AUGMENTED REALITY INSTRUCTIONAL STRATEGY ON STUDENTS' PERFORMANCE IN ICT IN EDUCATION COURSE, UNIVERSITY OF CALABAR

Abstract

This study investigated the effect of Augmented Reality Instructional Strategy on undergraduate students' academic performance in ICT in Education Course in University of Calabar. Two research questions and corresponding null hypotheses guided the study. The study adopted a quasi-experimental design. The population of the study consists of all the 200 level undergraduate students, who are offering the course ICT in Education (EDU 203.1) in Faculty of Educational Foundation Studies for 2020/2021 academic session in University of Calabar. The sample of the study comprised of two hundred and sixty-eight (268) students selected using the multi-stage sampling procedures. The instrument used for data collection was a researcher-made performance test titled; ICT in Education Performance Test (ICTEPT). The instrument was subjected to face content and content validation with a reliability coefficient of 0.80. Mean, Standard deviation and t-test and were the statistical tools used in the study. The findings revealed that Augmented Reality Instructional Strategy has a significant effect on the students' mean performance in ICT in Education. The study concluded that augmented reality instructional strategy is one of the emerging technologies with great educational possibilities and is being incorporated by various disciplines in education at different academic levels. It combines digital information with physical information in real time and with user participation. It was recommended that instructors should adopt the use of an augmented reality instructional strategy in teaching ICT in Education courses so that students could produce better and dependable results.

Keywords: ICT, innovative teaching strategy, augmented reality, 21st-century teaching and learning, academic performance.

INTRODUCTION

The quick changes and multiple innovations of the 21st century have placed new demands on our educational system. There has been an urgent need to improve students' preparation for productive functioning in present-day society. As learners keep changing their learning styles due to recent technologies, teachers must adapt to the training of the learners. According to Akpan and Akpo (2018), 21st-century innovation in the educational sector has constantly thrived to improve the quality of teaching and learning to obtain the best educational outcomes for learners. The 21st-century innovations have brought radical changes in the way knowledge is transferred with the aim of introducing innovative ways that can improve the quality of teaching

and learning, so as to obtain the best educational outcomes for learners. The development of collaborative tools such, as Google Hangout, Skype, blogs, IMO App, YouTube, Twitter, Google Notes, social media, etc, has altered the way individual learners learn and how institutions relate to each other. These collaborative tools help learners to be multitasking as they combine both video and audio in learning, with the aim of improving their levels of understanding (Hew & Brush, 2017). It is commonly believed that each learner has a preference for a learning style that allows him to learn better. Indeed, most people prefer some kind of interaction, such as processing stimuli or information or simply using a visual medium. For learners to learn effectively and better, the learner has to be aware of his preference which makes it easy to manage his own way of learning. This information will enable the learner to improve the effectiveness of his learning experience and to perform better in his academic achievement. Another teaching method that students can be used to engage students is the discussion method of teaching which engages students in open discussions and debates on various topics. Discussions help students learn, think critically, and communicate. Encourage students to talk and share what they know. Teachers who engage students in higher-order thinking activities before and after reading can improve comprehension in developed countries (Sternberg, 2002).

Fracturing education is not a small task but a necessary one, but the major concern is how can we reach an understanding of the whole if we have not investigated the total parts. Today, information is available all over, but the big question is, how do we use the information? How can it be used to help our learners? It is important for the educational institutions to understand the skills needed by teachers to effectively use the innovative teaching strategies in educational settings. It is important they have access to a good learning environment that will help them practice the field effectively. Functional education is one in which there is an anticipated

application, which thus assumes that the learner has immediate meaning transferable into action for his learning activities.

