining ICT, Information

and Communication Technology is considered a fusion of two technologies, Information Technology (IT) and Communication Technology (CT) (Iwu, 2006; Ishaq, Zin, Rosdi, Abid, & Ijaz, 2020). ICT is a combination of a host of technology which fosters information dissemination and virtual exchange of information which can be integrated into all human activities including teaching and learning. In addition, Osu, Udosen, and Akpan, (2010) added that ICT embodies technologies used for the manipulation and transmission of information. These include the media through which the information is recorded and transmitted such as: radio, television, microphone, camera, loudspeaker and telephone/mobile phones. Information and Communication Technology (ICT) is a necessity that characterizes the jet age and the industrialized societies. Its fangs had since redefined the education system in terms of pedagogical approach and instructional delivery (Ololube, 2006). According to Fari (2010), ICT refers to all the facilities used for the identification, generation, processing, storage, packaging, preservation, conservation and transfer of information, regardless of time and distance constraints.

In other words, Information and Communication Technology refers to a variety of information handling tools used for producing, storing, processing, distributing and exchanging of information. Today, it is an increasingly powerful tool for participating in international market, promoting political transparency and accountability, improving the delivery of basic services and for enhancing developmental opportunities across board (UNDP, 2006). ICT has become integrated into everyday human activities, private or public. Therefore, it becomes imperative for teachers, who implement the nation's educational policy, to be well-informed, to be able to manipulate and engage ICT facilities in order to function productively in this age of information explosion and technological advancement. The Federal Ministry of Education (2010) identifies the role of ICT policy on education amongst others as follows:

> *"The policy provides the needed guidance on what is expected in the entire process of ICT integration in education to all stakeholders in education. Its implementation, therefore, should lead to a speedy transformation of the teaching, learning and administration of education. This in turn will foster the production of graduates in the education system that can survive in the contemporary society, sustain national development and compete globally"* (p.3).

The actualization of the stated policy statement depends entirely on the ability of teachers who are the direct implementers of the policy to integrate ICT to aid instructional delivery for effective and meaningful worthwhile learning experience through Virtual Learning Environment (VLE) in their day to day teaching activities. Virtual Learning Environment (VLE) is one of the products of information and communication technology and it proves to be an effective method of instruction delivery. It is pertinent to note that VLE has a major advantage of individualizing instruction by presenting varied and flexible experiences to the individual learners and it takes care of learners' differences. The National Policy on Education states that education is an instrument for effecting national development (FRN, 2004). It makes the marriage of ICT and teaching-learning process a necessity as a vital instructional tool in actualizing the national educational goals and development. To buttress this, Galenouh, Gordlier and Murphy (2004) cited in Akinoso (2020) opined that the development and integration of ICT into the education sector is believed to set the pace for any form of innovation and changes that can ever happen to any nation. It was asserted by Albirini (2006) that, the winds of change in today's education sector have made Information and

Communication Technology to be programmed towards meeting the set educational goals. There are challenges and concerns as a result of knowledge explosion due to the introduction of ICT in almost every field of human endeavour, which calls for an awakening in the teaching profession likewise. Teachers need to be conscious of the quality of their teaching which is determined by the quality of teaching resources employed such as charts, models, specimens and slides (Sansanwal, 2009).

