Volume 11, Issue 5
October 2022

ITEE Journal
Information Technology & Electrical Engineering

ISSN: - 2306-708X

Augmented Reality-Based 3D Instructional Environment to Improve the Technical Skills and Academic Achievements of The Students

[1]Shakeel Ahmed and [2]Dr. Mohamed Saad Eldin Mohamed

[1]Faculty of Ocean Engineering Technology and Informatics at University of Malaysia, Terengannu And

Department of Elearning And I.T, Jazan University, Saudi Arabia

[2]Department Instructional Technology, Faculty Of Education At The University Of New Valley, Egypt

E-mail: [1]shakeel321@hotmail.com, [2]mohamed_saad_99@hotmail.com

ABSTRACT

The current research aims to identify the effect of different styles of augmented reality communication in three-dimensional e-learning environments to improve the technical skills and academic achievement of the students at the College of Computer Science, Jazan University, and the research sample consisted of 39 students in the Department of Information Technology and Security at Jazan University on three groups. Each group consists of 13 students, and the two researchers divided them into three experimental groups with a different pattern of communication in each group. The research came out with a set of results, the most important of which was - there is a statistically significant difference at the level of (0.05) between the main achievement of the experimental groups for the research. Due to the basic effect of the communication pattern with augmented reality technology for the benefit of the group that combines the two types; synchronous and asynchronous communication, and there is a statistically significant difference at the level of (0.05) among the average skill performance of the experimental groups for the research is due to the basic effect of the communication pattern with augmented reality technology in favor of the group that combines the two types of synchronous and asynchronous communication.

Keywords: *Augmented Reality, Synchronous, Asynchronous, Technical Skills, Academic Achievement*

1. INTRODUCTION

The world is now witnessing a great and rapid civilization leap in light of the information technology revolution. A great development has been achieved in scientific and technological progress, and the power of nations is no longer measured by the number of their members or their natural wealth only. Rather, it is measured by what is available to it of knowledge based on science, culture, and education which is one of the pillars of national security in developed countries and determines the state's level and its position among the countries of the world. The development of information technology, network, and communication systems has led to a clear change in all fields, especially in the field of education. Educational institutions are no longer the only educational environment for providing education and learning services, with the emergence of the term E-Learning to a large extent in education services. The most important applications of communication technology in the field of education. At present, there are many challenges to face the transformations of traditional education to e-learning or virtual education based on digital and visual technology associated with advanced information and communication technology cohesion, and among these challenges are:

- Using modern technologies in appropriate proportions and applications in the teaching and learning process.
- The increasing diversity in the educational process and its relationship with students or learners prepared marginally. Secondly, they are enrolled in official educational institutes and schools, and they need new ways to learn them throughout their career and community life.
- Demand within the changing life community increasingly emphasizes the importance of acquiring flexible competencies in light of teamwork-based work structures [1].

Expectations indicate the spread of the e-learning system over internet in many countries of the world. Due to its importance, which has been emphasized by many foreign and Arab studies, e-learning is considered essential in many countries and universities that currently work with e-learning in addition to many universities in the United States of America and Japan. Arab countries, taking the names of the virtual university, the virtual university, and the interest in the spread of these universities has increased to the adoption of many international bodies and organizations to support the establishment of this system in university education, such as the World Bank financing the African Virtual University AVU, and the support of the Hanoi summit in the establishment of a virtual university of francophone agency affiliated La Francophonie [2]. The idea of virtual reality comes from the extent to which the learner can enter a virtual world created by default and wander within it. A person can see himself inside the crater of an explosive volcano and around it flying lava, or for a person to find himself wandering inside the respiratory system and moving between the vocal cords. All this happens while the person is sitting in front of the computer, and this is what we call virtual reality, which is what happens when the simulation exceeds its limits and enters the imagination and becomes

