

**EFFECTS OF MOBILE ELECTRONICS RESPONSE SYSTEM SUPPORTED-
INSTRUCTION ON LEARNING OUTCOME IN THINK-PAIR-SHARE
(TPS) SETTING AMONG COMPUTER SCIENCE EDUCATION
STUDENTS IN SOUTH-WEST, NIGERIA**

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Abstract

The study investigated the effects of mobile electronics response system supported-instruction on learning outcome in think-pair-share setting among computer science education students in South West, Nigeria. The study has two objectives, answered two research questions and tested two null hypotheses. The study adopted quasi-experimental research design where an experimental and a control group were used. Two Colleges were selected and designated as Experimental Group and Control with a sample size of 211 (102 Males and 109 Female). Reliability coefficient of 0.802 was obtained when Computer Science Achievement Test was administered on the students. Mobile Response System Internet Link was the instrument developed, validated and used to teach the Experimental Group while the control group was taught using Individualized method. The research questions were answered using mean and standard deviation while Analysis of Variance (ANOVA) was used to test the pretest, Analysis of Variance (ANOVA) was used to test the hypotheses using Statistical Package for Social Sciences (SPSS) Version 20 to conduct the statistical analysis. The study revealed that students taught Computer Science with MERS in an individualized learning setting performed better than Think-Pair-Share. Female students performed better than the male students in the same group of Think-Pair-Share (TPS) collaborative setting when taught Computer Science with Mobile Electronic Response System. Based on the findings, it was recommended that Mobile Electronic Response System supported instruction especially in Think-Pair-Share and individualized setting should be used for teaching and learning processes at all levels of education.

Keywords: Mobile, Electronic Response System, Think-pair-share, Computer Science

Introduction

Computer science is very important to the success of students in a digital, inter-connected world. Computer science is a discrete academic discipline but is also embedded in virtually every area of academic study, the use of computer technologies, have become essential skills in most disciplines. Most students who took the subject among secondary schools in Nigeria has low performance in the subject, this could attribute to inadequate instruction resources need for proper instructional delivery. Due to paradigm shift in education, it is pertinent to embed computer science, related computer science skills and mobile learning into education curriculum. Mobile learning or M-learning can be any educational interaction delivered through the use of mobile technology and accessed by students at their convenience from any location (Educause, 2016). There are various software package that are used in mobile learning, some examples of mobile application designed and developed for teaching and learning purposes include Mobile Electronics Response System (MERS), data access, readers, geolocation and maps, among others. Students can have instant mobile access to all aspects of digital educational experience with the use of mobile applications. M-learning has the same advantages as e-learning over traditional lectures, but

extends its reach by making use of portable wireless technologies. The integration of M-learning to schools' system led to development of Mobile Electronics Response System (MERS) for teaching.

Electronics Response System also called classroom response systems, electronic student response systems, clickers, personal response system, student response system, or audience response system are interactive remote answering devices that offer instructors a means to gain some simple real-time feedback from the audience. A lecturer poses a multiple-choice question to his or her students via an overhead or computer projector, perhaps using PowerPoint to do so. Typically, a lecturer may ask students to vote in order to engage them later in discussion. Our primary in-class goal is not to lecture or present information. Rather, we seek to help students explore, organize, integrate, and extend their knowledge. Mobile Electronics Response System is used to send questions assess students understanding of topics or concepts been discussed from the lecture. It can reveal misunderstanding of topics cover during the lecture, determine the future directions and, evaluate student understanding of the previous class. In addition, it can be used to access student ability to apply class material to a new situation and also allow student to access their own level of understanding at the end of the class. Lecturers will send multiple choice questions, students therefore respond to it and the answer will be displayed to express if the concept is understood or not (Saleh & Ibrahim, 2015). This process can be used either with individualized or collaborative settings.

