

# Effect of Mobile Learning Application on Academic Performance of Students' in Carpentry and Joinery Craft in Technical Colleges in Anambra State, Nigeria

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**Abstract:** *This study was designed to on the effect of mobile learning application on academic performance of students' in carpentry and joinery craft in technical colleges in Anambra State. The study adopted a quasi-experiment research design. Two research questions guided the study and two hypotheses were tested at .05 level of significance. The population for the study ninety-two (92) NTC II students of the five (5) technical colleges offering carpentry and joinery craft in Anambra State. The entire population was divided into two (2) equal groups (experimental and control group) of forty-six (46) students apart; one for mobile learning application and traditional method. The instrument "Carpentry and Joinery Craft Achievement Test (CJCAT)" one hundred (100) multiple choice standardized test questions adopted from National Business and Technical Education Board (NABTEB) past questions papers for the period of 2020 - 2022 by the researchers. The instrument was validated by three (3) experts. The Carpentry and Joinery Craft Achievement Test (CJCAT) was administered on fifteen (15) students of Government Technical Collage Port Harcourt. Kuder Richardson (K-R) 21 was used to test the internal consistency of the Woodwork Achievement Test (WAT) and the reliability coefficient of 0.92 was obtained. Data collected were analyzed using mean and standard deviation to answer the research questions and Analysis of Covariance (ANCOVA) was used to test the hypotheses at .05 level of significance with the aid of SPSS. The study found that carpentry and joinery craft students taught joint and jointing as well as scaffolding using mobile learning application performed better than those students taught using the traditional method of teaching which is indicated in the performance mean gain of the both group. Consequently, the researchers recommended among others that mobile learning application should be developed in all areas of carpentry and joinery craft and installed for students' utilization for better performance in technical colleges in Anambra State.*

**Keywords:** Technical Collages, Carpentry and Joinery Craft, Mobile Learning Application and Performance

## Introduction

The Federal Republic of Nigeria (FRN) in realizing the importance and need for sustainable industrial and technological workforce established technical colleges to turn out graduates who will be employable in the world of work. Akpan (2007) stated that technical colleges are designed to prepare individuals to acquire practical skills, basic scientific knowledge and attitudes required as craftsmen and technicians at sub-professional levels. Technical colleges are the principal vocational institutions in Nigeria that give full vocational training intended to prepare students for entry into various occupations as operatives or artisans and craftsmen. According to Bakare (2006) technical colleges are charged with the production of craftsmen and technicians in various occupations. Technical colleges are institutions where students are trained to acquire relevant knowledge and skills in different occupations for employment in the real world. Technical colleges sometimes admit students who have the first school leaving certificate and give them a full six years vocational training (Uwaifo, 2010). He continued that this later case occurs in a situation where the technical college is experiencing difficulties in attracting enough junior secondary school leavers into its vocational programmes. Technical colleges give full vocational training intended to prepare students for entry into various occupations. Technical colleges are post-primary schools saddled with the responsibility of producing craftsmen and master-craftsmen as low-level manpower.

Technical colleges are regarded as the principal vocational institutions in Nigeria. Technical colleges according to Okoro (2006) are vocational training institutions in Nigeria that admit junior secondary school leavers to senior secondary schools and provide them with a full vocational course of three years' duration. Atsumbe, *et al* (2012) are of the view that technical colleges are institutions where students are trained to acquire relevant knowledge and skills in different occupations for employment in the real world. According to the Federal Government of Nigeria (FGN, 2013), technical colleges form part of technical and vocational education designed to produce craftsmen at the secondary school level and master craftsmen at the advanced craft level. Technical colleges

train craftsmen in electrical installation and maintenance work, radio and television repairs, welding and fabrication, fitting and mechanical engineering craft practices, motor vehicle mechanics works, blocklaying and concreting works, plumbing, painting and decorating, woodwork/carpentry and joinery among others.

Wood is a hard, tough substance that forms the trunk of a tree. Technically, the term wood includes other parts of the tree such as the roots and branches. The process of working with wood is called woodwork. According to Hornby (2000) as cited in Okwori et al., (2013), woodwork is also seen as the activity or skill of making objects from wood by woodwork craftsmen. Woodwork has areas of specialization and these include carpentry, joinery, cabinet making and wood machining. FRN (2013) identified areas of woodwork as follows: upholstery, wood machines, furniture making and carpentry and Joinery.