Intellectual stimulation and exchange of information are major tenets to achieving meaningful learning. These major elements can be reached through meaningful interactions between students and teachers, as well as among students, along the learning process. However, identifying the specific contribution of each interaction has been, and is still , a subject of analysis and debate in the educational context in general, and in e-learning in particular. The terms Virtual Learning Environment (VLE) and Managed Learning Environment (MLE) are often interchanged. A Virtual Learning Environment (VLE) is a set of teaching and learning tools designed to enhance students' learning experiences by employing computers and the Internet in the learning process. A Virtual Learning Environment (VLE) is a web based software system designed to facilitate learning and teaching with the use of ICT tools and activities (JISC, 2009a) which differ significantly from the traditional lecture method of teaching. The principal components of a VLE package include curriculum mapping (breaking curriculum into sections that can be assigned and assessed), student tracking, online support for both teacher and student, electronic communication (e-mail, threaded discussions, chat, Web publishing), and internet links to outside curriculum resources. In general, VLE users are assigned either a teacher ID or a student ID. The teacher sees what a student is doing, but the teacher has additional user rights to create or modify curriculum content and track the student's performance. It is difficult to say exactly how long VLEs have been in use. Students using a VLE can be set a 'task' to complete in class or at their own pace, time and location, they can contribute to synchronous and asynchronous discussions to help develop their learning (JISC, 2009b). Students using VLE have suggested that the use of a Virtual Learning Environment (VLE) has a positive impact on their academic achievement; it encourages independent learning and increases their motivation to learn.

The UK's Open University has been utilising computers for learning since the 1970s but it was in 2000 that the commercial computer based VLE 'Blackboard' was patented. By 2010 Blackboard software was used by over 3700 educational institutions in more than 60 countries (Blackboard, 2011). The other most popular VLE, 'Moodle', was introduced in 2001 (Ofsted, 2009a). It was originally developed to help educators create online courses with a focus on interaction and collaborative construction of content (Ofsted, 2009) and by 2011, the Moodle had a user base in 212 countries with 49,365 active sites in more than 75 languages (Moodle, 2011). Other examples of VLE are WebCT, Lotus Learning Space, and COSE. In the UK, within the post-compulsory sector in 2008-9, 92% of further education colleges had a virtual learning environment; the figure having risen from 58% in 2003-04 (Sero, 2009). In Nigeria, the first means through which e-learning was delivered to the students is through the use of CD-ROM (Ajadi, Salawu, and Adeoye, 2008). Today, there are various forms of virtual learning platforms in Nigeria especially as the internet services have become ubiquitous.

Pedagogy today is expected to budge from the conventional talking and chalking method to a more dynamic and flexible one, which is learner-centered (Ezekoka & Okoli, 2012). This learner-centered approach makes learners to directly affect and control the content, activities, materials

and pace of learning, which places them at the centre of the learning process which enhances independent learning (Collins & O' Brien, 2003). However, despite the evident relevance of ICT in education, coupled with the huge capital investment of both Federal and State governments through ICT driven project known as "SchoolNet" (Adomi & Anie, 2006; Okebukola, 2004) and donations from Non-Governmental Organizations to secondary schools in Nigeria, some teachers are still reluctant, ineffective and unproductive in using Virtual Learning Environment to facilitate and improve students' academic performance, especially in Basic Science. Sim and Theng (2014) asserted that, there is still a long way to go before secondary school teachers in developing countries like Nigeria will be able to take advantage of the opportunity provided by the 21st century technology. This was substantiated by Adomi and Kpangban (2010) who reported that 75 percent of teachers in Nigerian secondary schools have little or no experience regarding ICT in education.

. Employing the use of ICT-Driven Instructional aides through Virtual Learning designed for self-paced anywhere and anytime continuous learning without interruption might alleviate perceived problems in instruction. Also, observed from JSC examiners' report is the inability of the Basic Science teachers to cover every aspect of the Basic Science syllabus before presenting their students for JSCE which constitutes one of the reasons students do not perform as expected. This might be due to some observed limitations of the traditional "chalk and talk" system of teaching which is more teacher-centered approach than learners-centered as practiced in most schools today, thereby affecting students' performance at various examinations. The information technological age offers ICT instructional strategies such as VLE designed to make teaching and learning faster, easier, immediate, effective, efficient, and individualized and takes care of learners' individual differences regardless of their gender and location.