Hefin, Shewmaker, and Nguyen (2017) evaluated student learning in three different collaborative learning environments, both with and without mobile technology, to assess students' engagement, critical thinking, and attitudes toward collaborative learning. The results indicate that mobile technology is associated with positive student attitude of collaborative learning but with increased disengagement by students during class. In addition, the level of students' critical thinking was more closely associated with the tools used to construct written responses than with the collaborative learning environment style. Students constructing paragraph responses on a mobile device demonstrated significantly less critical thinking than those who used a computer keyboard or wrote responses by hand. Achievement is way of measuring and evaluating the impacts of a specific programme of instruction or training. Instructional strategies or teaching methods have a great influence on students' academic performance. The various features in the academic achievement of students include approaches towards learning, aptitudes, different levels of intellectual capabilities, diverse interest and teaching procedures which results in outstanding achievement that can lead to student satisfaction about concepts. This was evident in a study carried out by Zhu (2012), it was indicated that online collaboration enhances students' achievement and invariably increase the interest level of the students. Gambari (2010) reported that students' achievement could be linked to their attitude. Several researchers have worked on students' achievement level but the results were inconclusive. Hefin *et al.* (2017) carried out a study on the impact of (Think – Pair – Share) strategy on the achievement of third grade student in sciences in the educational district of Irbid, it was used the semi experimental in this study, the sample of study consisted of (120) students of third grade student in the educational district of Irbid, the findings of the study show that there are statistically differences in grades of students due to group variable at the significance level (0.05), and the differences were in favor of the experimental group and there are statistically differences due to gender at the significance level (0.05) in favor of females. The study recommended to entry (Think – Pair – Share) strategy within the teaching strategies used by students during the teaching and the involvement of teachers in training courses on (Think – Pair – Share) strategy. This learning method improves classroom participation by encouraging a high degree of students' response, rather than

using a basic recitation method in which a lecturer poses a question and one student offers a response. Saleh and Ibrahim (2015) carried out a research with the aims to know the Effect of (think, pair, share) strategy on the students of Physics achievement in Algas and their attitude toward it. The results were the superiority of the first experimental group in achievement and attitude. Finally, the researcher made their remarks and conclusions. This allows for learner to work independently without any partner. Collaborative learning is applicable to all disciplines irrespective of gender.

The role of gender in educational research can be not be overemphasized. Chukwuemeka (2010) reported that there is differences in students' academic achievement as result of gender and concluded that gender has effect on performance of Vocational and Technology Education student in the University. Studies revealed that females have negative attitudes towards computer than the males (Chukwuemeka, 2010). Some studies revealed that girls scored significantly higher than boys in science related subjects while some studies revealed boys performed better than girls (Okorieocha, 2010, Omale, 2012). Sunday (2014) carried out an investigation on the effects of gender on secondary school students' achievement in map work and it was observed that gender has no effect on students' achievement in geography in general, and map work in particular. These reviewed literatures serve as a drive for this to investigate effects of mobile electronics response system supported-instruction on learning outcome in Think-Pair-Share (TPS) setting among computer science education students in South-West, Nigeria.

Statement of the Research Problem

Research have shown that students perform poorly in Computer Science courses in colleges of Education in Nigeria and major reason is students' inability to recall what has been taught, since concepts and facts are taught are memorized and regurgitated. Students find Computer Science as too abstract course to comprehend and easily understood, thereby resorting to memorization or rote learning. In addition, overpopulation and lack of active participation of students during teaching is one of the major factors responsible for the poor performance. In attempt to solve this problem, several instructional materials and Mobile Applications were designed and developed by instructional designers yet the problem persists.

The causes of poor academic performance could be due to inadequate teaching methods used in our Colleges of Education and low integration of information and communication technology into teaching and learning process. This problem can be overcome by adopting students centered approach, where learning is participatory and integration of technology such mobile electronics response system, e-learning, hybrid learning, web-based instruction among others. Integration of mobile electronics response system for teaching Computer Science could improve the student performance in Colleges of Education. Therefore, there is need to develop a mobile electronics response system for Colleges of Education.

