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Mobile Collaboration Learning Technique on Students in Developing Nations

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Abstract**—**New and more powerful communications technologies continue to emerge at a rapid pace and their uses in education are widespread and the impact remarkable in the developing societies. This study investigates Mobile Collaboration Learning Technique (MCLT) on learners' outcome among students in tertiary institutions of developing nations (a case of Nigeria students). It examines the significance of retention achievement scores of students taught using mobile collaboration and conventional method. The sample consisted of 120 students using Stratified random sampling method. Five research questions and hypotheses were formulated, and tested at 0.05 level of significance. A student achievement test (SAT) was made of 40 items of multiple-choice objective type, developed and validated for data collection by professionals. The SAT was administered to students as pre-test and post-test. The data were analyzed using t-test statistic to test the hypotheses. The result indicated that students taught using MCLT performed significantly better than their counterparts using the conventional method of instruction. Also, there was no significant difference in the post-test performance scores of male and female students taught using MCLT. Based on the findings, the following submissions was made that: Mobile collaboration system be encouraged in the institutions to boost knowledge sharing among learners, workshop and training should be organized to train teachers on the use of this technique, schools and government should consistently align curriculum standard to trends of technological dictates and formulate policies and procedures towards responsible use of MCLT.

Keywords**—**Education, communication, learning, mobile collaboration, technology.

I. Introduction

MOBILE connectivity and smartphone pervasiveness has become more powerfully inclusive in people`s daily lives and the challenge of inclusive penetration to unconnected population of developing nations is at large. While mobile subscriber base of developed nations grows slowly as penetration rates approach levels close to saturation, the Sub-Saharan Africa nations still remains the world's most under-penetrated region. Nigeria as a developing nation is now one of the fasted growing smartphone destination in the region, having the highest number of mobile subscriptions. Spiraled by cravings for low cost smartphones and free apps, there are still more room for mobile growth and harnessing the potentials considering increase in her youth population.

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The explosion of increasingly sophisticated learning tools on offer via mobile phones has meant for tech – savvy teachers and students a 21st century virtual classroom. These moves represent an unprecedented nod to expanding educational access among the digital natives who now provokes a shift in the university business model for greatness as custodians of information to a reality that experience and collaborative environment gives the institution a competitive edge, with interactions now occur as much via email, social-multimedia networks and instant messaging as it does in person [1].

Modern technologies, if used appropriately, have been shown to enhance communication and critical thinking skills, develop lifelong learning behavior and facilitate student engagement in ways that promote a deeper understanding of coursework [2]. Higher educators world-wide also tend to fall back on outmoded transmission practices in their teaching and as [3] suggest are out of sync with the informal learning experiences of students. In addition to improving teaching and learning practices, providing access to the vast resources that are freely available online may benefit students who lack access to traditional forms of content e.g. textbooks and who are now natives of the digital age.

Leveraging technologies that are available to people with emerging social practices have the potential to bring about qualitative outcomes to education. Mobile technology is ubiquitous and faculty, staff and students are in the midst of an information revolution tied to collaborative tools and services and [4] indicated that over 90 percent of students with mobile device accessed course syllabus, presentations, assignments and other course material anytime. These capabilities are evident that education and learning is no more to be relegated to the four walls of the classroom.

Education has evolved in leaps and bounds in recent years and a number of different teaching techniques have emerged and the use of technology has simply given it new teaching techniques which revolve more around encouraging the students to awaken their curiosity and desire to learn [5]. One of such technique is Mobile Collaborative Learning which involves the whole process of learning and [6] identified this to include students teaching one another, students teaching the teacher and its standard the teachers teaching the students. This research interest advocates a situation in which two or more people learn or attempt to brainstorm and learn something as a group towards a common goal and pedagogically, a process that allow students to learn freely from one another and the teacher providing the needed support and rule of engagement in the learning context.

II. Theoretical Framework

Over the years, many theories have been predicated on the assumption that learning occurs in a school classroom, mediated by a trained teacher. However, there seem to be a technological disruption to this notion by [7] with proposed framework of "learning for a mobile society" which include to;

- Embrace considerable learning that occur outside classroom and lecture halls as people initiate and structure their activities to enable educational processes and outcomes.
- Coverage on contemporary practices that are learners centered; knowledge centered; assessment centered; community centered and involves ubiquitous use of personal and shared technology that account for mobility in a rapid and radical conceptual change.