Volume 11, Issue 5
October 2022

ITEE Journal
Information Technology & Electrical Engineering

ISSN: - 2306-708X

complete realism in which the user interacts fully [3]. Augmented reality is simply a three-dimensional technology that merges between real and virtual reality, that is, between the real object and the virtual object and interacts with it in real-time while the individual performs the real task, and then it is a composite display that combines the real scene that the user sees with the computer-generated virtual scene, which doubles scene with additional information. So the user feels that he is interacting with the real world, not the virtual with a goal improving user perception. Tom Caudell, researcher at Boeing Company, were the first to introduce this term in 1990, in conjunction with his colleague David Melleil, when he asked them to find an appropriate alternative to electrical wiring drawings and expensive devices used to direct electricians on the factory floor as an alternative to plywood panels that are designed individual wiring instructions for each aircraft [4].

Figure (1) A student while using Augmented Reality environment

Among the previous studies that have been based on augmented reality technology is the study [6] "The effect of using augmented reality applications on mobile devices on developing the achievement and creative thinking skills of fourth-grade students," where the research aimed to know the effect of augmented reality on associated achievement in science and creative thinking among fourth-grade primary students and what is the effect of using augmented reality applications on mobile devices outside the classroom (at home on their own devices) on the development of achievement related to the science course and creative thinking among fourth-grade primary students, and what is the effect of the difference between the use of augmented reality applications on mobile devices inside and outside the classroom on the development of achievement in the science course and creative thinking among fourth-grade students. The results in this study concluded that there is a statistically significant difference at the level of significance (05,0) between the scores of the students of the first experimental group in the pre and post applications of the cognitive achievement test related to the science decision and the creative thinking scale in favor of the post application, and the results in this study reached. There is a statistically significant difference at the level of significance (05,0) between the scores of the second experimental group students in the pre and post applications of the cognitive achievement test related to the science decision and the creative thinking scale in favor of the post application.

There is also a statistically significant difference at the level of significance (05,0) between the scores of the students of the second experimental group in the post application of the cognitive achievement test related to the science course and the scale of creative thinking in favor of the post-performance of the second experimental group. There is a positive correlation relationship between the grades of the experimental group students. The second in the cognitive achievement test and the measure of creative thinking skills in the post application.

According to the previous studies [7] "The effectiveness of using projective and planned augmented reality in developing the academic achievement of the computer network course among educational technology students and their motivation in the investigation activities and their attitudes towards this technology." This study aimed to identify the effectiveness of using projective and planned augmented reality technology in developing the academic achievement of the computer network course among educational technology students and their motivation in investigation activities and their attitudes towards this technology. The study sample consisted of students of the fourth year in the Department of Educational Technology, where it included (30) male and female students as a control group that studied in the usual way, (30) male and female students as an experimental group that studied using augmented reality, and that study found statistically significant differences in the degrees of student achievement. Augmented reality technology, with its two types, projective and planned, in levels of achievement (understanding, application, analysis) and the presence of statistically significant differences in the development of trends attributable to the method of teaching and in favor of AR technology in developing motivation in the investigation activities towards learning.

Synchronous:

It is the mode of communication through which information is transmitted at the same time without delay, whereby data is exchanged between users at the same time directly. Examples of this pattern are virtual reality programs, 3D chatting [9]. The researchers define it procedurally as the pattern in which learners interact in a computer subject simultaneously through their communication at the same time on the Internet through 3D chat programs.

Asynchronous:

It is the mode of communication through which the transfer of information is stored or archived, and then the learner enters and receives the information. The researchers define it procedurally as the pattern in which learners interact in a computer subject asynchronously through their communication on the Internet through the Second Life program, which the researchers used and support AR technology.

An effective utilization of the augment reality environment needs to deal with both synchronous and

asynchronous communication. Therefore, the aim of this research is to develop an Augment reality based 3D Instructional environment using Synchronous and Asynchronous communication to improve the technical skills and academic achievements of the students.