Carpentry and joinery craft is one of the major trade components of the curriculum of technical and vocational education. To a layman, carpentry and joinery is derogatorily referred to as cut-and-join-technology, but carpentry and joinery is much more than that. Woodwork technology is one of the programmes offered in technical colleges in Nigeria. Hence students in woodwork technology need to acquire appropriate skills in order to be employable in woodworking establishments. Like every other practical-oriented disciplines, carpentry and joinery according to National Business and Technical Examination Board (NABTEB) (2007) is meant to: (i) expose and acquaint the students to knowledge and skill in the design, construction, erection and dismantling of various temporary structures; (ii) acquaint the students with the knowledge and skill of the act of joinery production and set for the site; (iii) give and impart skills to students who shall be able to make: timbering to trenches and shore structures; construct formwork for concrete structures; erect and maintain: scaffolds, roofs, ceiling, wood partitions and screens, cladding to concrete and steel work; construct: wall panels, doors and windows, gates and garage doors, pre-fabricated timber building, stairs and furniture for domestic and public buildings; and (iv) expose students to the effective usage of the various hand tools used in carpentry and joinery.

Carpentry and Joinery is one of the vocational courses offered in Nigerian technical colleges. It is a skill-oriented trade capable of equipping learners with saleable skills for self-reliance and also paid employment. Carpentry and joinery programme deals with the acquisition of skills and techniques in designing, cutting, constructing, erecting and dismantling of various temporary and permanent carpentry and joinery structures. It is a trade curriculum with a wider description of specific behaviours expressed in modules of discrete practical tasks and related knowledge which the student is expected to demonstrate as a result of the educational process to achieve the objectives. It emphasizes learning by doing through cognitive and psychomotor skill. Woodworking is the act, art or trade of working with wood. It is the process of building, making or carving something using wood. Carpentry and joinery is a profitable business among a few woodworkers in Nigeria, who are still in the trade despite societal poor image that is ascribed to the trade. Carpentry and joinery craft require skills and business opportunities abound in the trades. Currently, several devices whether audio, video and audio-visual are used enhance the performance of students all over the globe among which is a mobile phone. Considering the importance of mobile phone in the society nowadays, mobile learning becomes premeditated in instructional processes.

Mobile learning, also known as m-learning, is a new direction in pedagogy and education, which is organized using mobile technologies. M-learning is learning with the help of mobile devices at any convenient time and in any place (Kuklev & Kalakov, 2010). Mobile learning is the capability to attain or provide educational content on individual pocket devices such as PDAs, smartphones and mobile phones. Gikas and Grant (2013) states "Mobile learning (M-Learning) is when the learning experience that you're trying to design happens to be out and about in the world". Mobile learning allows flexible learning and is a mixture of Information and Communication Technologies (ICT) providing education anytime and anyplace. In mobile learning learners can use mobile devices to access educational resources, share with others, or produce content, both inside and outside classrooms. UNESCO Institute for Information Technologies in Education (2010) noted the important role that mobile devices play in the lives of modern students posited that the realities of our lives are such that far from all students use traditional sources on paper, such as textbooks, study guides, dictionaries, for training, and they draw almost all the information from the Internet, directly using a computer, mobile devices.

Mobile technologies have been developing rapidly due to the improvement of wireless communications, the expansion of the functionality of mobile devices and the advent of open-source mobile platforms. To support these capabilities, various mobile applications are being developed (Sokolova, 2014). In the modern world, mobile technologies cover more and more areas of human activity. The growth of the mobile applications market shows the importance, convenience and relevance of the use of mobile systems in all spheres of life, including educational ones. Widespread ownership of mobile phones and the increasing availability of other portable and wireless devices have been changing the landscape of technology supported learning. Use of these technologies turns out to be well aligned with strategic educational goals such as improving student retention and achievement, supporting differentiation of learning needs, and reaching learners who would not otherwise have the opportunity to participate in education (Kukulka- Hulme et al., 2005).

Furthermore, Kuznetsova (2011) noted that mobile training provides for the availability of mobile means, regardless of time and place, using special software on a pedagogical basis of interdisciplinary and modular approaches. The emergence of new types of devices and applications is changing education, so it is important to ensure the proper use and implementation of mobile learning. In light of the above, the researchers therefore reiterate the imperativeness of mobile learning in education as giving access documents or document libraries, access quizzes and self-assessment as question or games, participate in lessons and tutorials, receive lectures archived or broadcasted live, access to video clip or audio libraries, read asynchronous postings, exhibit student work (e-market), participate in virtual learning communities on the go. Alongside formal education, everyday opportunities to access learning resources on mobile devices have multiplied.