One would acknowledge [8], [9] on emphasis for a new drive to train modern college students who need new learning environment due to their multi-directionless communication processes and a reformulation of the curricula to evoke collaboration as a way to helps students of native speakers build their own knowledge in a digital era. To this effect, [10] opined that today's higher education and administrators face a challenge with their students who belong to the "Net Generation" and the readiness to meet the technological advances of students by teachers who are familiar with learning and teaching styles of the older generations earmarked a foreseeable challenge.

Noteworthy is [11] that tradition methods of instruction will no longer work in a society that has encountered a paradigm shift from emphasising teaching to emphasising learning. Related research findings indicates that life experiences, expectations and technological know – how of teachers and students are significantly different, and it is attributed to profound traits of digital natives to having orientation and leveraging on both asynchronous and synchronous collaboration tools to foster lifelong partners of democratic learners. Many more research positions abounds, and it is obvious that technology have come to stay, but the fact that most Nigerians students are deeply engrossed on media socialization, and thus would be easily engaged in collaborative learning if properly guided is a pointer for an inclusive mobile collaborative teaching and learning method.

III. Research Purpose

The main purpose of this work was to determine the effect of mobile collaboration among students in developing nations, a case of Nigeria tertiary institutions and its implication to education. While the specific objectives are to find out;

1. If Mobile collaboration technique has any effect on learners' outcome among students of tertiary institution in a developing nation.
2. The retention achievement level of learners who were subjected to mobile collaboration in tertiary institutions.
3. Whether there is gender disparity in the use of mobile collaborative learning among students in tertiary institutions.
4. To the extent possible, if there are implications of using mobile collaborative technique for teaching and learning.

IV. Research Questions

The followings research questions underpin the study;

1. Is there any disparity in the performance of the students before they took the course?
2. Does Mobile Collaborative Learning Technique influence the academic achievement of students?
3. Is there any influence in retention capability of students with Mobile Collaborative technique and those taught with conventional (chalk and talk) method?
4. What possible difference is there between male and female students taught with Mobile Collaborative Learning Technique and those taught with conventional method?
5. What are the educational implications of using Mobile Collaborative Learning Technique in Nigeria higher education?

V. Research Hypotheses

The plausible hypotheses to be tested by the study are;

1. There is no significant influence in the academic achievement of students taught with Mobile Collaborative Technique and those taught with conventional method.
2. There is no significant influence in the academic achievement of students taught with Mobile Collaborative Technique and those taught with conventional method.
3. There is no significance influence in the retention test of students taught with MCLT and those taught with conventional method.
4. There is no significance influence of MCLT on male and female students' performance.

VI. Methodology

The study adopted the pre-test and post-test experimental control group design. The inferential statistics was used to make inferences from sample data to the population, testing for statistically significant relationships between variables or statistically significant differences between the control and experimental group. The study population comprised students from two tertiary institutions in Nigeria, while the target population comprises of computer Science students offering Pascal Programming Language for the 2014/2015 academic session in conformity to Nigeria Certificate in Education (NCE) minimum standard for computer science educators and Biochemistry students in the university, and in set standard of National University Commission (NUC). Out of this population a total of 120 students were randomly sampled. Sixty students in each of the two schools were sampled and assigned to two composed instructional groups and was not gender biased. In each of the schools, the sample consisted of 40 students who were randomly fused to the control group,

while 20 students made up of the experimental group. The instructor used purposive sampling to select students whose mobile phones were internet compliant to support the collaborative learning technique.