Statement of the problem

The inevitability of education is increasing by the day because of increasing pressure to catch up with the developed nations when it comes to global competitive (Hawkins, 2002). Before the introduction of virtual learning many students were taught through the traditional ways of teaching. The need to introduce virtual styles into the teaching and learning process is to improve the speed of students' learning, the ease of learning and academic performance of students. Despite this laudable rationale, the extent of exploitation of this instructional process is at a low ebb in our clime. To determine the militating factors, the actual level of adoption and the effects on learners academic performance is the focus of this study.

Research Hypotheses

Two main hypotheses guided the study, they are:

H$_{O1}$: There is no statistically significant mean difference in the academic performance, response time and autonomy of students taught using virtual learning environment and conventional lecture method.

H$_{O2}$: There is no statistically significant mean difference in the academic performance, response time and autonomy of male and female junior secondary school students taught using virtual learning environment and conventional lecture method.

Methodology

The study adopted the pre-test post-test non-equivalent quasi-experimental design. A virtual learning classroom was developed using Google classroom in order to compare students' performance in Basic Science using the VLE and conventional lecture method of teaching in the classroom. Two intact classes of JSS 2 students were used. . A total of 90 students involved; 45 in the virtual classroom and 45 in the conventional traditional classroom. The study lasted for three weeks. The pretest was taken before the commencement of the treatment while the posttest was given at the end of the third week. The instrument tagged Achievement Test in Basic Science (ATBS) was used The ATBS was developed in two formats, one using Google form and a time add-on/extension called timify.me in order to measure students' speed and independent learning (autonomy). The second format, for the conventional lecture group, was a Pencil and Paper Test (PPT) The speed of completion was measured using a stop watch while the independent learning (autonomy) was also measured. The data collected was tested through Multiple Analysis of Covariance (MANCOVA) using the General Linear Model of SPSS-23 Also, homogeneity of covariance was ensured

Presentation of the Findings

Table 1: MANCOVA of autonomy, response time, academic achievement, treatments and gender

	Treatment (V=.621)			**Gender** (V=.070)			**Treatment*Gender** (V=.043)		
	F	ρ	η_p^2	F	ρ	η_p^2	F	ρ	η_p^2
Groups	`	.000	.621	2.028[a]	.117	.070	1.204 [a]	.314	.043
A	31.264	.000	.274	5.678	.019	.064	0.921	.340	.011
RT	118.508	.000	.588	1.012	.317	.012	0.044	.835	.001
AC	10.761	.002	.115	2.037	.157	.024	0.639	.426	.008

Note: Pillai's trace (3, 81) and others are (1, 83); partial eta square = η_p^2; V=Pillai's trace A=Autonomy, RT=Response Time, AC=Academic Achievement

The two-way multivariate analysis of covariance (MANCOVA) was conducted to test the two hypotheses. A statistically significant effect was obtained for the treatment groups using Pillai's Trace, V= .621, F (3, 81) = 44.333, ρ <.05 with a multivariate effect size of η_p^2=.621, which implies that 62.1% of the variance in the canonically derived dependent variables was accounted for by treatment groups (VLE= Virtual Learning Environment, and CLE= Conventional Learning Environment).

Also, a non-statistically significant effect was obtained for gender using Pillai's Trace, V= .070, F (3, 81) = 2.028, ρ >.05 with a multivariate effect size, η_p^2=.070, which implies that 7.0% of the variance in the canonically derived dependent variables was accounted for by gender (male and female). In addition, a non-statistically significant MANCOVA interaction effect was obtained for treatments and gender using Pillai's trace, V=0.43, F (3, 81) = 1.204, ρ >.05 with a multivariate effect size, η_p^2=.043, which implies that 4.3% of the variance in the canonically derived dependent variables was accounted for by treatment and gender (see Table 1.