The 21st century has witnessed major developments. The concern of educators is the influence of these developments in the field of education. Technological developments over the years have enabled mankind to do more things with less effort. One such development involves the increasing use of the Internet as a means of presenting and delivering instruction to learners. Meaningful and useful education is something all students need regardless of the career choices they will eventually make. The issue is how best to integrate Information and Communication Technology (ICT) into the classroom. Students become more productive researchers when they are helped to learn carefully and construct their search terms before they use a trial-and-error method. Today's schools need to better prepare students for the 21st-century workforce. To do so, students need to experience a reformed learning environment that engages them meaningfully in activities in which they use computers as tools to solve real-world problems. This in turn deepens and enriches their understanding of requisite core content and skills. Centre for Education Innovation (2016) revealed that instructors in higher education employ mostly the didactic approach in delivering the content of their instruction which does not give room for the learners to actively use 21st-century learning skills. For this reason, so many innovative teaching strategies have emerged as 21st-century learning strategies that simplify teaching and learning by maximizing students' active learning and construction of knowledge which gives them the opportunity to be involved in the five key elements of constructivism, which are engagement, exploration, explanation, elaboration and evaluation in learning any concept of their choice. There is no best method of instructional delivery of a particular instructional content. However, the instructors should realize that the method used can either enhance or undermine the learning

outcome. Gutek (2012) observed that the teaching of computers in higher institutions is entirely dominated by the lecture method which is one of the crucial issues confronting the school system. This method, of teaching deprives learners of discovering knowledge themselves rather than depending solely on the teachers as the main source of knowledge. However, the emphasis is on the higher education teachers to be entirely committed to crucial matters and societal struggles confronting the schools since the success of every society depends on the products of the school. Cooper and Miller (2019) report that "the level of learning style or teaching strategy congruency is related to academic performance and to student evaluations of the course".

Statement of the Problem

In spite of the high level of innovation and changes in the educational sector, there are some challenges that are still confronting the practice of teaching and learning. Therefore, teaching preparations and activities should be done and organized to optimize class time with frequent opportunities to engage the students. Classroom activities are becoming boring to students who are digital natives, with the increasing use of the internet; undergraduate students are no longer interested in traditional classroom activities and need to be exposed to new teaching strategies. The activities of the 21st-century teaching strategies encourage the use of digital tools for teaching and learning. However, recent developments have shown a marginal decline in undergraduate students' performance in ICT-related courses. Based on these observations, the researcher is interested in finding out what could be responsible for this poor performance. Could it be a lack of facilities in the faculty for the teaching of the course? Could it be the teaching strategies used by lecturers in teaching this course? The thrust of this study, therefore, is to answer the question; can Augmented Reality Instructional Strategy improve Undergraduate Students' Academic Performance in ICT in Education course at the University of Calabar?

Aim and Objectives of the Study

The aim of this study was to investigate the effect of Augmented Reality Instructional Strategy on undergraduate students' academic performance in ICT in Education course in University of Calabar. Specifically, the study sought to;

1. determine the effect of Augmented Reality Instructional Strategy on students' mean performance scores in ICT in Education course.

2. find out the effect of the discussion method on students' mean performance scores in ICT in Education course.

Research Questions

The following understated research questions were raised to guide this study:

1. What is the effect of Augmented Reality Instructional Strategy on students' mean performance scores in ICT in Education course?

2. What is the effect of discussion method on students' mean performance scores in ICT in Education course?

Hypotheses

The following hypotheses were formulated and tested at 0.05 significance level:

1. Augmented Reality Instructional Strategy has no significant effect on the students' mean performance in ICT in Education course.

2. Discussion teaching method has no significant effect on the students' mean performance in ICT in Education course.

Significance of the Study

This study will bring into focus the place of the 21st-century innovative learning strategies (Augmented Reality Instructional Strategy) for the improvement of undergraduate students' academic performance at the University of Calabar, Cross Rivers State. This study is significant in many ways. It will be beneficial to the students, lecturers, instructional designers, and curriculum planners. To students, the study will promote engagement, through active learning activities and inclusion of career and life skills among students through interaction during their learning process. To lecturers, it can become a new pedagogy of teaching and learning which is learner-centered actively providing the lecturers with the opportunity of acting as facilitators, coaching and mentoring in the classroom. It can also create a platform that supports knowledge transfer between lecturers and students. The research work will also task the lecturers to see the need for embracing this new approach to teaching, which will make learning more effective and result oriented.