2. RESEARCH PROBLEMS

From the previous introduction, it can be seen that there is a new perception of increasing the degree of interaction between the learner and the electronic content, as it keeps the electronic content from tampering with its content, and leads to the separation of the digital content from the program design and the user interface (User Interface). This perception has been reached based on the perception of informatics workers that the method of designing visual output affects the users' understanding of the information provided to them as well as their perception because the good design of screens affects the accuracy and validity of the data and the modern model and here is the three-dimensional model that represents Augmented reality technology, reality and fields of application. During the working environment, researchers encountered many obstacles that can be summarized as follows:

- Every student himself can't participate in the practical side of time constraints, which leads to failure to achieve the desired level of skill for each student.
- The danger of performing some practical applications, such as disassembling internal computer parts, as they are assembled with electricity.

The main reasons that called for the current study can be mentioned as:

- Impaired skill practices.
- The lack of time to provide for learning and meeting individual differences.
- The absence of opportunities to deal directly with all the elements of learning.
- The seriousness of some experiments.
- The difficulty of relying on education systems and the presentation of some educational situations, especially those related to skills such as equipment maintenance.

The research problem can be dealt with according to the following question:

What is the effect of different patterns of augmented reality communication in 3D e-learning environments to improve the technical skills and academic achievement of the Faculty of Computer Science at Jazan University?

Through this question, several sub-questions branch out?

- What is the augmented reality technology in the current study?
- What are the augmented reality programs and tools?
- What are the computer skills and maintenance?
- What is the effectiveness of using augmented reality to improve the basic technical skills for computer use and maintenance?

3. RESEARCH AIMS

The current research aims to identify:

- The effect of communication patterns (synchronous - asynchronous) with augmented reality technology, to improve the technical skills and academic achievement of computer science students.

4. RESEARCH IMPORTANCE

The results of this research can contribute to:

- Providing advanced scientific solutions to the university education problems that keep pace with modern technological developments in the field of education.
- Developing the educational process by providing educational courses with modern technological methods that attract learners and increase the effectiveness of education.
- To benefit in developing e-learning in the field of educational technology by employing augmented reality technology.
- Reducing the cost of learning while increasing effectiveness and educating the largest possible number of students with equal educational opportunities.

5. RESEARCH LIMITATIONS

The study adheres to the following limits:

- **Objectivity:** The research is limited to the course on human interaction with the computer.
- **Humanity:** The application of this research is limited to a sample of students of the Department of Technology and Information Security of the Faculty of Computer Science and Information Technology.
- **Timing:** implementing the proposed program in the 2019/2020 academic year
- **Resources:** www.secondlife.com

Volume 11, Issue 5
October 2022

ITEE Journal
Information Technology & Electrical Engineering

ISSN: - 2306-708X

6. RESEARCH METHODOLOGY

This research used the semi-experimental approach in identifying the success of using communication patterns with augmented reality technology by verifying the study hypotheses and measuring the effect of using that technology in presenting the computer course at the College of Education in the New Valley by examining the relationship between the independent variable and the dependent variable.

Research variables:

- **Independent variable:** the patterns of communication with augmented reality technology.
- **Dependent variable:** the students' technical skills and academic achievement.

Research Sample:

The researchers selected a random sample of 39 students in the Department of Technology and Information Security, and they were divided into three groups randomly. The two researchers will divide them into three experimental groups to be taught using augmented reality with different communication styles for each group.

Experimental Design:

Table (1) The Experimental Design of the Research

Experimental Groups	**Pre-achievement measurement and observation of skill performance**	**Experimental Treatment**	**Post-measurement achievement and observation of skill performance**
The experimental group (1) Using augmented reality through a simultaneous communication pattern	(1) BC	M 1	C (1) b
Experimental Group (2) Using augmented reality through asynchronous communication pattern	(2) BC	M 2	C (2) b
The experimental group (3) using augmented reality through the two modes of synchronous and asynchronous communication	(3) BC	M 3	C (3) b

Statistical Methods:

The current research used the One-Way Analysis of Variance (ANOVA), and statistical analyzes were made on the degree of gain, which represents the difference between the post-measurement score and the pre-measurement score on the skill-based scorecard, and the academic achievement test.