A. Research Instruments

Research instruments used for the study are a Student Achievement Test (SAT) in line with minimum standard proposed for the course, Smartphone application and in particular a WhatsApp messenger. This was suitable for the reason that students are familiar with the Smartphone, which is an all-in-one device that serves multiple purposes and it`s always in possession of students. Ample numbers of students and educators that have social networking apps running on their mobile think of it as useful for chatting and less users are looking at how these versatile mobile applications can practically be used for learning. For consideration, WhatsApp stands different because of its unique features that suite socio-economic travail of developing nations, its rising success is for the reason that it is free, flexible and offers cross browser and cross platform compatibility. It is supported in nearly all smartphones and makes discussion super rich and finding a learning ambiance out of the message broadcasting feature wherein learning resources circle is established to deliver instant text message, make free calls, attach photos, share resource links, videos and recorded voice notes opens a plethora for educators to enhance learning competencies.

The SAT was formulated by the researcher in sets quality standard for curriculum best practices to assess learners` outcome. The SAT consisted of 40 multiple choice objective tests of standardised achievement test which format and curriculum validity was censured by two educational and one e-learning expert. From their comments, some items were rephrased, some content in group orientation added and reformatting done as recommended. Curriculum related evidence was adopted to ensure the contents of the test are parallel to the objectives and curricular emphases are in proper balance. However, the test reliability was at 0.79. In general, reliability less than 0.60 are considered poor [12].

Control 1 and Experiment1 consisted of both the control and experimental group who were administered the test questions prior to deployment of the treatment. Similarly, Control 2 and Experiment 2 consisted of both the control and experimental group who were administered the test questions after treatment. All the students in the two groups (experimental and control) completed the same content material for twelve weeks. With the control group having two hours period in a week and the experimental group subjected to the mobile collaborative method.

B. Threat to Methods of the Research

The possibility of interaction between the control and the experimental group prior to the post test assessment could have faltered the validity of the research outcome. However, the use of randomization in selecting the independent variables minimizes the sample error and the research was conducted under scrutiny relevant to the research conditions to ensure the two separate sets of treatments were not submerged.

VII. Data Analysis

Data were analysed statistically using SPSS for both pre and post – test. Answers to research question were obtained using mean scores and standard deviations. Corresponding t-test for the hypotheses was conducted at 0.05 level of significance.

VIII. Result Analysis

TABLE I
INDEPENDENT T-TEST ANALYSIS OF THE PRE-TEST SCORES OF THE EXPERIMENTAL AND CONTROL GROUP

Group	Test	N	M	SD	t	df	P
Control 1	Pre	80	8.59	2.32	-.775	118	0.440
Experimental 1	Pre	40	8.95	2.61			

Research question 1: *Is there any disparity in the performance of the students before they took the course?*

Table I shows the results of pre test t-test analysis of the mean scores for both groups. As shown in Table I, the mean score of designated experimental group (M= 8.95, SD= 2.61) is greater than the mean scores of the control group (M= 8.59, SD= 2.32). This reveals a difference in the performance between the two groups before they took the course.

Hypothesis 1: *There is no significant difference in terms of performance between both groups of students before they took the course.*

The independent t-test analysis ($t = -.775$, $df = 118$, $p = 0.440$) for $p < .05$ indicates a statistically significant difference between the experimental and control group prior to the commencement of the instruction.

TABLE II
INDEPENDENT T-TEST ANALYSIS OF THE POST-TEST SCORES OF THE EXPERIMENTAL AND CONTROL GROUP

Group	Test	N	M	SD	t	df	P
Control 2	Post	80	9.05	2.42	-3.56	118	.001
Experimental 2	Post	40	11.02	3.60			

Research question 2: *Does Mobile Collaborative Learning Technique influence the academic achievement of students?*

Table II shows the results of post test analysis of the two groups in relation to their academic achievement. The mean score of the Experimental group ($M = 11.02$, $SD = 3.60$) is greater than the mean score of the control group ($M = 9.05$, $SD = 2.42$), an indication that MCLT has higher influence on the learners` outcome than the conventional method.