METHODOLOGY

This study adopted a non-randomized, non-equivalent control group, pre-test, post-test quasi-experimental design. This design according to Nwankwo (2013) is a type of design that establishes a cause-effect relationship between the independent variable and the dependent variables. The study was carried out in Cross Rivers State which is one of the states in the South-South part of Nigeria. The population of the study consisted of all the 200-level undergraduate students taking ICT in Education course (EDU 203.1) in the Faculty of Educational Foundation Studies for the 2020/2021 academic session in University of Calabar. These include four hundred and fifty-eight (458) students offering the course ICT in Education. The sample size of this study consisted of two hundred and sixty-eight (268) 200-level students in the Department of Curriculum and Teaching (126), Guidance and Counselling Department (64) and Department of

Educational Foundations (78) in the Faculty of Educational Foundation Studies, University of Calabar who offered the Course ICT in Education for 2020/2021 academic session. A purposive sampling procedure was used in selecting the sample for the study. The reason for using these three departments is that ICT in Education course is domicile in the faculty where these three Departments are and as such, they have an idea of what the course is all about. The instrument for data collection was a researcher-made performance test on Computer in Education Course titled; ICT in Education Performance Test (ICTEPT). The face and content validity of the instrument was determined by three experts in the Departments of Educational Psychology, Guidance and Counselling and Curriculum and Teaching, University of Calabar. The reliability coefficient of the ICTEPT was determined with the Kuder Richardson Formula 21 (KR-21) technique which yielded a coefficient of 0.80. The method of data collection was done in phases. The researcher sought permission from the Heads of Department and Computer in Education course lecturers to use the students as well as some facilities in the selected departments. The next phase involved the readiness assurance process for the experimental group. The performance test was administered to students as pretest to determine the baseline knowledge. The researcher prepared an instructional package that suits the Assemblr Edu Augmented Reality online platform and then added the student to the classroom using their Gmail addresses and sharing class codes via the class general WhatsApp platform. The instructional packages were sent to the platform for the students to study and interact. During the class, the students were allowed to take ownership of their lesson, they interact among themselves, discussed the content and answered questions based on the content they have studied in the platforms. Post-test was administered at the end of three weeks. The data collected were analysed using mean and standard deviation to answer research questions. The null hypotheses were tested using t-test at

0.05 alpha levels. The statistical package for the social sciences (SPSS) was used for the analysis.

RESULTS

Research Question 1: What is the effect of Augmented Reality Instructional Strategy on students' mean performance scores in ICT in Education course?

Table 1: Effect of Augmented Reality Instructional Strategy on Students' mean performance scores in ICT in Education Course

Strategies		Pretest	Posttest	Mean gain
Augmented Reality Instructional Strategy	Mean	38.24	76.16	37.92
	N	126	126	
	Std. Deviation	9.89	15.44	

Table 1 showed that students taught with Augmented Reality Instructional Strategy had a mean score and a standard deviation of 38.24 and 9.89 respectively during the pre-test. After the post-test, students taught with Augmented Reality Instructional Strategy had a mean score of 76.16 and a standard deviation of 15.44 respectively. This indicated that Augmented Reality Instructional Strategy has an effect on the students' (pre-test and post-test mean) performance scores in ICT in Education course.

Research Question 2: What is the effect of discussion method on students' mean performance scores in ICT in Education course?