7. RESEARCH TOOLS

The research required the following tools to be performed.

- A list of educational objectives for the content and maintenance of the educational devices unit.
- An achievement test to measure the cognitive and skill dimension - prepared by the two researchers.
- Note card for students' skill performance - prepared by the researchers.
- Some of the devices for the augmented reality environment (helmet, electronic gloves, electronic glasses).

Preparing the Tutorial

After examining the more than one model for designing education, such as the Alessi & Trollip model [27], as well as the Dick & Carey model, Katia & Mary and the SLN model. From the Arab models, there are many different models for how to implement an educational design, but in their entirety, they stem from the "ADDIE" model, which is an abbreviation of five names for the five stages as shown in the figure Analysis, Design, Development, Implementation, Evaluation. Each stage has its output, which is considered the entrance to the next stage.

(Table 2) The general design model consisted of five stages, as shown in the following table:

Analysis	**Design**	**Develop**	**Implement**	**Evaluation**
Determine the educational needs and obstacles and the characteristics of the trainees	Determine the educational and technical specifications of the educational program	Transforming the design into a program that meets the needs of the learners	Conducting the education process	Evaluation of the effectiveness of the educational program And determine the extent of its efficiency

Volume 11, Issue 5
October 2022

ITEE Journal
Information Technology & Electrical Engineering

ISSN: - 2306-708X

In the following, the researcher explains each of the five stages:

- **Analysis Phase:**

The analysis stage is the first and most important stage of building an electronic educational program, as it is the basic step upon which the rest of the steps are built and the researchers explain to them as follows:

- **Needs Assessment:**

Needs are the set of changes required to be brought about in an individual related to his knowledge, skills, experiences, behavior, and attitudes [28]. At this stage, the learners' needs in the subject of computer are identified and maintained.

- **Identifying the constraints:**

Obstacles are what stand in the way of conducting educational programs in any educational institution, whether due to spatial, material, or temporal conditions.

- **Determine the learners' previous experiences:**

The two researchers conducted a set of personal interviews with the learners to determine their previous experiences and their knowledge of maintaining educational devices and computers, to determine the possibility of dealing with AR technology.

- **Determining the general and procedural objectives of the educational program:**

The process of setting goals is considered one of the important steps when preparing training or educational lessons, as it is the starting point on which the educational content is developed, as well as the endpoint where the achievement of those goals is measured at the end of the educational process and is an indicator of its success or not. Framework for setting goals with the following: Preparing a list of goals to be achieved through the use of augmented reality. The goals were limited to the following:

- Identify what augmented reality is
- Preparing a session to present the educational content.
- Improving the educational process by employing augmented reality in it.
- Exploiting all that augmented reality technology can provide in the educational lesson.

To measure the goals, it was necessary to formulate them in the form of phrases describing the performance expected of each learner after completing the educational program, which is known as behavioral or procedural goals, so the researchers prepared a list of objectives for the content of the educational program as follows:

Design Phase:

This stage includes determining the educational and technical specifications of the educational program based on the outputs of the previous analysis stage, which are as follows:

Development Phase:

In this phase, the design is transformed into an "educational program" product that meets the learners' needs.

Evaluation Phase:

The researchers made sure, before starting the application, to test the created program, to ensure that the session was sound so that all members of the research group could access it.

Skill Scorecard (build - set):

This card aims to identify the extent to which educational technology students have acquired the necessary technical skills in the course of computer use and maintenance.

Building a Scorecard:

The researchers performed the following procedures to construct the notecard.

- Determining the general objective of the notecard.
- Validate the performance note card.
- Stability of the scorecard.

Implementation and Evaluation Stage:

This stage includes the "ADDIE Implementation Model".

- The implementation of the pilot experiment.
- Basic Implementation experience.

