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How augmented reality can influence education systems

Gbenga T. Omoniyi*; Shahrudin Awang Nor; Nor Iadah Yusop*****

**Awang Had Salleh Graduate School, UUM College of Arts & Sciences, Universiti Utara Malaysia*
***SETARA, PPPM (PT) & Rating Manager, Strategy Planning Division, Institute of Quality Management, Universiti Utara Malaysia*
****School of Computing, UUM College of Arts & Sciences, Universiti Utara Malaysia*

Abstract

All over the world, the key to any meaningful development is education; however, method of acquiring this education in the time of our forefathers is no longer the same method needed in acquiring it in this age if meaningful development is anything to go by. Augmented reality is one of the newly discovered technologies that have received significant attention in recent time for their contributions toward educational growth. But there are some obstacles militating against the acceptance of augmented reality among the teachers and the students alike. Presented in this paper therefore is how augmented reality can influence education systems. The research employed survey method using exploratory research method established by Churchill. Statistical Package for the Social Sciences (SPSS) was used for the analysis of data collected. Findings in the study reveal that the restructuring of curriculum to include ICT education and making internet accessible and affordable with continuous training of teachers and students who are not digital natives are some of the means by which education systems can be influenced by augmented reality.

Keywords: *Education, Teacher, Student, Augmented reality, Influence, ICT, Internet*

1. Introduction

Recently, the increase in the use of e-learning tools and solutions is as a result of the sudden technology expansion, which has greatly influenced interactivity and how we run our day-to-day academic activities most especially, via web media contents [Bello and Akpojaro, 2019; Bello et al., 2018]. Traditional method of delivery contents of educational curriculum in classroom has greatly been combined with technology in the form of an embedded system [Olubummo et al., 2019] with positive outcomes to support the adoption in learning and teaching. Furthermore,

literatures have it that combining traditional face-to-face classroom with e-learning (augmented reality) results to more innovative system of teaching and learning [Shapley et al., 2011; Olubummo et al., 2019]. Education providers are expected to invest a good part of their personal time to get used to the innovative technologies in order to have the confidence of combining them in lessons, as these could really improve student attitude toward learning [Pierson, 2001; Olubummo et al., 2019]. But there are some adoption problems confronting augmented reality which has made it unacceptable as a supplementary and innovative means of delivery academic activities [Bello, 2018]. Presented in this paper therefore is how augmented reality can influence education systems among which are restructuring of curriculum to include ICT education and making internet accessible and affordable with continuous training of teachers and students who are not digital natives. In addition, it presents some realities that come with augmented reality [Bello et al., 2018].

2. Augmented Reality (AR)

Augmented reality can be defined as a system that combines real-time interaction, real and virtual worlds, and accurate 3D registration of virtual and real objects [Wu et al., 2013]. When the objects of the real world are improved upon by perceptual information that is computer-generated sometimes across multiple sensory modalities, among which are auditory, visual, haptic, olfactory [Schueffel, 2019], AR is said to be in action. The overlaid sensory information can either be constructive, that is, additive to the natural environment, or destructive, that is, masking of the natural environment [Rosenberg, 1992]. With this experience, AR is seamlessly interlinked with the physical world so much so that it is sensed as complete aspect of the real environment [Rosenberg, 1992]. Augmented reality in this way, alters perception of a real-world environment, whereas, virtual reality completely replaces the real-world environment with a simulated one [Steuer, 1993].

AR helps in enhancing the natural environments with enriched experiences, and with the advanced AR technologies such as computer vision, object recognition, smartphone embedded with AR cameras, the real world and its surrounded information becomes interactive and digitally manipulated. By this, it shows that AR plays a supplemental role, rather than replacing reality [Liu et al., 2007; Martín-Gutiérrez et al., 2010].

3. Augmented Reality in Education

Augmented reality in education is an advanced system whereby abstract and theoretical concepts become visualized for the support of students' interaction and engagement [Di Serio et al., 2013; Singhal et al., 2012]. Many benefits of AR in education have been attributed to the overwhelming research efforts being put into blending AR with traditional method of teaching and learning, especially for the subjects that need visualizing abstractions [Olubummo et al., 2019]. AR could also complement the traditional classroom method which does not give room for outside or distance learning by creating a learning experience through its technology-based approach [Burton et al., 2011].

4. Methods and Materials

The survey method used in this study was designed as an exploratory research study by Churchill [Shelton et al., 2004]. The survey instrument used in this work was designed for measuring ordinal variables. Small sample of junior secondary school teachers in Nigeria were chosen as the target population for this study and any conclusions draw from the results are for the purpose of applying it to larger population for further study. The survey was performed via questionnaire method which consists of the demographic profile of the teachers, and their familiarization with AR, their acceptance of AR, and the barriers that discourage them from accepting AR.

