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Learners' Feedback on the Effectiveness of Replacing an Instructional MOOC Video with Augmented Reality in a Practice-Based Course

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Abstract

Recently, Massive Open Online Courses have become sensational in the field of distance learning. There is a plethora of advantages being listed in learning through MOOCs but this pedagogy lacks in few areas when compared with traditional classes. One of those inabilities of MOOC is its support to prepare the students for laboratory-based courses. The authors of this study chose a MOOC course that teaches Digital Photography and created an Augmented Reality (AR) experience for a module that explains the different parts of a digital camera. The 2nd year Multimedia students of Vellore Institute of Technology have been asked to experience the MOOC video followed by the AR experience. Their feedbacks before and after the AR experience has been statistically tested and reported. The results revealed that the students feel more confident and concentrate more when the instructional video was given as an AR experience. This study suggests that AR integrated MOOC modules might help in training students better for practice-based courses.

Keywords: MOOC, Augmented reality in education, Distant learning, Practice-based courses.

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Introduction

Massive open online courses (MOOC) has the potential to be one of the most successful distance learning methods because it does not have any boundaries in reaching the potential learners irrespective of their geographical location. MOOCs have many advantages as indicated by many types of research that are being carried out in this field of study but at the same time, MOOCs are receiving a lot of critics as well. There are many studies currently being targeted towards the area where the MOOC technology lacks and one of those areas is – '*MOOCs are not for laboratory/practical based courses'* (Phatak, 2015). The authors of this particular study would like to discuss how a MOOC lesson module can be altered to make it more suitable for a practical-based course such as cinematography, chemical labs, constructional engineering and so on. This study replaced a MOOC video module with augmented reality (AR) and hopes that it would prepare a class of multimedia and animation students in the Vellore Institute of Technology before their practical session on Photography. This article studied the student's confidence level of handling a camera for the first time before and after introducing the AR experience.

Related Literature

Notable Discomforts of MOOCs

One of the main disadvantages of MOOCs that are being reported is that only a few of the total enrolled learners complete the course (Hone & El Said, 2016). A similar study conducted by Watted and the team suggests that the motivation factor of the learners plays a major role in retaining a learner in the course and it depends upon the quality of the content in that MOOC course (Watted & Barak, 2018). A study headed by S. Evans suggests that a MOOC course's experience depends upon the set of skills possessed by the MOOC professors. The study has discovered that many of the MOOC course professors are trained professionals in their subject matter but very least experienced in online teaching (Evans & Myrick, 2015).

T. Eriksson researched the factors that influence learners to drop-out of a MOOC course. The findings strongly suggest that the learners' level of engagement with the contents of the course is one of the major factors that affect learner's retention (Eriksson, Adawi & Stöhr, 2017). Another article published by A. Yousef and the team discussed the importance of personalizing MOOC courses according to the personality of its learners. The article emphasizes providing course content according to individual learners' learning approaches and abilities (Yousef & Sunar, 2015). The study also states that the majority of MOOC courses are following the same pattern of contents such as videos and quizzes.

MOOC vs Practical/Laboratory Sessions

A few of the discomforts of MOOC that have been discussed above are mostly from the courses where a video-based explanation suffices. For example, courses such as computer programming and similar theoretical based explanations are comparatively easy to convey via simple video lectures that can be viewed and followed online. But, most of the engineering courses, art subjects and few of their kinds are heavily dependent on practical/Hands-on sessions. An article published by Phatak (2015) highlights how MOOC pedagogy lacks in providing training/demonstration as part of its module and also suggests blended learning for wider acceptability of MOOC pedagogy.

A similar study headed by R. Blackburn sheds light on the importance of preparing the learners for a practical/laboratory session. The study tested the learners with a simulation of the chemical experiments in their learning module and then exposed the class to the actual laboratory. The study observed risk-free lab sessions as a result (Blackburn, Villa-Marcos & Williams, 2019) and also received highly positive feedback from the learners.

Díaz carried out a similar study where they have insisted on the incorporation of practical based exercise for a MOOC course that deals with learning and designing electronic circuits. The researchers have come up with a remote laboratory equipped with virtual instrument system design (Díaz and et al., 2013) which enabled the incorporation of demonstrating/practicing designing electronic circuits online.

AR in Education

To support the facts that are being discussed here, K. Thompson in his article mention that the students enrolled in a MOOC course are not there just to see and hear but also to engage themselves in a participatory or collaborative work (Thompson, 2011). Augmented reality (AR) is one of a fast-growing simulation technology that has made its way into the education/training sector in recent years. Unlike Virtual Reality (VR), AR mostly does not need any specialized equipment to experience it and a decent Smartphone is enough to get started with Augmented reality.