Discussion of the Findings

Hypothesis one stated that there is no statistically significant mean difference in the academic performance, response time and autonomy of students taught using virtual learning environment and conventional lecture method. The outcome of the MANCOVA analysis showed that there existed a statistically significant difference in the mean scores of students taught using virtual learning environment and conventional learning environment, their response time and autonomy. The difference showed that the mean performance score of students taught with VLE was greater than those with the traditional talk and chalk method (CLE). It further revealed that the multisensory nature of virtual learning environment is adequate and learner specific as it is able to meet the needs of varying learning styles. The finding of the study corroborates the work of Anekwe (2017) where she found out that virtual learning environment has significant impact on students' academic performance as compared to the traditional classroom (CLE). This is also in line with Sunesh and Samanthi (2016) who stated that VLE has a potential to significantly influence academic performance of students if the features are positively harnessed, implemented and supervised with the sole aim of meeting the needs of the learners. The findings is further supported by the work of Moreno-Guerrero, Aznar-Diaz, Caceres-Reche, and Alonso-Garcia (2020) whose findings showed that the use of virtual learning environment influenced the motivation, autonomy, participation, mathematical concepts, results and grade of the students.

The outcome of data analysis also revealed that the response time in the VLE was significantly difference to those taught with the traditional classroom (CLE). The difference in response time is due to the rate of learning of the VLE students as opposed to the traditional classroom. This is supported by the work of Love and Fry (2006), Liaw and Huang (2000) and Livingston and Condie (2006) who all stated that the use of information technology in the learning situation will significantly increase the speed at which students learn and this will in retrospect increase the speed at which they provide answers to questions. Their findings showed that the use of virtual learning environment provides students with the rich and unlimited access to the plethora of internet resources and as such enables them to learn at a faster rate in comparison to students in the conventional learning environment whose sole source of information is the teacher.

The outcome of the analysis further revealed that there existed a significant difference in the autonomy of JSS2 students taught Basic Science within the Virtual Learning Environment and those taught through Conventional Learning Environment. The difference in the autonomy between the experimental group (VLE) and the control group (CLE) can be largely attributed to the nature of VLE as the learner is solely in a virtual space interacting with the content alone while still collaborating with other members of the class and the teacher. This stand-alone and on-your-own nature of the VLE has been a leading factor for the autonomous learning. Jim (2011) asserted that the use of VLE promotes independent learning of students as they are able to explore the rich interactive VLE platform independent in search for content that meets their respective level of academic mastery which is absent in traditional classroom setting where the same content is presented to all graders at the same time. The learner in a VLE can go back to previous lesson at will in order to ensure mastery before proceeding to the next lesson. This added feature of self-paced learning is a significant feature which puts virtual learning environment at a significant level out of the rich of the conventional learning environment as students can learn and re-learn at their pace and time when they feel ready and motivated.

Hypothesis two stated that there existed no statistically significant mean difference in male and female academic performance, response rate and autonomy. The outcome of the MANCOVA analysis showed that there existed no overall statistically significant difference in the mean academic performance, response rate and autonomy of male and female students involved in the study. However, there existed a statistically significant difference in male and female rate of independent skill acquisition. This shows that both male and female in the experimental group had same attitude towards learning and as a result their performance were similar. This is in support of the findings of Abdu-raheem (2012) who revealed that there is no significant difference between the mean achievement scores of male and female students in both the experimental and control groups who were taught with VLE. Anyamene, Nwokolo, Anyachebelu and Anemelu, (2012), Dantala (2006), Ash (2005) and Basturk (2005) further corroborate this finding as their study on the effect of CAI packages on the performance of senior secondary school students in Mathematics, History and Physics respectively revealed that there is no significant difference in the post-test performance scores of male and female students taught using CAI package.

The data analysis in the study also revealed that there existed a significant difference in male and female students' autonomy in Basic Science. The study revealed that female students required less assistance compared to their male counterparts. The female students were more independent learners compared to the male students. This is in line with the work of Siti, Zahra, Saedah, Rana and Chin (2015), who stressed that female students taught using live, streaming and recorded media showed a better mean performance than male students in independent learning. However, the findings of Colley and Comber (2003) showed that boys reported to have higher frequency of use of computers than girls and as such are more efficacious or autonomous in their learning using the virtual learning environment in comparison to the female counterparts.