Hypothesis 2: *There is no significant influence in the academic achievement of students taught with Mobile Collaborative Technique and those taught with conventional method.*

Reading from Table II, one could see the t-value as -3.56, $df = 118$ and $p = 0.001$. Thus, the null hypothesis is rejected for $p < 0.05$ and the test revealed significantly higher levels of influence of MCLT on the performance of students taught. Next, the study investigated if there was a significant difference on the learner`s outcome within the groups after

taking the course. Table III reveals difference of mean scores between the pre test and post test for the control group which was tested using paired sample t-test. As shown in Table III, the mean of the pre test scores of the control group (M = 8.59, SD = 2.32) differs minimally from the mean (M = 9.05, SD = 8.59) of the post test scores. Therefore, the post test score indicates higher performance which was not statistically significant enough (t = -1.543, p = .127) for p > .05

TABLE III
PAIRED SAMPLE T-TEST ANALYSIS OF DIFFERENCE OF THE MEAN SCORES BETWEEN THE PRE AND POST TEST OF CONTROL GROUP

Group	Test	N	M	SD	t	df	P
Control 1	Pre	80	8.59	2.32	-1.543	79	.127
Control 2	Post	80	9.05	2.42			

TABLE IV
PAIRED SAMPLE T-TEST ANALYSIS OF DIFFERENCE OF THE MEAN SCORES BETWEEN THE PRE AND POST TEST OF EXPERIMENTAL GROUP

Group	Test	N	M	SD	t	df	P
Experimental 1	Pre	40	8.95	2.61	-3.43	39	.001
Experimental 2	Post	40	11.03	3.60			

Table IV demonstrates a paired sample t-test to compare the pre test and post test mean scores of the experimental group in order to reveal if there is difference in performance between the two tests. As displayed in Table II, the post-test scores (M = 11.03, SD = 3.60) and pre-test scores (M = 8.95, SD = 2.61) showed higher difference in mean score. Thus, it can be revealed that MCLT has higher influence on students performance and the t-test analysis indicate a statistically significant difference ($p < 0.05$) in performance between the pre-test and post-test of the experimental group (t = -3.43, p = 0.01).

TABLE V
PAIRED SAMPLE T-TEST ANALYSIS OF RETENTION CAPABILITIES BETWEEN CONTROL AND EXPERIMENTAL GROUP

Group	N	M	SD	t	df	P
Control	120	8.71	2.41	-3.44	119	.001
Experimental	120	9.71	3.00			

Research question 3: *Is there any influence in retention capability of students with Mobile Collaborative technique and those taught with conventional (chalk and talk) method?*

Furthermore, the study investigate retention capability between the students taught with MCLT and those taught with conventional method by comparing the difference of mean scores between the pre and post tests of both groups using paired sample t-test analysis. The difference in retention capabilities of students taught with Mobile Collaborative Learning Technique and those taught with conventional was remarkable as shown in Table V. The mean scores of experimental group (M = 9.71, SD = 8.71) is higher than the mean scores of the control group (M = 8.71, SD = 2.41).

Hypothesis 3: *There is no significance influence in the retention test of students taught with MCLT and those taught with conventional.*

TABLE VI
PAIRED SAMPLE T-TEST ANALYSIS OF THE DIFFERENCE IN INFLUENCE OF MCLT BETWEEN MALE AND FEMALE STUDENTS

Group	Test	N	M	SD	t	df	P
Male	Post	88	9.86	3.22	0.940	118	0.35
Female	Post	32	9.28	2.28			

The null hypothesis t-test for statistically significance difference between the two group (t = -.344, p = .001 < .005) is rejected as shown in Table V. This result shows that retention capability of the experimental group is significantly higher than the control group and therefore, the experimental group outperformed the control group.

Research question 4*: What possible difference is there between male and female students taught with Mobile Collaborative Learning Technique and those taught with conventional method?*

Table VI shows the result of t-test analysis of difference in mean scores between male and female students who were subjected to MCLT treatment. The mean score of the male students (M = 9.86, SD = 3.22) is higher than the mean score of female students participants (M = 9.28, SD = 2.28), an indication that MCLT has better influence on performance outcome of male students over the female students.

Hypothesis 4: *There is no significance influence of MCLT on male and female students' performance*

The t-test (t = 0.940, p = 0.35 > .005) shows that the hypothesis was rejected, a prove that there is no statistically significant difference in learners` outcome between the male and female students with Mobile Collaborative Learning Technique.