T. Khan studied the impact of AR on education by implementing an AR mobile application in the study module of a class at the University of Cape Town. The results proved that there was a significant increase in students' motivating factors such as attention, satisfaction, and confidence (Khan, Johnston & Ophoff, 2019). A similar study conducted by Á. De Serio among the middle-school students studying visual arts found that AR-enabled teaching increases the students' enthusiasm to a level that cancels out most of the barriers in students' motivation (Di Serio, Ibáñez, & Kloos, 2013). Alike these researches, D. Sampaio tested the use of AR prototypes in the teaching-learning process and discovered that the

students' motivation levels were higher when interacting with the prototypes (Sampaio, & Almeida, 2018).

Purpose of this study

As it is been discussed in the previous chapters, MOOC does have a lot of advantages but also suffers from a few practical challenges. One of those challenges is its inability to facilitate a practical based/laboratory-based course to the remote learners. Even a few types of research are being done in achieving practical sessions amidst a MOOC course but the research designs are in an early stage (Díaz and et al., 2013).

The authors of this study want to know how good a MOOC course prepares the students for a practical/lab session. The authors also want to understand the level of confidence the learners possess to carry out their practice session before and after augmenting a MOOC module. As indicated by a few studies, the confidence of MOOC learners depends upon their motivation, concentration (Sampaio & Almeida, 2018) and enthusiasm (Di Serio & et al., 2013).

Method

Sample

The sample of this study is the 2nd year students pursuing their bachelor's in Multimedia and Animation at Vellore Institute of Technology (VIT), India. The class consists of 33 students (N=33) and one of their practice sessions is Digital Photography. During their first session for the aforesaid subject, students are usually asked to go through a MOOC course on 'Handling a Camera' which is available in the institution's online course database. The detailed video lecture shows the different parts of a camera and prepares them to handle a real digital camera in their hands-on session. The sample consists of both genders and all of them are between the age of 18 – 25. The class was chosen on purpose as they were suitable for the present study.

Instrument and Study Design

A simple questionnaire had been provided to the learners and they have been asked to rate their experience with the presentation. The questions were simple rating scales, how the learner was engaged with the presentation, how clear was the presentation and how confident they feel to handle the camera in the upcoming lab session. The respondents rated their experiences on a five-point Likert scale which represented (1) for Strongly Disagree and (5) for Strongly Agree. The responses were recorded digitally using Google Forms.

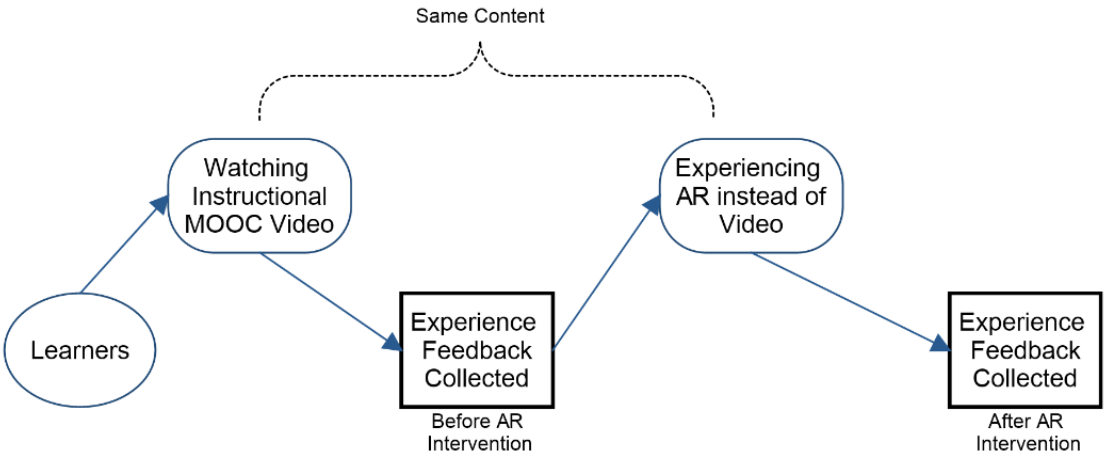

Figure 1. Representation of the research design

As we can see in Figure 1, the responses had been collected right after the online video experience and again the same questionnaire had been presented to the respondents after their AR experience (same group pre-test – post-test model). The sample for both responses is the same. The respondents were kept unaware of the upcoming AR experience to avoid biased responses.

Research Assumptions

The authors of this study assume the following conditions,

Null Hypothesis ($H_0 = H_1$)

There will be no significant change in the amount of learners' concentration and confidence rating after AR intervention. (H_0)

Alternate Hypothesis ($H_0 \neq H_1$)

There will be a significant change in the amount of learners' concentration and confidence rating after AR intervention. (H_1)

AR Experience Design

The authors took the exact content from the video module and applied them in the AR experience and rendered it as a smartphone app for easy viewing by the respondents. The original video shows the different parts of the camera and its specification one by one. For the AR experience, the authors studied the real camera and made a 3D model of it using *Autodesk Maya*. Then they took the model into *Unity Game Engine* and with the help of *Vuforia* software within it, they made an AR app that renders the camera model on a marker (some

unique picture that triggers the AR render). The respondents can view the camera model up close and from all angles and the 3D model was designed to look as close to the real camera.

