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STUDENTS' PREFERENCE FOR USING AUGMENTED REALITY IN TEACHING AND LEARNING A CONCEPT IN COMPUTER STUDY

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Abstract

Augmented reality (AR) has come a long way since it was previously only shown in science fiction films; it is now widely employed in the educational sector as well. The educational industry should not fall behind in the use of augmented reality to improve student teaching and learning. In addition, a few published studies have studied the use of AR in education, but the majority of these studies have not focused on content creation or the long-term impact of augmented reality on the respondents. This research is intended to fill a gap in the existing literature. The initiative is significant to the extent that understanding these areas is a useful indicator of what teachers and other stakeholders can do to improve the situation. The purpose of the study was to (a) determine whether there were any significant gender or academic qualification inequalities among respondents, and (b) determine how AR affected their learning process. A total of 76 students, 36 males and 40 females, participated in the study. Over ninety percent of the students surveyed in the study said that the augmented materials effectively communicated teaching and were beneficial to them. In addition, females (N = 40, mean = 29.35, SD = 3.13) showed a more positive outlook on the application of augmented reality than males. In addition, students with a higher level of education were more enthusiastic about the application of augmented reality.

Key words: augmented reality, instructional methods, collaborative learning, and interactive learning.

1. Introduction

Augmented reality (AR) uses a wide range of computer and information technologies to combine real-world objects, places, and people with computer-generated simulations (Ivanova & Ivanov, 2011). This technology has been used even before it was useful in the classroom because it does not require buying expensive equipment. By utilising augmented reality (AR) apps, teaching and learning materials are able to reach users in novel ways and take on a more three-dimensional appearance. When implemented effectively, AR increases students' levels of both motivation and concentration (Zhang, Sung, Hou, & Chang, 2014). In addition, augmented reality applications make it possible for students to carry out the learning process on their own. This saves the teacher time because they do not have to explain the topic over

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and over again. It also lets the teacher have less contact with the students, so they can have some element of a personalised and rewarding learning experience.

Augmented reality has the potential to help students learn and teach in a lot of different ways. It makes the process of acquiring, processing, and remembering information much easier. In addition, the use of this technology can make education more engaging and pleasurable for both the teacher and the students. In addition to this, it is not limited to a specific age range or educational level; rather, it may be utilised successfully in all levels of education, from pre-school all the way through college and even in the working environment (Aleksandrova, 2018). Therefore, it is the responsibility of researchers and educators working in the field of science to investigate the use of technology in the classroom to generate meaningful learning that is beneficial to the education community.

2. Theoretical Foundations

In the context of this study, a great number of augmented reality-related hypotheses were found to be relevant to the topic. Constructivism and active learning are two examples of these educational philosophies.

Constructivism

Constructivism is an approach to knowledge that puts the learner at the centre of the process of gaining knowledge (Murphy, 1997). Students in a constructivist classroom are encouraged to take responsibility for their own learning as they interpret new experiences in light of the knowledge they already possess. This occurs as students interpret new experiences in light of the knowledge they already possess. The degree to which a person is able to understand the material being taught to them depends not only on the information and concepts that are being presented to them but also on how well they are able to organise and reorganise the conceptual understanding that is already in place (Driver, 1989). The process of actively generating meaning through one's own experiences and interactions with the external environment is what we refer to as learning. Learning possibilities present themselves not only as a result of cognitive conflict or challenge but also through activities of problem-solving that are either spontaneous or deliberately planned.

Learning is a social activity that requires working together with others, negotiating with one another, and taking part in the actual activities of communities. Due to the way people learn, training that fits with these facts has a better chance of working. Students work collaboratively and assume responsibility for activities and decisions while teachers provide support in a constructivist classroom setting, which presents a difficult problem or challenge in an environment with a wealth of resources. This is an example of a typical constructivist instructional approach (Mays, 2015).

The implication is that a teacher should realise that students will learn better with the elimination of passive and authoritarian teaching styles in favour of active and activity-driven methods that involve each student in a process that involves concrete objects, real-world experiences, and augmented environments. In other words, a teacher should realise that his or her students will learn better if he or she gives up the passive and authoritative teaching style.

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Active Learning

The active activity shows how important it is for learners to be involved and take action during teaching and learning activities. This shows how important they are to the learning process. Learning is thought of as an active process of production that cannot be separated from doing and requires learners to think about what they are doing (Light, 2008). This is in contrast to passively taking in information.