It is in this light that, the present study sought to determine the effects of mobile electronics response system supported- instruction on learning outcome in Think-Pair-Share (TPS) setting among computer science education students in South-West, Nigeria.

Research Questions

The following research questions were raised to guide the study

- (i) What is the effect of Mobile Electronic Response System on Computer Science students' achievement in TPS and individualized setting?
- (ii) What is the effect of gender on Computer Science students' achievement in Think-Pair-Share setting?

Research Hypotheses

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

Ho₁: There is no significant difference in the mean achievement scores of Computer Science students using Mobile Electronic Response System in collaborative (TPS) setting and Individualized learning.

Ho₂: There is no significant difference in the mean achievement scores of male and female Computer Science Students Mobile Electronic Response System in Think-Pair-Share setting.

Methodology

The research design that was employed for this study is a quasi-experimental design/using pretest-posttest, control group design. The treatment variables had one level of independent variable, while the moderating variables had two levels of gender (male and female). The Experimental Group were exposed to the use of Mobile Electronics Response System in Think-Pair-Share setting. Students in experimental group were exposed to the conventional Lecture method using Mobile Electronics Response System Supported-Instruction (MERS) in Think-Pair-Share Collaborative setting while Students in Control group were also exposed to Convectional Lecture using Mobile Electronics Response System Supported-Instruction (MERS) Individually. The post-test was administered on the students in all the groups after four weeks treatment.

The population of this study comprised of 1,878 Computer Science students of Colleges of Education from the South-West, Nigeria. The zone is made up of Oyo, Osun, Ondo, Ekiti, Ogun and Lagos State (COE Registry/ Administration Report 2018/2019). The target population was NCE 1 Computer Science students of College of Education in South- West, Nigeria.

Students in intact Computer Science classes comprising of male and female students in NCE I classes of the selected colleges that have access to smartphones, android or Laptops were used as sample for the study. NCE I Computer Science I Students of Emmanuel Alayande Colleges of Education, Oyo and Federal college of Education, Abeokuta were used for Experimental group III (Individualize Learning), Students from Adeyemi College of Education, Ondo and Osun College of Education, Ilesha was used for Think-Pair-Share Collaborative Settings experimental group I and Federal College of (Technical) ,Akoka. Lagos and Ekiti state college of Education Ikere- Ekiti was used for Think- Aloud Problem Solving Collaborative Setting experimental group II. Table 3.3 shows the sample size from the selected schools. The sample size for the study consists of 211 students which comprises of 102 males and 109 females.

Table 1: Sample Size for the Study

S/N	Names of Schools	Total Number	Sample Size	Male	Female
1.	Adeyemi College of Education, Ondo State	205	36	16	20
2.	College of Education, Ilesha, Osun State	126	38	19	19
3.	Emmanuel Alayande College of Education, Oyo	155	32	17	15
4.	Federal College of Education(Technical), Lagos	142	42	17	20
5.	College of Education, Ikere-Ekiti	115	32	12	19
6.	Federal College of Education, Abeokuta	326	32	16	16
	TOTAL	1069	211	102	109

Source: Bursary Department of the colleges of Education, 2018/2019

The instruments were validated by different experts. To determine the reliability of the Computer Science Achievement Test (CSAT), a pilot test was conducted on 28 NCE I students (12 males and 16 female) of Osun- state College of Education, Ila-Orangun. The College was part of the research population, but not part of the selected Colleges for the main study. CSAT was administered on the students at once. The data was split into two using the split-half method. The scores obtained and correlated using Pearson Product Moment Correlation (PPMC) revealed the reliability of 0.802.

The researcher exposed the Computer Science Lecturer in charge of the course mode of operandi of Mobile Electronics Response System and also plan with the lecturers in the colleges when the learning activities would be carried out. The activities were moderated by the researcher and assisted by their Computer Science lecturer who was trained as research assistants through a day training on how to use Mobile Electronics Response System (MERS) to support Instruction in classroom; the researcher briefed the Computer Science lecturer on the objectives and modalities of the experiment. The researcher ensured availability of power and that all required facilities such android phones, laptops, smartphones, internet facilities are in good working conditions.