Table 2: Effect of discussion method on Students' mean performance scores in ICT in Education course

Strategies		Pretest	Posttest	Mean gain
Discussion method	Mean	38.41	65.21	
	N	78	78	26.79
	Std. Deviation	12.71	11.13	

Table 2 showed that students taught with the discussion method had a mean score and a standard deviation of 38.41 and 12.71 respectively during the pre-test. After post-test, the same students had a mean score of 65.21 and a standard deviation of 11.13 respectively. This indicated that the discussion method has an effect on students' (pre-test and post-test mean) performance scores in ICT in Education.

Hypothesis 1: Augmented Reality Instructional Strategy has no significant effect on the students' mean performance in ICT in Education course

Table 3: T-test analysis on the students' mean performance in ICT in Education course

		Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pair 1	Pretest – Posttest	37.92	18.53	1.65	-22.966	125	.000

Table 3 showed the degree of freedom of 125 at 0.05 level of significance, the t-calculated value of -22.966 and a p-value of 0.001 less than 0.05. Hence the null hypothesis is rejected. This indicates that Augmented Reality Instructional Strategy has a significant effect on the students' mean performance in ICT in Education

Hypothesis 2: Discussion teaching method has no significant effect on the students' mean performance in ICT in Education course

Table 4: T-test analysis on the students' means performance in ICT in Education course

		Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pair 1	Pretest - Posttest	-26.79	17.49	1.98	-13.533	77	.000

Table 4 showed the degree of freedom of 77 at 0.05 level of significance, the t-calculated value of -13.533 and a p-value of 0.001 less than 0.05. Hence the null hypothesis is rejected. This indicates that discussion teaching method has a significant effect on the students' mean performance in ICT in Education.

DISCUSSION

The analysis of the results presented in Table 1 showed that Augmented Reality Instructional Strategy has an effect on the students' (pre-test and post-test mean) performance scores in ICT in Education. The pair t-test analysis presented in Table 4 confirmed that there is a significant effect of the Augmented Reality Instructional Strategy on the students' (pre-test and post-test mean) performance scores in ICT in Education. This all indicates that Augmented Reality was effective enough to help students gain the learning competencies required for learning ICT in Education. The findings of this study support the findings of Jairo and Odhiaubo (2013) who studied the effect of the Augmented Reality Learning strategy and its Challenges. Their research discovered that augmented reality instructional strategy has an essential impact on the student's academic performance. Augmented Reality as it was described easy in use on the part of the teacher, which enabled him to engage intensively the learners in the learning situation, in contradiction to those in the controlled group who could not get fully engaged in the lesson but rather were led by the teacher to learn by memorization. The exploration of learning occurs with the teacher acting as a facilitator. And the application of AR learning in ICT in education occurs in a constructivist and student-centered manner by allowing students to learn according to their ability. The use of AR in learning influences students' cognitive load, which in turn influences student achievement. Incorporating AR into ICT learning can improve cognitive development and learning abilities and also improves students' achievement by reducing the cognitive load. The findings also differ

from that of Akpan and Abraham (2021) who studied the effect of a community of inquiry and students' academic performance in Computer in Education, University of Port Harcourt. The result revealed that during the pre-test students in experimental group had (mean =39.55; SD= 14.73), and in the post-test, they had (mean=75.18; SD=7.22). While those in the control group in the pre-test had (mean =37.45; SD=10.52) and in the post-test (mean=57.30; SD=10.28) after the administration of the instrument. This implies that students taught Computer in Education with the Community of Inquiry (CoI) instructional approach perform better than those taught with the discussion method. This was achieved by engaging students both in face-to-face interaction and online interaction. The cognitive presence of the students was measured based on the ability of the students to construct their own knowledge while embarking on their personal study. The social presence in the online group was measured based on their ability to project their personal identity to the online platform.