On a dynamic level, it is impossible to separate activity from conscious learning because the two are inextricably tied to one another. It is absolutely necessary to have a solid understanding of activity systems in order to successfully create educational activities (structures of activities in their sociocultural and socio-historical contexts). Interactions take place between the various components of these systems (people, tools, objects, labour divisions, communities, and norms), including those that make up activities and conscious learning.

3. Methodology

The purpose of the research is to establish whether or not augmented reality is capable of imparting education and learning and to show that engaging in such an activity is helpful for the production of content and the acquisition of ideas. In addition to obtaining feedback from participants about the ways in which augmented reality impacted their learning while they were utilising the technology, the purpose of this research was to:

- determine whether or not there is a significant difference between males and females in their preference for the AR environment for learning;
- whether or not there is a significant difference in the perceptions that respondents have of their academic credentials;
- evaluate how AR has impacted the participants' learning strategies.

The material in the quantitative datasets is analysed statistically, but the information in the qualitative datasets is more subjective and open-ended. The quantitative datasets contain the material. It makes it possible for the "voice" of the participants to be heard, as well as the interpretation of observations (CIRT, 2019).

In addition, the research entails the simultaneous collection of qualitative and quantitative data, their independent analysis, and then a comparison of the results of the quantitative and qualitative analyses, i.e., the qualitative and quantitative survey data that was acquired. To accomplish both the validation of the quantitative findings with qualitative data and the supplementing of the quantitative findings with open-ended qualitative data, both of these components were essential.

This study looked at the verbatim reports of employees who had just been hired and were in the middle of an 18-month training course. For the study, 76 students from a single class were chosen as participants. There were a total of 36 males and 40 females in the sample. The administration of online surveys served as a means of gathering both quantitative and qualitative data.

Procedure

For this study, 76 verbatim reporter students from the same class were randomly split into two groups: the experimental group (made up of 37 learners) and the control group (made up of 39

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learners). On the other hand, not a single one of the participants had any prior knowledge of or experience working with augmented reality technology. The course coordinator was provided with a summary of the research, and the researcher was granted the appropriate permissions. Before the study began, both the teacher in charge of the course and the learners who agreed to take part in the research confirmed that it had been carried out following the appropriate ethical guidelines and with their informed consent.

The process of education encourages creative thinking and active participation from students. The goal here is to stimulate the interest of the learners in the computer study topic as it is being discussed. Augmented reality is a useful tool in this situation. The piece of hand-crafted artwork "Introduction to Computer Study" was integrated with a film that provided an instructive narrative on the subject of computer study. The augmented hand-drawn image that will be used in the teaching and learning videos for the course was created using the HPReveal (https://hpreveal.com) application. The HPReveal app is available for free download on both iOS and Android platforms.

The application was housed on a remote server and made available to all of the students through the deployment of the programme on the server. When the camera lens of the smartphone is focused on the picture of the hand-made object, the augmented instructional teaching and learning video starts to play. However, the video will not continue playing once the lens is no longer focused on the image. Each student in the experimental group saw the image, and they interacted with it by pointing the cameras on their smartphones at the target. Since the application is housed on a remote virtual server that is connected to the internet, it is necessary to have a connection to the internet in order to use it. The instruction for the control group took the form of a traditional classroom lecture.

Figure 1: Picture created by hand

Effect of Application of Augmented (EAA) was used to collect both quantitative and qualitative information about how they felt learning the concept in computer studies through an online survey. The questionnaire is organised logically as follows: The Likert-scale with four levels: strongly agree (SA), agree (A), disagree (D), and strongly disagree (SD) of nine items comprises six questions on the value of augmented reality to impart instruction and three on knowing if the augmented material is good and beneficial for content generation.

Three highly knowledgeable individuals in the field of technology and a non-educational expert examined this instrument. The instrument achieved a reliability coefficient of 0.72. The qualitative component posed the issue of how "augmented reality" has impacted their learning.