Each member of the group installed MERS on their BYOD devices. The experimental group one was exposed to the use of MERS using Think- Pair- Share Setting (TPS) and Control group was exposed to MERS using Individualize learning strategy (individual learning).

Computer Science Achievement Test (CSAT) was administered immediately after the treatment, data obtained from administration of CSAT was analyzed using descriptive and inferential statistics for research questions and research hypothesis. Mean and standard deviation were used to answer the research questions. Analysis of Variance (ANOVA) was used to research hypotheses at 0.05 level of significance.

Results

Research Question One: what is the effect of Mobile Electronic Response System on Computer Science students' achievement in TPS and individualized setting?

Table 2: Mean and Standard Deviation of Score of TPS at Pretest and Posttest of Achievement

Group	N	Pretest		Posttest		Mean Gain
		\bar{X}	SD	\bar{X}	SD	
Individualised Learning	68	37.41	12.55	79.44	8.79	42.03
Think-Pair-Share	70	32.50	12.14	77.06	9.76	44.56

Table 2 reveals the mean achievement score and standard deviation of students who used Mobile Electronic Response System in Individualized Learning and Think-Pair-Share settings. The result showed that individualized learning had the highest Mean achievement score of 79.44 with standard deviation of 8.79, while Think-Pair-Share which had Mean achievement score of 77.06 with Standard Deviation of 9.76. This shows that individualized learning setting enhanced better achievement of students more than Think-Pair-Share Settings.

Research Question Two

What is the effect of gender on Computer Science students' achievement in Think-Pair-Share setting?

Table 3: The Mean and Standard Deviation of Male and Female Students in Think-Pair-Share Setting

Group	N	Pretest		Posttest		Mean Gain
		\bar{X}	SD	\bar{X}	SD	
Male	28	31.64	1.07	75.93	12.12	44.29
Female	40	33.10	1.31	77.85	7.78	44.75

Table 3 shows the mean and standard deviation of the pretest and posttest scores of male and female Computer Science students in collaborative Think-Pair-Share collaborative setting. The outcome revealed that the mean and standard deviation of pretest scores of male and female students expose to Think-Pair-Share Setting was ($\bar{X}= 31.64$, $SD =1.07$) and ($\bar{X}= 33.10$, $SD =1.31$) respectively. Similarly, the result revealed that the mean and standard deviation of posttest scores of male and female students expose to Think-Pair-Share Setting was ($\bar{X}= 75.93$, $SD =12.12$) and ($\bar{X}= 77.85$, $SD =7.78$) respectively. This implies that female students had mean gain of 44.29 higher than the male which 44.75, expose to TPS setting.

Research Hypotheses

Ho₁: There is no significant difference in the mean achievement scores of Computer Science students using Mobile Electronic Response System in collaborative (TPS) setting and Individualized learning (IL).

Table 4: Summary of Analysis of Variance (ANOVA) of Posttest Scores of IL & TPS

Source of Variation	Sum of Squares	df	Mean Squared	F-Value	P-Value
Between Groups	200.344	1	200.344	2.597	0.109
Within Groups	10412.736	135	77.131		
Total	10613.080	136			

Table 4 showed the ANOVA result of the comparison of posttest scores of Computer Science students using IL and TPS. An examination of the Table shows no significant difference in the achievement score of the two groups $F(1, 136) = 2.597$, $P\text{-Value} = 0.109$, $p > 0.05$. Therefore, there was no significant difference in the mean achievement scores of Computer

Science students using Individualized Learning and Think-Pair-Share collaborative. On the basis of this, Hypothesis one was accepted.

Ho₂: There is no significant difference in the mean achievement scores of male and female Computer Science Students Mobile Electronic Response System in Think-Pair-Share collaborative setting.