The findings further revealed that there existed no significant difference in male and female response rates. This showed that the mean response rate between the male and female students on the set achievement test in science were similar. This finding is in support of the work of Mullis, Martin, Fierros, Goldberg and Stemler (2000), who stated that below the high school level, there exists no significant difference in male and female student's ability to recall or response rate.

Conclusion
From the findings of the study, it could be concluded that virtual learning environment (VLE) had a considerable influence on academic performance of students (both male and female) as students who were taught using the virtual learning environment (VLE) outscored those who were taught with the traditional teaching method. Virtual learning environment (VLE) substantially influences independent learning and response rate of students as students taught through virtual learning environment (VLE) achieved mean autonomy and response rate which were higher than those of the control group.

Recommendations
As a result of the findings by the study, these recommendations are suggested:
1.   All schools should introduce virtual learning into their classrooms to ensure a continuous interaction of the learners anywhere-anyplace with each other, the content and the instructor or teacher.

2. Schools should set up an ICT departments in their schools to help teachers upload their lessons, animations, assessment sheets and other instructional contents to the virtual learning classroom.
3. Government should ensure the provision of internet access to schools, the government should ensure that all citizens have affordable access to the internet. Parents and other stakeholders in education should support the creation of virtual learning classrooms at all levels in primary and secondary schools.
4. The government should provide virtual learning centres across all the states of the federation and encourage in-service training of teachers in order to encourage the usage of virtual learning classrooms by teachers

References

Abdu-Raheem, B.O. (2012). A Gender Difference and Students‟ Academic Achievement and Retention in Social Studies among Junior Secondary Schools in Ekiti State. *European Journal of Educational Studies*: 4(1), Ozean Publication.

Adomi, E. E. Kpangban, E. (2010) "Application of ICTs in Nigerian Secondary Schools". *Library Philosophy and Practice (e-journal)*. 345.

Adomi, E.E., & Anie, S.O. (2006). An assessment of computer literacy skills of professionals in Nigerian university libraries. *Library Hi Tech News*; 23 (2): 10-14.

Ajadi, T. O., Salawu, I. O., Adeoye, F. A. (2008). E-learning and distance education in Nigeria. *The Turkish Online Journal of Educational Technology - TOJET*. 7 (4). ISSN: 1303-6521 Retrieved from https://files.eric.ed.gov/fulltext/ED503472.pdf

Akinoso, S. (2020). Effect-of-the-use-of-multimedia-on-students-performance-in-secondary-school-mathematics-1. *Global Media Journal*. 16. 1-8.

Albirini A. (2006). Teachers' attitude toward information and communication technologies: the case of Syrian EFL teachers. *Journals of Computer and education;* 47, 373 – 398

Anekwe J. U. (2017). Impacts of virtual classroom learning on students of Nigeria Federal and STate universities. *European Journal of Research and Reflection in Educational Sciences*; 5 (3).

Anyamene, A., Nwokolo, C., Anyachebelu, F. & Anemelu, V.C. (2012). Effect of Computer-Assisted Packages on the Performance of Senior Secondary Students in Mathematics in Awka, Anambra State, Nigeria. *American International Journal of Contemporary Research*: 2(7).

Ash, J.E. (2005). *The Effectiveness of Computer Assisted Instruction on Middle School Mathematics Achievement.* Retrieved on 30th March, 2020, from http://www.research Enstae.edu /dissertation/ AA13187984.

Basturk, R. (2005). The Effectiveness of Computer Assisted Instruction in Teaching Introductory Statistics. *Educational Technology Society*, 8(2) 170-128.