Research Results:

The researchers used the torsion factor to identify the significance of the differences between groups in the pre-test scores, and the following table (3) illustrates the results of this analysis.

Table (3) Calculating the torsion coefficient to ensure the consistency of the research sample in the pre-academic test.

Sample	Number of the sample	Average	Standard Deviation	Mediator	Coefficient of Torsion
First Group	13	30.1	2.7	30.0	0.4
Second Group	13	30.1	2.7	30.0	0.4
Third Group	13	30.7	3.8	30.0	0.6

The results of the statistical treatment, as shown in the previous table, indicated that the skew coefficient ranges between ±1. This indicates the homogeneity of the research sample in terms of academic achievement. As for the skill performance, the researchers used the Levan test, and the test result showed the homogeneity of the research sample, as there

Volume 11, Issue 5
October 2022

ITEE Journal
Information Technology & Electrical Engineering

ISSN: - 2306-708X

are no statistically significant differences between the groups regarding the degrees of pre-skill performance. The torsion coefficient was also used to identify the significance of the differences between groups in the pre-test. Table No. (4) below shows the results of this analysis:

Table (4) Calculating the torsion coefficient to ensure the homogeneity of the research sample in the pre-skill performance

Sample	Number of the sample	Average	Standard Deviation	Mediator	Coefficient of Torsion
First Group	13	64.2	5.7	65.0	- 0.1
Second Group	13	64.2	4.4	63.0	0.9
Third Group	13	64.8	5.4	66.0	- 0.4

The results of the statistical treatment, as shown in the previous table, indicated that the skew coefficient ranges between ± 1. This indicates the homogeneity of the members of the research sample in the aspect of skill performance.

Presenting the Results of Academic Achievement:

The unidirectional method of analysis of variance was used to identify the significance of the differences between groups regarding academic achievement between the three experimental groups in addition to measuring the main effect of the independent variables on the dependent variables. Table (5) illustrates this analysis.

Table (5) One-way analysis of variance (ANOVA) using LSD Test)

Study variables	Synchronous connection mode		Asynchronous connection mode		Both Modes	
	Before	After	Before	After	Before	After
Average ± standard deviation	1, 30 ± 7, 2	33 ± 5 and 2*	9, 30 ± 8, 3	7, 33 ± 8, 3*	7, 30 ± 8, 3	5 and 37 ± 4.2 * ¶ §
Average relative change (Earning degree)	10.5% ↑		10% ↑		22.3% ↑	

It is clear to us from the previous Table (5) the significance of the differences in the achievement test for the variable of the synchronous and asynchronous communication type, and both types between the pre and post-measurement are statistically significant at the level (0.05) * within the groups; The significance of the differences between the variable of the synchronous communication style and the pattern of the asynchronous communication is not statistically significant at the level (0.05) #; The significance of the differences between the variable of the simultaneous communication style and both types are statistically significant at the level (0.05); The significance of the differences between the variable of the asynchronous communication style and both types are statistically significant at the level of (0.05) §; Mean ± standard deviation; mean percent change.

8. RESEARCH RECOMMENDATIONS

- The necessity of making use of modern technology and its applications, such as augmented reality technology, in teaching the computer course to other college students and other subjects.
- Paying attention to improve the skills of the students and teachers in the Faculties of Education to enable them to deal with the changes in the current era.
- Holding training courses for faculty members at Jazan University to train them in the use of augmented reality technology.

9. RESEARCH PROPOSAL

- Conducting more studies and research to study the impact of augmented reality technology in improving the educational process.
- Studying the possibility of using augmented reality technology in other courses.
- Study the effect of different augmented reality strategies to improve thinking skills.

