

IMPRESSION OF AUGMENTED REALITY BY PRE-SERVICE TEACHERS FOR LEARNING

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Abstract

Augmented Reality (AR) refers to the blending of collaborating digital essentials that enthusiastically intermingle with real-world surroundings. However, its impact may not be well explored if users do not have positive impression about these innovative technologies. Therefore, this study investigated (i) the awareness of augmented reality for learning (ii) the level of impact of augmented reality for learning by pre-service teachers (iii) the difference in the impression of augmented reality by male and female pre-service teachers in colleges of Education. Quantitative research design was adopted for the study. The population for the study comprised all pre-service teachers in Kwara state and simple random sampling techniques was used to select 300 respondents from three colleges of education through a researcher developed questionnaire. The finding revealed that the pre-service teachers are aware of augmented reality strategies for learning and pre-service teachers have good impression about the impact of augmented reality for learning irrespective of their gender. The study concluded that the effective utilization of AR into the teaching and learning process could boost students' academic performance. This implies that lessons taught with the effective guide of AR could arouse learners' curiosity to understand the concept being taught. The need to evolve policy actions that will increase access to AR and actions to improve its quality especially into the learning system was therefore recommended.

Keywords: Impression, Pre-service Teachers, Augmented Reality, Awareness, Learning, Gender

Introduction

Learning is an important part of the educational/instructional process and it is the expected productivity of the instructional process. Thus, any instructional activity that has no effective learning output is just like a two-dimensional horse that cannot act. Adapting daises that are not intended for learning is not an easy task but is achievable with apposite guidelines and planning for both teachers and students (Jamari, Mohd Zaid, Mohamed, Abdullah & Aris, 2017). Technologies for learning can be real, adapted or adopted, Learning was regarded according to Heinich, Molanda, Russell and Smaldino (2002) as the acquisition of innovative knowledge, skills and boldness as a discrete interrelationship with information and the settings. Erstwhile, before the age of computer, realia were used in the facilitation of learning. Realia refer to certain real-life objects. The use of ICT gadgets may enhance professional growth speedily and lecturers who use computer system to work may gain quicker access to study materials through the internet. Learning may not necessarily be all digital but it can explore the benefit of digital resources in a unified and elaborated means (Bersin, 2017). Technology may not take over teachers' role fully but can be adopted by teachers to strengthen students' learning experience and comprehends an extensive spectrum of resources and performs (Basak, Wotto, & Belanger, 2018).

Berwald (2017) established that realia are not limited to a sequence of artifacts which define the customs and backgrounds of a culture, it as well supports the learning progression. They are also a set of teaching aids that facilitate the simulation of experience in the target culture. Teachers, instructors and students over the years have used realia as a learning resource in and outside the classroom. The recent technology boom,

shortage/unavailability of realia and the need to utilize technology in the instructional and learning process brought about the advent of virtual reality.

Virtual reality was developed to cover up some of the lapses of the realia especially the issues of unavailability and inaccessibility. Fominykh, Prasolova-Førland, Stiles, Krogh, and Linde (2018) described Virtual Reality (VR) as an experience occurred within simulated and immersive environments that can be parallel to or wholly different from the real world. Dede, Jacobson, Richards and Richards (2017) described the Virtual Reality interfaces to be known for providing sensory immersion, at contemporary concentrating on visual and audio stimuli with nearly haptic (touch) boundaries. The authors further stated that the participant can turn and move as they do in the real-world experience, and the digital setting re-joins to preserve the impression of occurrence of one's body in a simulated setting. The Augmented reality came as a bridge between virtual reality and the real life(realia).

Augmented Reality (AR) refers to technologies which devotedly intermingle with real-world backgrounds and context-based fundamental information. Widyasari, Nugroho, & Permanasari, (2019) described AR as the technology that merges virtual content with the physical world in such a way that the two complement one another. Similarly, AR can be defined as a Medium wherein digital information overlays the physical world depending on the perspective of the individual interacting with and experiencing the AR Medium (Sommeraurer and Oliver 2018). Although AR is an emerging technology in education with high relevance for teaching, learning, and creative inquiry, it has been adopted and used in the military for over 50 years.

Cizmecci (2019) established that while majority of people are aware that augmented reality predominantly lies on superimposing digital layers onto a real-world backdrop, Remote augmented reality takes matters further in enabling users to interact with one another through Augmented reality strategies from any location around the globe. Awareness determines impression and impression have strong relationship with utilization, thus users of any technology should be aware of its relevance before its adoption. Also, Fombona, Vazquez-Cano and Valle (2018) deduced that AR allows for the amalgamation of digital and physical information in real time situation through variety of technological procedures. It could be through the use of smart devices with authentic applications to enhance the instructional processes. Akcayir and Akcayir (2017) also confirmed through their study that AR has become an emerging technology with prodigious possibilities for its use in education.