Blackboard (2011) *"Student Services"*. Blackboard, Inc. Retrieved from: http://www.blackboard.com/higher-education/ student-services-and-technology-support/enrollment-services.html on 20th October, 2020

Cohen, J. (1992). *A power primer. Psychological Bulletin*, 112, 155-159.

Colley, A. and Comber, C. (2003). Age and Gender Differences in Computer Use ad Attitudes among Secondary School Students: What has changed? *Educational Research*: 45(2): 155-165.

Collins, J. W., & O'Brien, N. P. (Eds.). (2003). *Greenwood Dictionary of Education*. Westport, CT: Greenwood.

Dantala, N.M. (2006). *Effect of Computer Assisted (CAI) Package for Individualized Learning of History in the Senior Secondary school in Niger State, Nigeria*. An unpublished M. Tech. Thesis, Science education Department, Federal University of Technology, Minna.

Dumitru, I.Al. (2007). the learning process in adulthood. In R. Paloş, S. Sava, D. Ungureanu. *Adult education. Theoretical bases and practical benchmarks*. (pp. 105-129). Iasi: Polirom Publishing House.

Ezekoka, G.K. & Okoli, A.M. (2012). The Use of Computer in Teaching and Learning in Secondary Schools in Imo State. *Journal of Educational Media and Technology*, 16(1).

Fari, S. A. (2010 Information Sharing on Teaching and Research in Tertiary Institutions in Katsina State. *Samaru Journal of Information Studies;* 10 (1 & 2): 12-16

Federal Ministry of Education (2010). *National policy on ICT in education*. Abuja, Nigeria: Nigerian Educational Research Development Council

Federal Republic of Nigeria (2004). *National Policy on Education* (2004 rev.) Lagos: Federal Government Press.

Firat, M. (2016). Measuring the e-learning autonomy of Distance Education Students. *Open Praxis*; 8(3): 191 - 201

Galenouh, D. Murphy, C. & Gordlier, J. (2004). Teachers" perceptions of the effectiveness of ICT competence training. *Computers and education;* 63.

Gubbels, J., Swart, N.M. & Groen, M.A. Everything in moderation: ICT and reading performance of Dutch 15-year-olds. *Large-scale Assess Educ* 8, 1 (2020). https://doi.org/10.1186/s40536-020-0079-0

Howell, D. C. (2007). *Statistical methods for psychology*. Belmont, CA: Thompson Wadsworth.

Huberty, C. J., & Petoskey, M. D. (2000). Multivariate analysis of variance and covariance. In H. Tinsley and S. Brown (Eds.) *Handbook of applied multivariate statistics and mathematical modelling*. New York: Academic Press.

Idowu, B., Adagunodo, R..&Idowu, B. (2004). Gender Difference in Computer Literacy among Nigeria Undergraduate Students: A Case Study of Obafemi Awolowo University Students, Nigeria. *The African Symposium- An On-line Educational Research Journal*: 4(3).

Ishaq, K., Zin, N. A. M., Rosdi, F. Abid, A. & Ijaz, M. (2020). The impact of ICT on students' academic performance in public private sector universities of Pakistan. *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, 9 (3): 1117 - 1121.

Iwu, A.O. (2006). Information and Communication Technology. In A.O Iwu; Ike, Chimezie, O.S. (Eds.). *Perspective on Education Technology* (pp. 339-359). Owerri. IM: Peace Publishers.

Jim P. (2011). *Putting the learn back into weblearn - using a VLE to promote independent learning*. Investigations in university teaching and learning. 7 spring.

JISC (2009a) *Effective Practice in a Digital Age* (Bristol, HEFCE).

JISC (2009b) *Effective Use of VLEs*. Available online at: www.jiscinfonet.ac.uk (accessed 23 March 2020).

Liaw, S., & Huang, H. (2000). Enhancing interactivity in web-based instruction: A review of the literature. *Educational Technology*, 39(3), 41−45.