10. CONCLUSION

Current research target to improve the technical skills and academic achievement of the students in computer sciences using Augmented Reality environments with Synchronous and Asynchronous communication patterns and research came out with a set of results, the most important of which was - there is a statistically significant difference at the level of (0.05) between the main achievement of the experimental groups for the research. Due to the basic effect of the communication pattern with augmented reality technology for the benefit of the group that combines the two types; synchronous and asynchronous communication, and there is a statistically significant difference at the level of (0.05) among the average skill performance of the experimental groups for the research is due to the basic effect of the communication pattern with augmented reality technology in favor of the group that combines the two types of synchronous and asynchronous communication.

REFERENCES

[1] M. Al-Hadi, E-learning via the Internet, 1st ed. Cairo: The Egyptian Lebanese institution, 2005, pp. 67-89.

[2] M. Abdel-Hamid, Networks education systems, 1st ed. Cairo: the world of books, 2005, pp. 121-135.

[3] S. Buntha, "CAVEMANDER: An Approach and Software Platform for Building Command and Control Applications in CAVE", Scholarworks.unr.edu, 2009.

[4] M. Attia Khamis, "Virtual Reality Technology, Augmented Reality Technology, and Mixed Reality Technology", Egyptian Society for Educational Technology, vol. 25, no. 1, pp. 65-78, 2021. [Accessed 12 July 2020].

[5] A. Al Dahasi, "The Use of Augmented Reality Technology in the Development of Mathematical Thinking Skills", Reading and Knowledge, vol. 3, no. 190, pp. 216-234, 2021. [Accessed 10 November 2020].

[6] A. Hamadah, "The effect of using augmented reality applications on mobile devices in developing the achievement and creative thinking skills of fourth grade pupils", Arab Society for Educational Technologies, vol. 34, pp. 259 - 318, 2017. [Accessed 5 June 2020].

[7] A. Ismail, "The Effectiveness of Using Projective and Planned Augmented Reality in Developing the Academic Achievement of the Computer Networks Course by Educational Technology Students", Journal of Educational and Social Studies, vol. 22, no. 4, 2016. [Accessed 1 January 2021].

[8] S. Al-Naji, A proposed visualization of the use of augmented reality technology in science teaching, 1st ed. Khartoum: University of Khartoum, 2013, pp. 163-187.

[9] H. Hufnagel and M. Geisen, Special aspects of moderating virtual classroom-scenarios. Stuttgart , Germany : Fraunhofer Institute for Industrial Engineering , Department of Human Resource Management, 2007.

[10] A. Al-Laqani and A. Al-Jamal, Glossary of educational terms, knowledge in curricula and teaching methods, 2nd ed. Cairo: Books World, 1999, pp. 56-67.

[11] A. Al-Issawi, Educational Psychology, 1st ed. Beirut: Dar ElRateb, 2000, pp. 18-20.

[12] E. Obari, "What is augmented reality technology and what are its applications in education", new education, news and ideas of educational technologies, 2021.

[13] A. Ismail, "The Effectiveness of Using Projective and Planned Augmented Reality in Developing the Academic Achievement of the Computer Networks Course by Educational Technology Students", Journal of Educational and Social Studies, vol. 22, no. 4, 2016. [Accessed 1 January 2021].

[14] J. Bacca-Acosta, S. Baldiris, R. Fabregat and S. Graf, "Augmented Reality Trends in Education: A Systematic Review of Research and Applications", Educational Technology & Society, vol. 17, no. 4, pp. 133-149, 2014. Available: https://www.j-ets.net/. [Accessed 8 December 2020].

[15] M. Muhammad Al-Husseini, "The Effect of Using Augmented Reality Technology in a Unit of the Computer Course on Achievement and Attitude of High School Students", Thesis.mandumah.com, 2014.

[16] M. Attia Khamis, "Virtual Reality Technology, Augmented Reality Technology, and Mixed Reality Technology", Egyptian Society for Educational Technology, vol. 25, no. 1, pp. 65-78, 2021. [Accessed 12 July 2020].

[17] E. Anderson and F. Liarokapis, "Using Augmented reality as a medium to assist teaching in higher education", in Eurographics 2010, Coventry, 2010, pp. 11-13.