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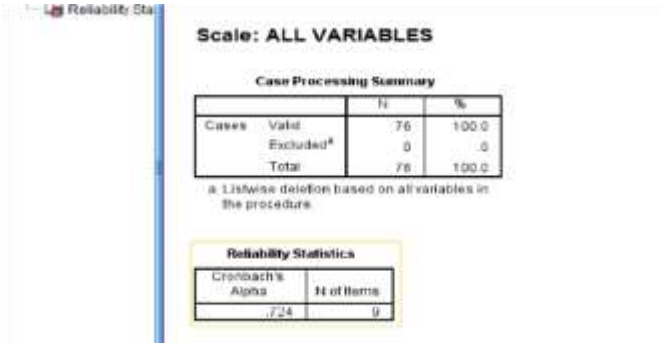

Figure 2: Test of dependability

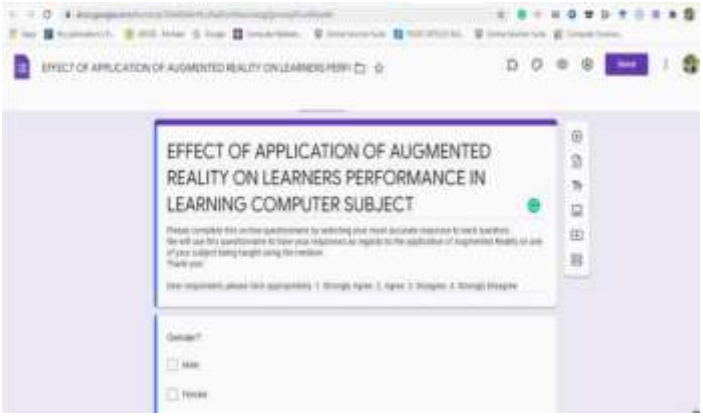

Figure 3: Screenshot of the online survey

4. Findings and Discussion

The demographic information

The investigation was conducted in a suitable atmosphere with 76 students enrolled in a training course for verbatim reporting. 36 males and 40 females were assigned to the experimental and control groups (n = 37 and n = 39, respectively).

Table 1: Demographic information

Group	Sex	
Experimental	Female	20
	Male	17
Control	Female	20
	Male	19

The purpose of this test is to establish whether or not augmented reality can deliver instructions. Over ninety percent of respondents said that the supplementary materials might be used to teach while they were being used (see Figure 4). The outcome was in line with what Bower, Howe, and McCredie (2014) found in a study that was similar to this one.

In the study of Robinson and Grover (2014), they looked at an example of "learning by design" using augmented reality in a secondary school setting. The subject of visual art is covered, and some samples of student work together with their comments indicate that the AR approach produced high levels of independent thought, creativity, and critical analysis in the students. Adedoja (2016) provided further evidence that students can use technological gadgets to effectively engage in verbal debate and the sharing of ideas with their fellow classmates. The intrapersonal learner also contains a mind that is capable of self-reflection. This type of student strives to understand the meaning and importance of the things they learn about. Learners have the option of using Web 2.0 applications on their mobile devices to communicate their thoughts and ideas with the teachers as well as with other students who are present in the classroom.

It is worth noting that one technological application or gadget can fully develop all of a student's intelligence in the context of a learning environment. Students would be able to participate in learning activities and be more successful if they used argumentation technology that was employed for educational reasons. This

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might be a significant step towards the development of multiple intelligences.

Figure 4: Level of Agreeing to AR communicating better instruction

Respondents asserted the following to bolster the figure 4 claim:

Student 1, Male, BSc By introducing me to more information about how technology might transcend the physical world and enter the digital realm, it enrich my understanding.

Student 2, Male. MEd 'Improved and realism of workplace technology. I am able to comprehend what I am studying.

Student 3, Female, BSc "To see learning from a new angle, given that we have control over the reality and augmented experiment." I had a great time and the communication was clear.

Student 4, Female, MEd It has streamlined the learning process because the communication is straightforward and allows for repeated play.

Student 5, Male, BSc I have never encountered such a novel and pleasant approach in education. The video lecture and the communication are crystal clear.

Student 6, Male, MEd In a few seconds, this experiment will see technology transcend the physical world and enter the digital realm. It actually conveyed the lecture well and nicely.

The findings were also in agreement with those of Martin-Gonzalez, Chi-Poot, and Uc-Cetina (2016), who carried out research on the usability evaluation of an augmented reality system for teaching Euclidean vectors. Their findings were consistent with the findings of the present study. They came to the conclusion that augmented reality (AR), which is one of the newest technologies, has shown itself to be a beneficial tool for increasing learning strategies and that the majority of users were enthusiastic about using the AR system to study.

In addition, a study by Turan, Gürol, and Uslu (2000) discovered that AR had a moderate impact on students' academic performance but had no impact on their perceptions of their own level of self-efficacy. It was reported that the students in the experimental group were satisfied with the utilisation of augmented reality in their classrooms and desired to use the technology in the future for additional classes and fields of study based on the results of interviews with them. This was apparent based on the findings of the interviews.