Table 5: Summary of Analysis of Variance (ANOVA) of Male and Female Mean Achievement Scores of Students in Think-Pair-Share Setting

Source of Variation	Sum of Squares	df	Mean Squared	F-Value	P-Value
Between Groups	353.950	1	353.950	3.872	0.048
Within Groups	6033.814	66	91.421		
Total	6387.765	67			

Table 5 showed the ANOVA result of the comparison of posttest scores of Computer Science male and female students TPS. An examination of the Table shows significant difference in the achievement score of the two groups $F(1, 67) = 3.872$, $P\text{-Value} = 0.048$, $p < 0.05$. Therefore, there was significant difference in the mean achievement scores of Computer Science male and female students using Think-Pair-Share collaborative. On the basis of this, Hypothesis two was rejected.

Discussion

The findings of the study unveiled that Mobile Electronic Response System had a positive impact on the mean achievement scores of Computer Science students in an individualized setting more than in a collaborative (Think-Pair-Share) setting. This outcome is in line with that Sunday (2014) who evaluated students' experiences of using mobile-based CRS technology in the context of an entrepreneurship course with individualized and collaborative (Think-Pair-Share) setting. Results indicate that individualized mobile-based CRS technology setting improve the achievement score of the student significantly compare to those collaborative (Think-Pair-Share) setting of mobile electronic response system, and the outcome is also in line agreement with the finding of Seyed *et al.* (2013) the authors compared the individual and collaborative learning setting among student and their findings indicate a more significant impact individualized setting as compared to collaborative settings on academic achievement score of student. It is also in line with Wu *et al.* 2019 who evaluated students' experiences of using mobile based CRS technology in the context of an entrepreneurship course, result indicates that mobile based CRS technology is useful and effective tool for facilitating interaction among learners and contents, enhancing students engagement with entrepreneurial knowledge acquisition also improving students motivation towards increased entrepreneurial capability. In particular, students experience innovative, active and deep learning in a mobile- based and CRS - supported classroom regardless of time and location. The findings is in agreement with the findings of Trasher *et al.* (2012) who examined web-based instruction an empirical comparison of student performance and observed that students performed significantly better with WBI and CBI than ordinary classroom.

The outcome of the study also revealed the effect of Mobile Electronic Response System on the mean achievement scores of male and female Computer Science students in a collaborative (Think-Pair-Share) setting with female performing better. This finding disagree with the finding of Okeke *et al.* (2018) whose findings shows otherwise, that is male student perform significantly in a collaborative learning strategy as compared to their female counterpart.

Gender difference can be observed depending on age, the area and where they live, context and usage scenario. Male are more active in free exploration and learning new applications-games in particular. They discover the basic functions of the Phone faster. Female are more focused on their learning task but may be accidentally interrupted by problem in operating the device, however the research on using to support different learning task did not show significance difference by the gender (Evans, 2013). According to Grimis (2014), the increase adoption of mobile device could help female break through the misconception of the technology as a "male thing". It is common assumption that using computer is a male dominant activity, the use of mobile device does not show similar gender difference.

Conclusion

Based on the findings in this study, Mobile Electronic Response System had a positive impact on the mean achievement scores of Computer Science students in an individualized and collaborative (Think-Pair-Share) setting. It can be concluded that female performing better collaborative (Think-Pair-Share) setting than male. Hence, Mobile Electronic Response System had a positive impact on the mean achievement scores of Computer Science students in a collaborative (Think-Pair-Share) setting and in an individualized setting.

Recommendations

Based on the findings, the following recommendations are made.

- (i). Mobile Electronic Response System supported instruction especially in Think-Pair-Share; and individualized setting should be used for teaching and learning processes at all levels of education in Nigerian schools.
- (ii). The use of Mobile Electronic Response System supported instruction in Think-Pair-Share and individualized setting is gender friendly, therefore, it should be encouraged in the classroom to enhance male and female performance in Computer Science at College of Education level.
- (iii). Workshops and training programmes on the benefits and procedures of using Mobile Electronic Response System should be frequently carried out by policy makers.

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