This connectivity of the physical world resources augments students' experience and understanding (Dunleavy, Dede, & Mitchell, 2009) hence the name Augmented Reality. The shift to Augmented reality is aim at teaching students on their standings by integrating technology that can surpass their opportunities in order to stimulate and engage them in a way that meets their needs and interests. The technology of Augmented reality can be revolutionary as it has the capability to create a real-life experience when used in instructional content and for learning purposes (Sommeraurer & Oliver, 2018). Impression of real or intending users on a particular technology affects the usage. This could either be positive or negative and could be a combination of both. Utilization of resources according to Andrea, Holz, and Vaughan (2015) is a complex behavioral phenomenon. The impression of any innovation including use of innovative technologies could differ by gender. Technology offers the opportunity for access to up-to-date research reports and knowledge globally which can be accessed through proper utilization of different search engines (Nwokedi, Nwokedi, Chollom, & Adah, 2017). Interactions with learning materials will help the students not to forget what they have learnt easily.

Statement of the problem

There are several factors responsible for the utilization of any technology. These factors could arouse users' interest to adopt such technologies as well as arrest their interest to continue using such technologies without cohesion. The use of realia for teaching and learning is an ancient and has lasted through the phases of human and technological advancement. Recently, their use for teaching and learning is gradually becoming

a problem due to their unavailability and inaccessibility where available. Also, the demand for a better learning experience in which the learner is immersed into the whole process is required due to the nature of the present-day learners (digital natives). Many technological inventions have attempted to bridge this gap but none offered the mediated and immersive learning with a touch of reality and virtually like the Augmented Reality. The Augmented reality combines the real world and virtual objects with a simultaneous interaction (Billinghurst and Denser 2012).

Although the Augmented Reality have been around for a long time, many pre-service teachers are neither aware of its existence which could be a major determinant of its utilization for learning. Sahen (2016) asserted that the decision-making process of innovation adoption involves five steps: awareness, attitude formation, decision, implementation (utilization), and confirmation. This innovative technology may have been explored in other nations of the world but little is been researched into as it is less adopted or not adopted in some cases in Nigeria. To this end, this study investigated preservice teachers' impression of augmented reality for learning in Kwara State.

Objective of the Study

The study investigated preservice teachers' impression of augmented reality for learning in Kwara State

Research questions

1. To what extent are pre-service teachers aware of augmented reality for learning?
2. What is the level of impact of augmented reality for learning?
3. What is the difference in the impression of augmented reality by male and female pre-service teachers?

Research Hypothesis

H₀₁: There is no significant difference in the impression of augmented reality for learning by male and female pre-service teachers.

Methodology

Research Design

The study adopted the descriptive survey research design. The method was employed in this research because of its reliability to give relevant and appropriate analysis that is capable of providing accurate results of the study.

Sample and Sampling Techniques

The population considered for this study are pre-service teachers in all colleges of education, in Kwara State. Purposive sampling technique was used to select three government owned Colleges of Education from all the colleges of education in Kwara State. Random sampling technique was used to select pre-service teachers from different schools of across the colleges of education.

Research Instrument

The questionnaire was used to collect data for this study and is a researcher developed instrument. The questionnaire comprised three sections. The first section is the demography and it contains the respondent's personal information like gender, school, and level. These questions were used to elicit respondent's personal data which are used as variables of comparison. The second section was on awareness of augmented reality for learning. Related and relevant items on each of the sections were generated. The

response mode of Aware and not Aware was adopted for this section. While the third section focused on impact of Augmented Reality by pre-service teachers to investigate how the respondents viewed the use of Augmented Reality, that is, the positive or negative impact. The response mode was strongly disagree, disagree, agree, and strongly disagree.

Validation of Research Instrument

The research instrument was validated by four educational technology experts and two computer science experts from several universities in Nigeria. A reliability test was carried out on the questionnaire using samples from a college of education in Kwara state other than the population for the study. The instrument was further pilot tested on 30 students on federal college of education, Osiele, Abeokuta, Nigeria. It was subjected to crumbach alpha and the result was 0.68 on awareness of Augmented reality and 0.79 on impact of Augmented reality for instructional purposes.

Procedure for Data Collection

A letter of introduction was taken to the appropriate authorities of the selected institutions in other to seek permission for the study to be conducted in their institutions. The questionnaires were administered to the students who responded willingly to the questionnaire items. None of the respondents were coarse to participate in this study as all were done with their consent. All information gathered from them for the study was used solely for this study and not for other purposes.

Data Analysis Techniques

Data was analyzed using suitable descriptive and inferential statistics. Frequency counts were used to shape the demographic date; mean was used to answer the research questions. while Mann-U Whitney was used to test the hypothesis. All the hypotheses were tested at 0.05 level of significance.