The class has been asked to see the MOOC video on their mobile phones first. The respondents did not have any restrictions on the number of times the video can be seen. Once all the respondents were done watching the course, they filled the questionnaire.

Figure 2. Respondents experiencing AR presentation following their MOOC experience

Then, the whole class had been informed about the AR experience and the AR app designed especially for this study was installed on the respondents' smartphone. After the installation, the respondents used the markers given to them and experienced the same information from that online video but in the form of Augment Reality. Figure 2 shows a few respondents experiencing the AR version of the MOOC module. The respondents were asked to fill the questionnaire again right after their AR experience.

Results

The total number of respondents was 33 (N=33) and their responses had been recorded before and after their AR experience. Pre-test – Post-test research design was followed and the authors chose Wilcoxon Signed Rank Test (Non-Parametric) as the statistical method for the present study because the number of samples was less (N<50) and also the responses were not normally distributed. Another reason for choosing the aforementioned statistical test is because the responses are from the same sample (Two-Related-Samples Tests). The authors used SPSS software to process the responses.

Table 1. shows Wilcoxon Signed-Rank Test result for learners' level of concentration

Ranks – Ratings on Concentration Level				
		N	**Mean Rank**	**Sum of Ranks**
After AR - Concentration Level - Before AR - Concentration Level	Negative Ranks	3[a]	9.50	28.50
	Positive Ranks	13[b]	8.27	107.50
	Ties	17[c]		
	Total	33		

a. After AR - Concentration Level < Before AR - Concentration Level
b. After AR - Concentration Level > Before AR - Concentration Level
c. After AR - Concentration Level = Before AR - Concentration Level

According to the results shown above, the majority of the respondents' responses (N=17) tied in the comparison between MOOC video and AR presentation. A few respondents (N=03) felt that the AR presentation demanded less concentration from them but a significant number of respondents (N=13) felt that their concentration levels were higher during the AR presentation.

Table 2. Shows Wilcoxon Significance table for learners' level of concentration

Test Statistics[a]	
	After AR - Concentration Level - Before AR - Concentration Level
Z	-2.180[b]
Asymp. Sig. (2-tailed)	.029

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks

The above table represents the p-value of the Wilcoxon signed-rank rest. SPSS computed the 2-tailed significance as 0.029 and the standardized test statistic (Z score) as -2.180. Concerning this, the authors also performed the Wilcoxon signed-rank test on learners' self-rated confidence levels.

Table 3. Shows Wilcoxon Signed-Rank Test result for learners' level of confidence

Ranks – Ratings on Confidence Level				
		N	Mean Rank	Sum of Ranks
After AR - Confidence Level - Before AR - Confidence Level	Negative Ranks	4[a]	10.75	43.00
	Positive Ranks	16[b]	10.44	167.00
	Ties	13[c]		
	Total	33		

a. After AR - Confidence Level < Before AR - Confidence Level
b. After AR - Confidence Level > Before AR - Confidence Level
c. After AR - Confidence Level = Before AR - Confidence Level

Table 4. Shows Wilcoxon Significance table for learners' level of confidence

Test Statistics[a]	
	After AR - Confidence Level - Before AR - Confidence Level
Z	-2.465[b]
Asymp. Sig. (2-tailed)	.014

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

According to the computed results shown above in Table (3), out of 33 respondents (N=33), four learners felt (N=4) that their confidence level was higher after the MOOC video. On the contrary, the majority of the respondents (N= 16) felt more confident in handling the camera after experiencing the AR presentation. 13 learners' responses (N=13) were tied with this statistic test. According to Table (4), the computed value of standardized test statistic (Z score) of learners' confidence level is -2.465 and the 2-tailed significance value is 0.014.

Discussions

As per the results computed by SPSS, the authors would like to interpret the results statistically. For this study, it's assumed that if the p-value result is less than 0.05, then the statistical test is significant.

Table 5. shows Mean values are compared before and after AR intervention

Descriptive Statistics					
	N	Mean	Std. Deviation	Minimum	Maximum
Before AR - Concentration Level	33	4.0000	.96825	1.00	5.00
Before AR - Confidence Level	33	3.7273	1.03901	1.00	5.00
After AR - Concentration Level	33	4.3636	.92932	1.00	5.00
After AR - Confidence Level	33	4.2424	.66287	3.00	5.00

Table (2) shows the 2-tailed significance value (p-value) obtained from processing the learners' responses regarding their level of concentration. The obtained p-value 0.029 is lesser than 0.05 and hence statistically significant.