Table 2 revealed that the discussion method has an effect on the students' (pre-test and post-test mean) performance scores in ICT in Education. The result of the hypothesis in Table 4 shows that the effect of the discussion method on students' (pre-test and post-test mean) performance scores in ICT in Education was significant. This finding is in line with the findings of Zainal, Yahya and Rahman (2014) who reported "a statistically significant effect on the performance mean score of students taught using the discussion method. The discussion method espouses the teacher's guidance using purposeful questions aimed at directing learners' attention to important ideas and assisting them with hard-to-grasp concepts in ICT in education in a manner that other methods do not offer. This is because discussion creates opportunities for students to reflect on the storyline or the text language and this promotes comprehension. For teaching and learning of ICT in education to exert a positive impact on student's performance, classroom instruction

should include posing questions during lessons". Abeysekera and Dawson (2015) in a study also reported on "designing and teaching a third-year course with 30 students enrolled in education for enterprise in the economics faculty at the University of South Africa. The results revealed that videos contribute to the mastering of the concepts representing strong teaching present in the online component. The online technology in the individual space was inspiring and fostered independent and self-directed learning which corresponds to both emotional and learning presence, based on these the students had a positive perception of the use of video for learning".

CONCLUSION

The study concludes that augmented reality instructional strategy is one of the emerging technologies with great educational possibilities and is being incorporated by various disciplines in education at different academic levels. It combines digital and physical information in real time while allowing for human participation. This combination is achieved by the use of various technical platforms, such as smartphones and tablets, to create a new reality enhanced with information from both the real and virtual worlds. This technology covers a wide range of topics, target groups, academic levels, and other factors. Augmented reality is a teaching strategy that allows the real world to be combined with digital information through different augmented reality technological devices. Elements such as 3D objects, multimedia content or text information are superimposed on real-world images. These elements increase the possibilities of interaction with the learners with the aim of improving the level of their retention.

RECOMMENDATIONS

Based on the findings and conclusion of this study the following recommendations were made;

1. Instructors should adopt the use of an augmented reality instructional strategy in teaching ICT in Education courses so that students could produce better and dependable results.

2. Faculties in conjunction with the University should organize conferences, seminars and workshops for lecturers in the Faculty of Education to expose them to the design and implementation of the current and innovative instructional strategies to promote students' performance in schools in the University.

3. Proper attention should be given to new pedagogies in the educational sector since the 21st century has brought in new innovations in the system.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

REFERENCES

Abeysekera, L. & Dawson, P. (2015). Motivation and cognitive load in the flipped classroom: definition, rationale and a call for research. *Higher Education Research & Development*, *34*(1), 1-14.

Akpan, K. P. & Akpo F. (2018). Imo app blended classroom and students' academic performance among postgraduates in faculty of education, university of Port Harcourt, Rivers State. *IOSR Journal of Research & Method in Education (IOSR-JRME) 8 (3), 38-47.* www.iosrjournals.org.

Centre for Education Innovation (2016): Annual Report.

Cooper, A. L. & Miller, S. (2019). Student learning styles adaptation method based on teaching strategies and electronic media. *Educational Technology & Society*,12 (4), 15–29.

Gutek, (2012). *Education in global context: Institutional effectiveness practices in college and universities.* Retrieved on 25-07-2018 from http://eserv.uum.edu

Hew, K. F. & Brush, T. (2017). Integrating technology into K-12 teaching and learning: current knowledge gab and recommendations for further research. *Journal of Education Technology Research and Development*, 55(5) 223-224.

Jairo, S. S. & Odhiaubo, C. L. (2013). Utilizing mobile-augmented reality for learning human anatomy. *Procedia Social and Behavioural Science, 197, 659-668*

Nwankwo, O. C. (2013). *Practical guide to research writing.* Third edition. Golden publishers. Niger Street. Port Harcourt.

Stenberg, L. (2002). Adolescence. New York: Mc-Graw hill

Zainal, R., Yahya, R. & Rahman K., A. (2015). Influences of gender on academic achievement of Fiber Optic Communication System: An experience of Politeknik Merlimau Melaka. *IOSR Journal of humanities and social science* (IOSR-JHSS) 19(8), PP 108-111 e-ISSN: 2279-0837, p-ISSN: 2279-0845.