Results

Table 1:
Population of Respondents for the Study

Estimated Population	Returned	Return Rate
300	284	94.7%
Gender	Frequency	Percentage (%)
Male	114	40.1
Female	170	59.9
Total	284	100.0
Level	Frequency	Percentage (%)
NCE 1	86	30.3
NCE 2	142	50.0
NCE3	56	19.7
Total	284	100.0

The report presented in Tables 1 indicated the number of pre-service teachers in adopted for the study. A total of 300 pre-service teachers were sampled but 284 copies were properly filled and returned, this was thus used for the analysis. The table further show the distribution of respondents based on gender. The table revealed that 40.1% (114) of the respondents were male, while 59.9% (170) of the respondents were female.

Thus, this indicated that female respondents were more than the male respondents in this study. Table 4 shows the distribution of respondents based on Level. The table revealed that 30.3% (86) of the respondents were in NCE 1, 50.0% (142) of the respondents were in NCE 2 while the remaining 19.7 (56) of the respondents were in NCE 3.

Research Question One

To what extent are pre-service teachers aware of augmented reality for learning?

Table 2:
Awareness of Augmented Reality

S/N	Statement	Aware (%)	Not Aware (%)
1.	I have come across Augmented Reality concept before	89 (31.3%)	195 (68.7%)
2.	I am of the cognizant of the relevance of Augmented Reality for academic activities	101 (35.6%)	183 (64.4%)
3.	I am aware that the utilization of Augmented Reality enhances technological learning thereby improving performance	167 (58.8%)	117 (41.2%)
4.	I am aware that the use of Augmented Reality helps in practical activities and experimental study	96 (33.8%)	188 (66.2%)
5.	AR resources and tools to improve productivity and learning efficiency are ideas that I am conscious of	182 (64.1%)	102 (35.9%)

The awareness of AR was investigated and the results presented in table 2. It indicated that 31.3% of the respondents are have come across AR concept before while 68.7% claimed not to have come across AR concept before. Also, 35.6% of the respondents are of the cognizant of the relevance of Augmented Reality for academic activities while 64.4% of the respondents are not of cognisant of such. Others are as shown in table 2.

Research Question Two

What is the level of impact of augmented reality for learning?

Table 3:
Impression of Augmented Reality

S/N	Statement	SD (%)	D(%)	A(%)	SA(%)
1.	Usage of Augmented Reality will enhance my learning effectiveness	28(9.9%)	34(12.0%)	56(19.7%)	166(58.5%)
2.	Using Augmented Reality will improve my academic performance	36(12.7%)	32(11.3%)	48(16.3%)	168(59.2%)
3.	Augmented Reality supports the core areas of my study	16(11.6%)	14(4.6%)	142(50.0%)	112(39.4%)
4.	Use of Augmented Reality will help me in practical activities	28(9.9%)	84(29.6%)	116(47.1%)	56(19.7%)
5.	Use of Augmented Reality can improve my productivity and learning efficiency	42(14.8%)	36(12.7%)	118(41.5%)	88(31.0%)

6.	Augmented Reality can give me control over my learning	40(17.8%)	46(21.4%)	86(30.4%)	112(39.4%)
7.	Adoption of Augmented reality for learning will make me finish my course content/outline quickly	30(10.5%)	38(13.4%)	78(27.5%)	138(48.6%)

Research question 3 dealt on pre-service teachers' impression on the impact of Augmented Reality for learning. Item 1 revealed 9.9% representing 28 respondents strongly disagreed that Usage of Augmented Reality will enhance the learning effectiveness, 12.0% representing 34 respondents Disagreed with the statement while 19.7% representing 56 respondents Agreed with the statement and 58.5% representing 168 respondents Strongly Agreed with the statement. Item 2 revealed 12.7% representing 36 respondents strongly disagreed that Using Augmented Reality will improve their academic performance, 11.3% representing 32 respondents Disagreed with the statement while 16.3% representing 48 respondents Agreed with the statement and 59.2% representing 168 respondents Strongly Agreed with the statement.

Item 3 revealed 11.6% representing 16 respondents strongly disagreed that Augmented Reality supports the core areas of their study, 4.6% representing 14 respondents Disagreed with the statement while 50.0% representing 142 respondents Agreed with the statement and 39.4% representing 112 respondents Strongly Agreed with the statement. Item 4 revealed 9.9% representing 28 respondents strongly disagreed that Use of Augmented Reality will help them in practical activities, 26.9% representing 84 respondents Disagreed with the statement while 47.1% representing 116 respondents Agreed with the statement and 19.7% representing 56 respondents Strongly Agreed with the statement.