Academic performance according to Akuda and Izu (2016) is the knowledge attained or skills developed in the school subjects, usually determined by test scores or marks assigned by the teacher. Costa and Belen (2014) also defined academic achievement as the learning outcome of students which include the knowledge, skills and ideas acquired and retained through his course of study within and outside the classroom situations. Student achievement in school subject symbolizes the score or mark on an achievement test. According to Olaoye and Adu (2015) academic performance of a student is the learning outcomes of students which include the knowledge, skills and ideas acquired and retained through his course of study within and outside the classroom situations. Academic performance of student according to Oludipe (2012) is quantified by a measure of the student's academic standing in relation to those of other students of his age. Students' performance is characterized by a lot of factors ranging from teacher quality, method of teaching and availability of material and equipment.

### **Statement of the Problem**

Carpentry and joinery students of technical colleges need to learn and acquire necessary skills that will enable them to be self-reliant or employed for pay in industries as well as other woodworking establishments as lower level manpower upon graduation. The students are expected to write and pass an external examination; National Business and Technical Education Board (NABTEB). However, most of carpentry and joinery technology students of technical colleges were unable to do so. This is evidenced in the performance rating of the National Business and Technical Education Board (NABTEB) chief examiner (2021) that students' scores in carpentry and joinery technology were poor and discouraging. The poor performance according to the chief examiner could be due to several factors amongst which are; acute shortage of qualified woodwork teachers, lack of facilities, lack of appropriate methods for teaching and learning, lack of skill required by woodwork technology teacher for practical projects such as frame construction, carcass construction and stool construction, over-dependence of the use of the traditional teaching and learning approach; thus most carpentry and joinery craft students look at it as just a mere process, uncondusive classroom. In light of the above, the researchers decided to take a shift from the traditional teaching and learning to development a mobile application that will aid students to learn at ease and at their comfort. Hence, the study effect of mobile learning application on academic performance of students' in carpentry and joinery craft in technical colleges in Anambra State was conducted.

### **Aim and Objective of the Study**

The aim of the study was to determine the effect of mobile learning application on academic performance of students' in carpentry and joinery craft in technical colleges in Anambra State. Specifically, the study sought to determine:

- 1) Effect of mobile learning application on academic performance of carpentry and joinery craft students' in joint and jointing in technical colleges in Anambra State
- 2) Effect of mobile learning application on academic performance of carpentry and joinery craft students' in scaffolding work in technical colleges in Anambra State

### **Research Question**

- 1) What is the effect of mobile learning application on academic performance of carpentry and joinery craft students in joint and jointing in technical colleges in Anambra State?
- 2) What is the effect of mobile learning application on academic performance of carpentry and joinery craft students in scaffolding in technical colleges in Anambra State?

### **Hypotheses**

**HO<sub>1</sub>**: There is no significant difference between the mean performance score of students taught joint and jointing using mobile learning application and those taught using traditional method in technical colleges in Anambra State.

**HO<sub>2</sub>**: There is no significant difference between the mean performance score of students taught scaffolding using mobile learning application and those taught using traditional method in technical colleges in Anambra State.

**Methodology**

- **Research Design:** The study adopted a quasi-experimental research design.
  - Category A:  $O_1 X_1$
  - Category B:  $O_1 X_2$
  - Where;  $O_1$  – Pre-tests for both groups
  - $O_2$  - Post-tests for both groups
  - $X_1$  - Treatment (Category A: Experimental group)
  - $X_2$  - Treatment (Category B: Control group)
  