Furthermore, on the research subject of whether or not augmented reality is useful for the production of material while learning concepts, a significant number of students expressed that they appreciated the updated materials (see Figure 4). This result is consistent with the findings of Alakarppa, Jaakkola, Vayrynen, and Hakkila (2017), who came to the conclusion that the concept's combination of educational aspects and physical activity in an outdoor setting has promising potential. This result is consistent with the findings of Alakarppa, Jaakkola, Vayrynen, and Hakkila (2017). It was believed by educators that the use of natural materials, in particular, would improve the quality of the educational experience for students.

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According to Adi Badiozaman, Segar, and Hii (2021), students reported higher levels of engagement, which suggests that the learning experience caught their attention, piqued their curiosity, and helped them focus on the main aspects of the learning content.

The descriptive statistics (see Table 2) suggested that females (N = 40, Mean = 29.35, StD = 3.13) had a more favourable attitude towards the use of augmented reality than males (N = 40, Mean = 29.35, StD = 3.13).

Table 2: Gender descriptive statistics

	N	Mean	Std. Deviation
Female	40	29.35	3.13
Male	36	28.67	2.52
Total	76	29.03	2.86

According to the findings of Saleem, Kamarudin, Shoaib, and Nasar (2021), an augmented reality app's perceived utility, ease of use, and enjoyment are all directly influenced, while an individual's attitude towards usage and behavioural intention to use are indirectly influenced. The female students demonstrated this finding while participating in the experiment.

BEd./BSc./HND./BTech (N = 56, Mean = 28.98, StD = 3.03) and MEd./MSc (N = 20, Mean = 29.15, StD = 2.37), but the latter had a more favourable attitude regarding the application of augmented reality, as demonstrated by the descriptive data in Table 3.

Table 3: Mean of educational attainment

	N	MEAN	STD. DEVIATION
BEd./BSc./HND./BTech	56	28.98	3.03
MEd./MSc	20	29.15	2.37
Total	76	29.03	2.86

In addition, the majority of highly qualified students (Med/MSc) stated:

Student 1, Male, 'Because I've encountered numerous similar technologies though this seems different, but I'm proficient with them'

Student 2, Male. The working reality of technology. I comprehend its technological nature.

Student 3, Female, Because of my academic background, I believe I can flow with the procedures.

Student 4, Male, In a few seconds, this experiment will see technology transcend the physical world and enter the digital realm. Although I was exposed to something similar in school, it was not as comprehensive as this.

Student 5, Male, 'I had seen similar material during my graduate studies.'

The results of this study back up Adedoja's (2016) claim that the level of education of the participants is the most important factor in deciding whether or not mobile technology can help teach effectively. This could be because as people go further in their education, they tend to learn more about how complicated teaching is and how technology can be used to make learning easier. This helps them reach their educational goals. This could also be due to the fact that, as people progress further in their education, they are likely to become more knowledgeable and skilled about the complexities of teaching. For example, a person who has earned a Master's degree in contemporary instructional strategies and methods must have had more opportunities to interact with people working in the field of education than his first-year colleague. He employs the digital technology that is available in the twenty-first century. They would have been

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able to appreciate the immense benefits that technology can bring to the learning process if they had been exposed to it and experienced it firsthand, which would have equipped them with a solid technological foundation.

Ebner (2015) has noticed that mobile devices can provide a level of reach, scope, and immediateness that is completely invisible and impossible in traditional classroom settings. Everything comes down to having a carefully crafted didactic plan that is based on an efficient learning strategy.

4. Conclusion

The results show that students like the idea of using mobile technology to add augmented reality to their academic lessons. It is possible that this is because so many people use their mobile phones for other things as well. People in today's society use their mobile phones to do critical jobs in all aspects of our national life. This is true regardless of a person's socioeconomic status or their reading ability. Every significant actor in the education business is, without a shadow of a doubt, well aware of the fact that mobile technology confers upon them increased mobility and makes things more approachable.

This study adds to earlier research that looked at how much students learned after using an augmented reality teaching app. It is suggested that similar research be done over longer periods of time to lessen the effect of novelty, which may have caused problems. This study, along with others that came before it, has shown that augmented reality technology can be beneficial in educational settings. However, a significant amount of research on this topic is still in its infancy. It is necessary to conduct additional research in order to determine which types of educational activities will benefit the most from the application of augmented reality technology.

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