IX. DISCUSSION

It is evident from the results of the research that both control and experimental groups of students recorded significant improvement on learners` outcome in the use of conventional classroom method and mobile collaborative learning techniques respectively. Thus, both groups of students were influenced by the learning activities and this finding concur with [13] which reveals appreciable learners improvement in both control and experimental group who participated in a Smartphone blended learning course. Nonetheless, how effective the use of mobile collaborative learning techniques in teaching and learning of the courses could influence learners` outcome serves the core aim of the research. Therefore, the study investigated the level of statistical difference in learners' performances and retention capacity between the control group and the experimental group as well as statistical influence of MCLT among male and female students.

The null hypothesis of no significance difference in retention capability between the students taught with MCLT and those taught with conventional method was rejected since the result shows that retention capability of the experimental group was significantly higher than the control group and therefore, the experimental group who are exposed to the use of Smartphone technologies outperformed the control group. At a glance, it is clear that [14] was right to posit that mobile

Smartphone users are more likely to have remarkably higher academic achievement background than other computer users. The MCLT must have influenced the students to spending an increased time to collaborate on the subject, a commitment which seems to respond to steady inflow of posts from group members.

In light of the result, the research findings reflect preference by the experimental group who were taught with MCLT to foregone over reliance on conventional classroom teaching and learning method. Researchers have recognized the potentials of mobile phones, particularly the social networking features to trigger broadened academic participation, and integrating these innovations into the classroom tasks has often been marred with resistance predicated on the fear of social delinquencies and academic uncertainty. An adoption of WhatsApp in an Information and Technology course according to [15] refutes the antagonist, and rather indicates that the method enhances pedagogical delivery and lecturers to students' participation indicated heightened students collaboration, emergence of a new student learning community for knowledge creation.

Age factor was not found to be deterministic on performance of students who undertook the course using Mobile collaborative learning method. The results reveal no significance difference between the male and female students with MCLT. The irrelevance of the age factor is substantiated and all students tend to work collaboratively towards solving common tasks and achieving rewarding outcome. Noted, the technique improves the performance of the experimental group, but does not discriminate between the genders. This assertion is in consonance with [16] of not a significance difference between male and female students on use of social media for improved learning in Nigeria tertiary institution. The idea of integrating popular and free technology into teaching and learning is a good one for both male and female learners.

X. Implication of the Study

This study present two conflicting worlds of learning, one in a mobile space where students own powerful multimedia communicators where they practice new skills at real time using audio and video interaction, file sharing, texting, instant messaging and another, under a barrier of classroom which provides both the structure and content of discourse and are regulated externally by the curriculum and examination systems, and where the teachers is a sole facilitator. How well academia and government resolve these conflicts has potentially significant implication on how we design and incorporate mobile collaborative learning techniques in our curriculum to enhance effective, innovative and adaptive learning experience.

The internet is the world`s largest repository of information and high speed access is critical. Suffice to say that a superior network performance is imperative. However, Nigeria`s mobile broadband penetration is still very low which stands at 10.1 per cent, a threefold shortfall of an average 30 per cent for peer countries in Africa. Therefore, there is need for a holistic review and implementation of a workable national broadband strategy and penetration for all Nigeria to dignify structured high speed interactive multimedia learning platforms where education authorities, institutions and citizens have choices on high quality educational products and services in borderless frontiers of learners. Thus, the effectiveness of mobile collaborative learning method depends much on the facilitator and how the technique is being deployed. Emphasis on sensitization, teachers training and professional development should be encouraged to ensure proper adoption, to drive strong achievement outcome and to broadened perspective on what is possible. However, the study would trigger interest for further research in the use of mobile apps for virtual collaborative learning.

XI. Conclusion

The study showed that the use of mobile collaborative learning technique was successful, and improved on learner's outcome of students. It has offered the possibility to conduct democratic learning in a much instant texting, file sharing, voice and video interactions. The flexibilities offered by mobile technologies are worthwhile and the study envisaged for students to learn at anytime and anywhere. Therefore, integrating this technique into a tradition classroom will result to more effective, innovative and improved learning experience. To prepare a future generation of learners, it is imperative to implement this pedagogical approach of learning in our daily teaching practice.

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