110 teachers participated in the survey, of whom 65 (59.09%) were female and 45 (40.91%) were male. Their age is between 30 and 55, with 60 (54.54%) being between 30 and 38 years of age; 35 (31.81%) being between 39 and 49 years of age; and the remaining 15 (13.63%) being between 50 and 55 years of age.

5. Results and Discussion

81 participants of whom female gender took the lead were already got used to classroom e-learning systems and together with the remaining 29 participants who are not e-learning compliant, they complained of unstable power supply, lack of internet accessibility and affordability, and lack of ICT training for the teachers who are not digital natives as barriers to adoption of AR in junior secondary schools in Nigeria. Shown in Table 1 are some of the barriers to use AR in classrooms.

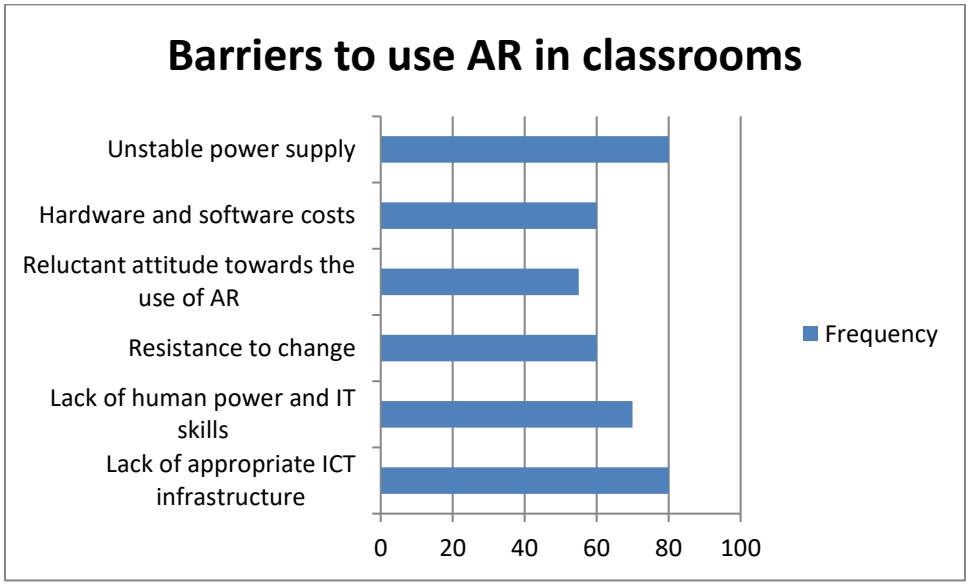
Table I: Barriers to the adoption of AR in junior secondary schools in Nigeria

Barriers to use AR in classrooms	**Likert scale**					
	Strongly agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Total**
Lack of appropriate ICT Infrastructure	80	20	5	3	2	110
	72.73%	18.18%	4.55%	2.73%	1.82%	
Lack of human power and IT skills	70	30	4	3	3	110
	63.64%	27.27%	3.64%	2.73%	2.73%	
Resistance to change	60	40	5	2	3	110
	54.55%	36.37%	4.55%	1.82%	2.73%	
	55	45	5	3	2	110

Reluctant attitude towards the use of AR	50%	40.91%	4.55%	2.73%	1.82%	
Hardware and software costs	60	40	5	4	1	110
	54.55%	36.37%	4.55%	3.64%	0.91%	
Unstable power supply	80	20	5	3	2	110
	72.73%	18.18%	4.55%	2.73%	1.82%	

Table II shows the bar chart analysis of the barriers to the adoption of AR in junior secondary schools in Nigeria. From the table, it is seen that lack of appropriate ICT infrastructure and unstable power supply are the most barriers to the adoption of AR in Nigeria with 80 participants strongly agreed to the fact, followed by lack of human power and IT skills that had 70 participants agreeing to the fact. Resistance to change, and hardware and software costs had 60 participants supporting the fact while reluctant attitude towards the use of AR had 55 participants that supported it as a barrier to the adoption of AR in junior secondary schools in Nigeria.

Table II: Graph of Barriers to the adoption of AR in junior secondary schools in Nigeria



6. Conclusion

This study was all about how augmented reality can influence education systems. Questionnaire method was used to survey the opinion of junior secondary schools' teachers in Nigeria. The

questionnaire contained the demographic profile of the teachers, and their familiarization with AR, their acceptance of AR, and the barriers that discourage them from accepting AR.