- **Population of the Study:** The population of the study was ninety-two (92) NTC II students of carpentry and joinery craft in technical colleges in Anambra State. The school include the following: GTC Onitsha; GTC Nkpor; GTC Umuchu; GTC Umunze and GTC Umueri. The entire population was divided into two (2) equal groups (experimental and control group) of forty-six (46) students apart.
- **Sample and Sampling Techniques:** The entire population of carpentry and joinery craft students was studied in their intact classes.
- **Instrument:** The instruments for data collection was tagged Woodwork Achievement Test (WAT). The test questions were standardized test questions adopted from National Business and Technical Education Board (NABTEB) past questions papers for the period of 2020 - 2022 by the researchers. The test items were one hundred (100) multiple choice questions; fifty (50) were set on each of the objectives.
- **Validity of Instrument:** The instrument was subjected to face and content validity in order to ensure appropriateness of the instruments by three experts; One (1) from the Department of Technical Education (Building Technology Option), Ignatius Ajuru University of Education Port Harcourt, Rivers State and Two (2) from the Department of Woodwork Technology Education, Federal College of Education (Technical) Umunze Anambra State. All suggestions and recommendations from the experts were harmonized and used to produce the final copy of the instrument.
- **Reliability of the Instrument:** The reliability of the research instruments was established after pilot testing. The Woodwork Achievement Test (WAT) was administered on fifteen (15) students of Government Technical Collage Port Harcourt which were not part of the study population. Kuder Richarson (K-R) 21 was used to test the internal consistency of the Woodwork Achievement Test (WAT) and the reliability coefficient of 0.92 was obtained.
- **Data Analysis:** Data collected were analyzed using mean, standard deviation, pre-test and post-test to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at .05 level of significance through the help of Statistical Packages for Social Sciences Version 22(SPSS 22). The pretest-posttest mean difference of each of the treatment groups were computed to determine the effect of mobile learning application on the achievement of carpentry and joinery craft student in Anambra State. Decision rule based on the calculated mean was used; if f-ratio is less than .05, then “reject” the null hypothesis whereas, if f-ratio is greater than .05 “accept”.

**Results**

**Research Question 1:** What is the effect of mobile learning application on academic performance of carpentry and joinery craft students in joint and jointing in technical colleges in Anambra State?

**Table 1: Pretest and Posttest Mean Performance Scores of Carpentry and Joinery Craft Students taught Joint and Jointing with Mobile Learning Application**

Group	N	Pretest $\bar{X}$	S.D	Posttest $\bar{X}$	S.D	Mean Difference $\bar{X}$	Mean Gain $\bar{X}$	Remark
Experimental Group (M-Learning App)	46	22.11	3.18	43.13	2.42	21.01	7.67	<b>Performed Better</b>
Control Group (Traditional method)	46	18.07	3.10	31.41	2.25	13.34		

Source: Authors (2023)

The results in table 1 showed the pretest and posttest mean performance score of carpentry and joinery craft students taught joint and jointing using mobile learning application (experimental group) as 22.11 in the pre-test and a mean score of 43.13 in the post-test, making a pretest, posttest mean difference of 21.01. Whereas, the pretest and posttest mean performance score of students for the control group was calculated as 18.07 in Pretest and 31.41 in posttest with a pretest- posttest mean difference of 13.34. Furthermore, the mean gain for the two (2) groups of students was calculated to be 7.67 showing that the mean performance of

students in experimental group was higher than those in the control group. The result above revealed that carpentry and joinery craft students taught joint and jointing using mobile learning application performed better than those students taught using the traditional method of teaching which is indicated in the performance mean gain of the both group.

**Research Question 2:** What is the effect of mobile learning application on academic performance of carpentry and joinery craft students in scaffolding in technical colleges in Anambra State?

**Table 2: Pretest and Posttest Mean Performance Scores of Carpentry and Joinery Craft Students taught Scaffolding with M-Learning Application**

Group	N	Pretest $\bar{X}$	S.D	Posttest $\bar{X}$	S.D	Mean Difference $\bar{X}$	Mean Gain $\bar{X}$	Remark
Experimental Group (M-Learning App)	46	17.09	2.95	42.21	7.40	25.12		
Control Group (Traditional method)	46	11.59	2.19	28.40	4.63	16.81	8.31	<b>Performed Better</b>

Source: Authors (2023)

The results in table 1 showed the pretest and posttest mean performance score of carpentry and joinery craft students taught jointing using mobile learning application (experimental group) as 17.09 in the pre-test and a mean score of 42.21 in the post-test, making a pretest, posttest mean difference of 25.12. Whereas, the pretest and posttest mean performance score of students for the control group was calculated as 11.59 in pretest and 28.40 in posttest with a pretest- posttest mean difference of 16.81. Furthermore, the mean gain for the two (2) groups of students was calculated to be 8.31 showing that the mean performance of students in experimental group was higher than those in the control group. The result above revealed that carpentry and joinery craft students taught jointing using mobile learning application performed better than those students taught using the traditional method of teaching which is indicated in the performance mean gain of the both group.

**Test of Hypotheses**

**Hypothesis (H0<sub>1</sub>):** There is no significant difference between the mean performance score of students taught joint and jointing using mobile learning application and those taught using traditional method in technical colleges in Anambra State.