Livingston, K., & Condie, R. (2006). The impact of on-line learning on teaching and learning strategies. *Theory into Practice*, 45(2), 10−158.

Love, N., & Fry, N. (2006). Accounting students' perceptions of a virtual learning environment: Springboard or safety net? Accounting Education: *An International Journal,* 15, 151−166.

Meyers, L.S., Gamst, G., & Guanno, A. (2006). *Applied multivariate research: Design and interpretatio*n. Thousand Oaks, CA: Sage Publishers.

Moreno-Guerrero, A., Aznar-Diaz, I., Caceres-Reche, P., Alonso-Garcia, S. (2020). E-Learning in the Teaching of Mathematics: An Educational Experience in Adult High School. *Mathematics*; 8 (840): 1 - 16

Mullis, I. V. S., Martin, M. O., Fierros, E., G., Goldberg, A. L., & Stemler, S. E. (2000). *Gender differences in achievement: IEA's Third International Mathematics and Science Study (TIMSS).* Chestnut Hill, MA: Boston College.

Ofsted (2009a), *The importance of ICT: Information and communication technology in primary and secondary schools, 2005/2008,* London, Ofsted. Retrieved from www.ofsted.gov.uk/Ofsted-home/Publications-and-research/ Browse-all-by/Documents-by-type/Thematic-reports/The-importance-of-ICT-information-andcommunication-technology-in-primary-and-secondary-schools-2005-2008 on 29 June, 2020

Okebukola, P. (2004). E-learning in varsities, others underway, NUC boss lists strategies. *The Guardian* (12 October): 35, 39.

Ololube, N. P. (2006) "Appraising the Relationship Between ICT Usage and Integration and the Standard of Teacher Education Program in a Developing Economy. *International Journal of education and development using ICT*: 2(3).

Osu, S.R., Udosen, I.R. & Akpan, B.P. (2010). Application of ICT in Senior Secondary Biology: Resources Availability and Level of Preparedness of Biology Teachers. *Journal of Educational Research and Policies*: 5(1), 22-25.

Sansanwal, D.N. (2000). Information Technology and Higher Education. *University News*. 3 8(46).

Schumacher, P & Morahan, J. (2001). Gender, Internet and Computer Attitudes and Experiences. *Computers in Human Behaviour*. 17. 95-110. 10.1016/S0747-5632(00)00032-7.

Sero (2009). *Harnessing Technology: Annual Sector Survey of FE Colleges 2008/09* – Report, Coventry, Becta.

Shashaani, L. (1997). Gender Differences in Computer Attitudes and Use among College Students. *Journal of Educational Research. Computing Research*: 16,37-51.

Sim, Janice CH, & Theng, Lau Bee. (2014). *Teachers' perceptions of the use of ICT as an instructional tool in Mathematics and Science*. Retrieved 2/10/2020, from https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.498.6634&rep=rep1&type=pdf

Siti H. H., Zahra, N., Saedah, S., Rana, A. A., & Chin, L. (2015). Exploring the Link Between Learning Styles and Gender Among Distance Learners. *Procedia - Social and Behavioral Sciences.* 191. 1082-1086. 10.1016/j.sbspro.2015.04.238.

Sunesh H. & Samanthi W. (2016). Impact of virtual learning for improving quality of learning in higher education. *2nd International Conference on Education and Distance Learning*.

Thabet, T. S. A. & Kalyankar, N. V. (2014). The effect of E-learning approach on students' achievement in Fraction Math Course Level 5 at Yemen's Public Primary School. *Global Journal of Computer Science and Technology: E Network, Web and Security*. 14 (2):44-52 ISSN: 0975-4172 & Print ISSN: 0975-4350

Tomte, C. (2011). Challenging Our Views on ICT, Gender and Education. *Nordic Journal of Digital Literacy*, issue/2011.

UNDP (2006). *Human Development Report - TIMOR LESTE 2006*. The Path Out of Poverty.