The results of the survey showed that young teachers employ more of e-learning as tool in classroom than the rest of the participants. Female participants were higher in number than their male counterpart, this suggests that female teachers need more of exposure to AR. Table I shows the Likert opinion of participants to the barriers of adopting AR in junior secondary schools in Nigeria. Lack of appropriate ICT, Unstable power supply, and Lack of human power and IT skills are the most barriers to the adoption of AR in junior secondary schools in Nigeria.

REFERENCES

Bello, R.W. (2018). Societal Adoption problems of Internet of Things (IOT)-A Study, International Journal of Advanced Research in Computer Science and Software Engineering. 8(9), pp. 5-11. DOI: https://doi.org/10.23956/ijarcsse.v8i9.864.

Bello, R.W., and Akpojaro, J. (2019). Application of social networking and cloud-based services to smart education, International Journal of Advanced Research in Computer Science and Software Engineering. 9(1), pp. 6-13. DOI: https://doi.org/10.23956/ijarcsse.v9i1.930.

Bello, R.W., Otobo, F.N., and Eru, E.J. (2018). "Virtual learning environment-Some realities," International Research Journal of Advanced Engineering and Science. Volume 3, Issue 2, pp. 372-374.

Burton, E. P., Frazier, W., Annetta, L., Lamb, R., Cheng, R., & Chmiel, M. (2011). Modeling augmented reality games with preservice elementary and secondary science teachers. Journal of Technology and Teacher Education, 19(3), 303-329.

Di Serio, Á., Ibáñez, M.B. And Kloos, C.D. 2013. Impact of an augmented reality system on students' motivation for a visual art course. Computers & Education 68, 586-596. https://doi.org/10.1016/j.compedu.2012.03.002

Liu, W., Cheok, A.D., Mei-Ling, C.L. And Theng, Y.-L. 2007. Mixed reality classroom: learning from entertainment. In Proceedings of the Proceedings of the 2nd international conference on Digital interactive media in entertainment and arts, Perth, Australia 2007 ACM, 1306833, 65-72. https://doi.org/10.1145/1306813.1306833

Martín-Gutiérrez, J., Luís Saorín, J., Contero, M., Alcañiz, M., Pérez-López, D.C. And Ortega, M. 2010. Design and validation of an augmented book for spatial abilities development in engineering students. Computers & Graphics 34, 77-91. https://doi.org/10.1016/j.cag.2009.11.003

Olubummo, D. A., Emmanuel, I. D., Otobo, F. N., and Bello, R. W. (2019). Combining Traditional Face-to-Face Classroom Practices with Computer Mediated Activities for Meaningful Learning Experience, International Journal of Advanced Research in Computer and Communication Engineering. Volume 8, Issue 6, pp. 1-9. DOI

10.17148/IJARCCE.2019.8601.

Pierson, M.E. 2001. Technology Integration Practice as a Function of Pedagogical Expertise. Journal of Research on Computing in Education 33, 413-430. https://doi.org/10.1080/08886504.2001.10782325

Rosenberg, L. B. (1992). The Use of Virtual Fixtures as Perceptual Overlays to Enhance Operator Performance in Remote Environments. Stanford Univ Ca Center for Design Research.Schueffel, Patrick (2017). The Concise Fintech Compendium. Fribourg: School of Management Fribourg/Switzerland. Archived from the original on 24 October 2017. Retrieved 31 October 2017.

Schueffel, P. (2017). The Concise Fintech Compendium. Fribourg: School of Management Fribourg/Switzerland. Archived from the original on 24 October 2017. Retrieved 31 October 2017.

Shapley, K., Sheehan, D., Maloney, C. and Caranikas-Walker, F. 2011. Effects of Technology Immersion on Middle School Students' Learning Opportunities and Achievement. The Journal of Educational Research 104, 299-315. https://doi.org/10.1080/00220671003767615

Shelton, B., and Hedley, N. "Exploring a Cognitive Basis for Learning Spatial Relationships with Augmented Reality," Technology, Instruction, Cognition and Learning, vol. 1, no. 4, pp. 323-357, 2004

Singhal, S., Bagga, S., Goyal, P. And Saxena, V. 2012. Augmented Chemistry: Interactive Education System. International Journal of Computer Applications. 49, 1-5. https://doi.org/10.5120/7700-1041

Steuer, Jonathan, "Defining Virtual Reality: Dimensions Determining Telepresence" Department of Communication, Stanford University. 15 October 1993.

Wu, Hsin-Kai; Lee, Silvia Wen-Yu; Chang, Hsin-Yi; Liang, Jyh-Chong (March 2013). "Current status, opportunities and challenges of augmented reality in education". Computers & Education. 62: 41–49. doi:10.1016/j.compedu.2012.10.024.