Learners' level of concentration scores was compared before and after AR intervention. As per Table (5), on average, learners' concentration level ratings were lower before (Mean= 4.0) than after the AR presentation (Mean= 4.36). A Wilcoxon signed-rank test revealed that this difference was statistically significant, T=107.50, z= -2.180 $p<0.05$

In Table (4), it is evident that the p-value obtained is lesser than 0.05 and hence it can be considered that the difference in learners' rating of their confidence is statistically significant.

Learners' level of confidence scores was compared before and after AR intervention. As per Table (5), on average, learners' confidence level ratings were lower before (Mean= 3.72) than after the AR presentation (Mean= 4.24). A Wilcoxon signed-rank test revealed that this difference was statistically significant, T=167, z= -2.465 $p<0.05$

Since the p-value of both the variables (Learners' concentration and Learners' Confidence) was lesser than the cut-off value of this study which is 0.05, the authors have rejected the null hypothesis and accept the alternate hypothesis.

Conclusion

As per the statistical analysis and the results obtained, the authors conclude that there is a statistically significant difference in the ratings before and after the AR presentation. The direction of the change can be understood from Table 5, the mean values of both the variables are higher after the AR treatment. So, it is safe to say that learners' do feel more confident and ready for their practical session when they are allowed to go through an AR simulation than a traditional, flat 2D video. The authors also believe that the engaging nature of AR increases learners' concentration, as well. MOOCs have been constantly receiving critics for not supporting laboratory-based courses and using Augmented Reality as an alternative way of presentation might help in preparing the learners better for their hands-on sessions. AR is still in its early stages and many studies are being concentrated on making MOOCs more friendly for practice-based subjects[1]. The AR module is also not very expensive to implement and apart from its benefits being discussed in this study, it might also improve other factors such as level of interaction, motivation and so on.

Future Work

The continuation of this study can be the observation of the students during their lab sessions. They can be monitored if the AR treatment shows any difference in their risk-free operation and the fluency in handling the equipment. Other factors such as interactivity and motivation can also be tested after the treatment. Further deeper field research is needed to study in what other ways AR can have an impact on MOOC courses.

References

Blackburn, R. A. R., Villa-Marcos, B., & Williams, D. P. (2019). Preparing Students for Practical Sessions Using Laboratory Simulation Software. Journal of Chemical Education, 96(1), 153–158. https://doi.org/10.1021/acs.jchemed.8b00549

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

Díaz, G., Loro, F. G., Castro, M., Tawfik, M., Sancristobal, E., & Monteso, S. (2013). Remote electronics lab within a MOOC: Design and preliminary results. Proceedings - 2013 2nd Experiment@ International Conference, Exp.at 2013. https://doi.org/10.1109/ExpAt.2013.6703036

Eriksson, T., Adawi, T., & Stöhr, C. (2017). "Time is the bottleneck": a qualitative study exploring why learners drop out of MOOCs. Journal of Computing in Higher Education, 29(1), 133–146. https://doi.org/10.1007/s12528-016-9127-8

Evans, S., & Myrick, J. G. (2015). How MOOC instructors view the pedagogy and purposes of massive open online courses. Distance Education, 36(3), 295–311. https://doi.org/10.1080/01587919.2015.1081736

Hone, K. S., & El Said, G. R. (2016). Exploring the factors affecting MOOC retention: A survey study. Computers and Education, 98, 157–168. https://doi.org/10.1016/j.compedu.2016.03.016

Khan, T., Johnston, K., & Ophoff, J. (2019). The Impact of an Augmented Reality Application on Learning Motivation of Students. Advances in Human-Computer Interaction. https://doi.org/10.1155/2019/7208494

Phatak, D. B. (2015). Adopting MOOCs for Quality Engineering Education in India. In R. Natarajan (Ed.), Proceedings of the International Conference on Transformations in Engineering Education (pp. 11–23). Springer India. https://doi.org/10.1007/978-81-322-1931-6_3

Sampaio, D., & Almeida, P. (2018). Students' motivation, concentration and learning skills using Augmented Reality. 1559–1566. https://doi.org/10.4995/head18.2018.8249

Thompson, K. (2011). THINGS YOU SHOULD KNOW ABOUT … TM MOOC s. EDUCAUSE Learning Initiative, 1–2. https://library.educause.edu/~/media/files/library/2011/11/eli7078-pdf.pdf

Watted, A., & Barak, M. (2018). Motivating factors of MOOC completers: Comparing between university-affiliated students and general participants. Internet and Higher Education, 37(December 2017), 11–20. https://doi.org/10.1016/j.iheduc.2017.12.001

Yousef, A. M. F., & Sunar, A. S. (2015). Opportunities and Challenges in Personalized MOOC Experience. ACM WEB Science Conference 2015, Web Science Education Workshop 2015, May, 3–5.

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