**Table 3: Summary of Analysis of Covariance on Effect of Mobile Learning on Students in Joint and Jointing in Technical Collages in Anambra State**

Source	Sum of Squares	Df	Mean square	F	Sig.
Corrected Model	433L354a	4	1082.8385	17.137	.000
Intercept	2101259	1	2101.259	266.043	.000
PRE	1.228	1	1.228	.155	.694
Group	287.776	1	287.776	36.436*	.000
Error	718.735	90	7.898		
Total	567463.000	92			
Corrected Total	5050.089	91			

Source: Authors (2023) **Significant at sig F < .05**

The data in table 3 revealed that the F-calculated values for the group which is the effect of instructions on carpentry and joinery craft students when taught joint and jointing using mobile learning application. The F-calculated value for group is 36.436 with a significance of F at .000 which is less than .05. Hence, the null hypothesis was therefore rejected at .05 level of significance. Indicating that there was significant difference between mean performance scores of carpentry and joinery craft students when taught joint and jointing using mobile learning application students and those taught using traditional method.

**Hypothesis (H0<sub>2</sub>):** There is no significant difference between the mean performance score of students taught scaffolding using mobile learning application and those taught using traditional method in technical colleges in Anambra State.

**Table 4: Summary of Analysis of Covariance on Effect of Mobile Learning on Students in Scaffolding in Technical Collages in Anambra State**

Source	Sum of Squares	Df	Mean square	F	Sig.
Corrected Model	7432.558 <sup>a</sup>	4	1858.1395	9.327	.000

Intercept	2582.420	1	2582.420	81.016	.000
PRE	21.146	1	21.146	.663	.417
Group	8.538	1	8.538	.575*	.010
Error	3123.797	90	31.875		
Total	165128.000	92			
Corrected Total	10556.355	91			

Source: Authors (2023)

Significant at sig F < .05

The data in table 4 revealed that the F-calculated values for the group which is the effect of instructions on carpentry and joinery craft students when taught scaffolding using mobile learning application. The F-calculated value for group is .575 with a significance of F at .010 which is less than .05. Hence, the null hypothesis was rejected at .05 level of significance. Showing a significant difference between mean performance scores of carpentry and joinery craft students when taught scaffolding using mobile learning application students and those taught using traditional method.

### Discussion of Findings

The results in table 1 showed the pretest and posttest mean performance score of carpentry and joinery craft students taught joint and jointing using mobile learning application (experimental group) and traditional method (control group). The result revealed that carpentry and joinery craft students taught joint and jointing using mobile learning application performed better than those students taught using the traditional method which is indicated in the performance mean gain of the both group (7.67). Furthermore, table 3 revealed the F-calculated of 36.436, with a significance value of F at .000 which is less than .05. Hence, the null hypothesis was therefore rejected indicating a significant difference between mean performance scores of carpentry and joinery craft students when taught joint and jointing using mobile learning application students and those taught using traditional method in technical colleges in Anambra State. This finding is supported by Ozan (2013) came with a conclusion that mobile learning is more permanent for learning. In addition, using social networks and mobile technologies positively affect students' performance toward courses. Huang et. al., (2014) and Wishart (2015) mobile learning applications increase the effect of learning and enhance the process of learning

Table 2 above showed the pretest and posttest mean performance score of carpentry and joinery craft students taught scaffolding using mobile learning application (experimental group) and traditional method (control group). The result revealed that carpentry and joinery craft students taught scaffolding using mobile learning application performed better than those students taught using the traditional method which is indicated in the performance mean gain of the both group (8.31). In another development, table 4 revealed the F-calculated of .575, with a significance value of F at .000 which is less than .05. Thus, the null hypothesis was rejected showing a significant difference between mean performance scores of carpentry and joinery craft students when taught scaffolding using mobile learning application students and those taught using traditional method in technical colleges in Anambra State. This finding is similar to the findings of Demir and Akpınar (2018) mobile learning has significantly positive effect on academic achievement compared to traditional learning in this research. The finding is also in line with that of Evans (2008) emphasized that mobile learning is more effective and instructive than books, and more supportive in learning. Also, this finding is supported by Hwang and Chang (2011) whose study indicated that mobile learning not only catches students' interaction but also increases their success.