Item 5 revealed 14.8% representing 42 respondents strongly disagreed that Use of Augmented Reality can improve productivity and learning efficiency, 12.7% representing 36 respondents Disagreed with the statement while 41.5% representing 118 respondents Agreed with the statement and 31.0% representing 88 respondents Strongly Agreed with the statement. Item 6 revealed 17.8% representing 40 respondents strongly disagreed that Augmented Reality can give control over learning, 21.4% representing 46 respondents Disagreed with the statement while 30.4% representing 86 respondents Agreed with the statement and 39.4% representing 112 respondents Strongly Agreed with the statement. Lastly, 10.5% of the respondents representing 30 respondents strongly disagreed that adoption of Augmented reality for learning will make them finish course content/outline quickly, 13.4% representing 38 respondents Disagreed with the statement while 27.5% representing 78 respondents Agreed with the statement and 48.6% representing 138 respondents Strongly Agreed with the statement

Research Question Three:

What is the difference in the impression of augmented reality by male and female pre-service teachers?

Table 4: Gender Difference in Using Augmented Reality

Gender	N	Mean	Mean Gain
Male	114	26.39	0.88
Female	170	25.51	
Total	384		

The influence of gender on the use of augmented reality was presented in table 6. The mean score on male teachers' use of augmented reality was 26.39 while mean score on female teachers' use of augmented reality was 25.51. The mean difference was 0.88 indicated that male teachers use augmented reality more than their female counterparts.

Hypothesis One: There is no significant difference in impression of augmented reality for learning by male and female pre-service teachers.

Table 5: Mann Whitney U results on impression of AR for learning based on gender

Gender	N	Mean Ranks	Rank Sum	U	p
Male	114	27.93	153.00	182.000	0.77
Female	170	27.01	166.00		

Table 5 represents that there is no significant difference between the impression of male and female pre-service teachers on the use of augmented reality for learning [$U = 182.000$, $p > .05$]. The mean ranks considered indicated minute differences in the impression of male and female pre-service teachers on the use of augmented reality for learning although the mean rank of the male pre-service teachers was more than their female counterparts.

Discussions

Pre-service teachers are aware of the technologies for Augmented reality for learning. Cizmeci (2019) stated that virtual reality has been long touted as the innovation we are waiting for, there appear to be far more practical applications embedded in augmented reality. Also, Fombona, Vazquez-Cano and Valle (2018) in a study on Analysis of Geolocation and Augmented Reality on Mobile Devices, Social and Educational Proposals Related to the Environment and Field Trips and established that AR is gaining recognition drastically in all sectors around the globe. Cabero-Almenara and Barroso-Osuna (2019) pointed out that the AR-enriched notes were perceived by majority students as been easy to use and the students showed a true intention of utilizing AR for their training in collaboration with acquiring high degree of acceptance.

The impression of augmented reality for learning by pre-service teachers is positive. Widyasari, Nugroho, & Permanasari, (2019) described AR as the technology that merges virtual content with the physical world in such a way that the two complement one another. Similarly, AR can be defined as a Medium wherein digital information overlays the physical world depending on the perspective of the individual interacting with and experiencing the AR Medium (Sommeraurer and Oliver 2018). In addition, Wallace (2018) in a study on augmented reality and exploring its potential for extension established that AR is quickly becoming common in our day-to-day activities and in majority of data sharing field. Augmented reality has the ability of providing real-time and instant solutions by projecting coatings of information on real-world surroundings as this may create more attractive and evolving user experiences. Also, Kroll (2016) on Augmented reality deduced that AR is generating layers of digital information ahead of the physical world perceived and discovered through the IOS and Android devices.

There was no significant difference in level of impact of augmented reality for learning by male and female pre-service teachers in Kwara state college of education, Ilorin. The atmosphere empowers all the learners to wholly get enthralled in the erudition and in a way that makes experience a genuine learning environment (Raccoon-gang 2019). In support of this findings, Cabero-Almenara and Barroso-Osuna (2019) established that in recent times, AR has gained more relevance in the field of Education. Billingham & Denser (2012) shows a significant benefit to struggling readers when using AR in the classroom but more research is needed and thus points out the need for more research on AR in a classroom setting and the positive effect of interactive AR experiences on motivation, engagement and learning retention, especially for struggling readers.

Conclusion

Not everyone can learn effectively only by reading, some need the adoption of visual effect for proper comprehension and digestion. There is need for developers/designers to design the technology that can be influenced by the research to provide AR tools tailored for use in the classroom and with print-based text. As the technology evolves, teacher education should incorporate these new technologies into their training because when teachers are familiar with AR technology this could equipped them better to use it in the classroom as well as drive prospective advancement. This study concluded that both male and female pre-service teachers have good impression towards the use of Augmented reality for learning.

Recommendations

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

1. lecturers or course tutors in higher institutions of learning especially colleges of education should endeavour to adopt the usability of AR for teaching.
2. Curriculum planners should include augmented reality, learn the importance, ease of use and usefulness of AR for teaching and learning and therefore include it in the curriculum for pre-service teachers to learn its convention and application.

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