### Conclusion

Mobile learning allows us to extend the scope of education beyond the physical confines of a classroom. We can access quality content from home or office, communicate with a large community of learners and teachers, and work online. The value of mobile learning is that it allows students to communicate, collaborate and develop new ideas using sound digital resources. Quick access to information, anywhere and anytime learning, interacting with friends and facilitating learning are observed as important key points of mobile learning. Furthermore, the study revealed that students taught using mobile learning application performed than those taught using traditional method in joint and jointing as well as scaffolding in technical colleges in Anambra State. There is was a significant difference (positive effect) between students taught joint and jointing as well as scaffolding using mobile learning application and those taught using traditional method in technical colleges in Anambra State.

### Recommendations

Based on the findings of this study, the following recommendations are made:

- 1) Mobile learning application should be developed in all areas of carpentry and joinery craft and installed for students' utilization for better performance in technical colleges in Anambra State

- 2) Mobile phones should be made available to all students by the government and other agencies for effective learning using mobile learning application.
- 3) Workshops, seminars, conference and training should be organized by school management and other relevant group to sensitize students and teachers on the use of mobile learning application.

### References

- Akpan, A. C. (2007). *The quality of training received in electricity and electronics programme by technical college graduates in Akwa-Ibom State* [Unpublished master's thesis]. University of Nigeria, Nsukka
- Akuda, B.N. & Izu, B. (2016). Basic Maintenance Strategies of Technology Education Teachers. *Journal of Technical Education Today*, 7(1&2), 9-26.-61.5.372.
- Atsumbe, B. N. (2002). Basic academic, practical and effective skill to be emphasized in the technical college curriculum. *Journal of Nigerian Association of Teachers of Technology*, 1(4), 119-126
- Bakare, J. (2006). Safety practice skills needed by electrical electronics students of technical colleges in Ekiti State," An unpublished PGDTE Project, Department of Vocational Teacher Education, University of Nigeria, Nsukka
- Costa, D. & Belem, E. (2014). *Achievement test: Meaning and types-explained*. Cambridge University Press.
- Demir, K. & Akpinar, E. (2018). The effect of mobile learning applications on students' academic achievement and attitudes toward mobile learning. *Malaysian Online Journal of Educational Technology (MJOET)*, 6(2), 48 – 59
- Evans, C. (2008). The effectiveness of m-learning in the form of podcast revision lectures in higher education. *Computers & Education*, 50(2), 491-498.
- Federal Republic of Nigeria (2013). *National policy on education*. NERDC Press.
- Gikas, J. & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, 19, 18-26.
- Huang, Y. M., Liao, Y. W., Huang, S. H., & Chen, H. C. (2014). A Jigsaw-based cooperative learning approach to improve learning outcomes for mobile situated learning. *Educational Technology & Society*, 17(1), 128-140.
- Hwang, G. J. & Chang, H. F. (2011). A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students. *Computers & Education*, 56(4), 1023-1031.
- Kuklev V.A. & Kalakov N. I. (2010). *Components of the mobile learning system as a tool to support the quality of education*. // Editorial board.
- Kuznetsova A. A. (2011). *Education informatization (Binom)*. <http://: BHV-Petersburg, Binom>,
- Okoro, O. M. (2006). *Principles and methods in vocational and technical education*. University Trust Publishers
- Okwori, R.O., Adamu, M. M. & Odo, I. M. (2013). Evaluation of practical skills possessed by woodwork graduates of technical colleges in Niger State, Nigeria. *Multilingual Academic Journal of Education and Social Sciences*, 1(2), 73 - 82
- Olaoye, O, & Adu, E. O. (2015). Problem-based Learning Strategies and Gender as Determinant of grade 9 Students' Academic Achievement in algebra. *International Journal of Education Science*, 8(3), 485-492
- Oludipe, D. L (2012). Gender difference in Nigerian junior secondary school students' academic achievement in Basic Science. *Journal of Educational and Social Research*, 2(1), 93-99
- Ozan, O. (2013). *Directive support in connectivist mobile learning environments* [Unpublished master's thesis]. Anadolu Üniversitesi, Eskişehir.
- Sokolova V. V. (2014). *Mobile application development*. Publishing House of the Tomsk Polytechnic University.
- UNESCO (2010). *Policy guidelines for mobile learning*. [http://www.unesco.org/new/fileadmin\\_.pdf](http://www.unesco.org/new/fileadmin_.pdf)
- Uwaifo, V. O. (2010). Technical education and its challenges in Nigeria in the 21<sup>st</sup> Century. *International NGO Journal*, 5(2), 40-44.
- Wishart, J. & Thomas, M. (2015). Introducing e-research in educational contexts, digital methods and issues arising. *International Journal of Research & Method in Education*, 38(3), 223-229.