[18] P. Werhane, "Mental Models, Moral Imagination and System Thinking in the Age of Globalization", Journal of Business Ethics, vol. 78, no. 3, pp. 463-474, 2007.

[19] M. Dunleavy and C. Dede, augmented Reality teaching and learning, 4th ed. New York: Springer, 2021, p. 3.

[20] D. Howe, "Definition of synchronous | Dictionary.com", www.dictionary.com, 2007. [Online].

[21] H. Hufnagel and M. Geisen, Special aspects of moderating virtual classroom-scenarios. Stuttgart , Germany : Fraunhofer Institute for Industrial Engineering , Department of Human Resource Management, 2007.

[22] L. D. MARIANO, N. Philline and C. DE LA ROSA, Beyond an Institutionalized Learning Environment Fostering Interactions and Learning Using Synchronous and Asynchronous Messaging Systems, 1st ed. Manila: University of the Philippines, 2004, pp. 265-276.

[23] N. Di Blas and C. Poggi, "European virtual classrooms: building effective “virtual” educational experiences", Virtual Reality, vol. 11, no. 2-3, pp. 129-143, 2007.

[24] R. Jones, J. Lou, L. Yeung, V. Lai, C. Man and B. Woo, "Beyond the Screen A Participatory Study of Computer Mediated Communication Among Hong Kong Youth", Department of English and Communication, City University of Hong Kong, 2001.

[25] L. D. MARIANO, N. Philline and C. DE LA ROSA, Beyond an Institutionalized Learning Environment Fostering Interactions and Learning Using Synchronous and Asynchronous Messaging Systems, 1st ed. Manila: University of the Philippines, 2004, pp. 265-276.

[26] M. campos and A. Construtivist, "Method for the analysis of networked cognitive communication and the assessment of collaborative learning and knowledge

building", Asynchronous Learning Network, vol. 8, no. 2, pp. 1-29, 2004.

[27] S. Alessi and S. Trollip, Multimedia for learning: Methods and Development., 3rd ed. Boston: Allyn and Bacon, 2000, pp. 216-228.

[28] "Identifying Training Needs", in at the First Arab Conference for Training and Human Resources Development - Future Vision, The Hashemite University- Amman - Jordan, 2006, pp. 116-120.

[29] A. Al Dahasi, "The Use of Augmented Reality Technology in the Development of Mathematical Thinking Skills", Reading and Knowledge, vol. 3, no. 190, pp. 216-234, 2021.

[30] A. Ismail, "The Effectiveness of Using Projective and Planned Augmented Reality in Developing the Academic Achievement of the Computer Networks Course by Educational Technology Students", Journal of Educational and Social Studies, vol. 22, no. 4, 2016.

[31] A. Hamadah, "The effect of using augmented reality applications on mobile devices in developing the achievement and creative thinking skills of fourth grade pupils", Arab Society for Educational Technologies, vol. 34, pp. 259 - 318, 2017.

[32] I. Souza-Concilio and B. A. Pacheco, "The Development of Augmented Reality Systems in Informatics Higher Education", in 2013 International Conference on Virtual and Augmented Reality in Education, Brazil, 2013, pp. 179 – 188.

[33] J. Mat-jizat, J. Osman, Z. Abidin, R. Yahaya and N. Samsudin, "THE USE OF AUGMENTED REALITY (AR) AMONG TERTIARY LEVEL STUDENTS: PERCEPTION AND EXPERIENCE", Semanticscholar.org, 2015.

[34] E. Klopfer and K. Squire, "Environmental Detectives—the development of an augmented reality platform for environmental simulations", Educational Technology Research and Development, vol. 56, no. 2, pp. 203-228, 2007.

[35] S. Ahmed “An efficient implementation of thin client technology for e-learning in the Jazan University. 2014 International Conference on Web and Open Access to Learning (ICWOAL), 1-6

BIOGRAPHIES OF AUTHORS

Mr. Shakeel Ahmed received the degree in computer science from Pakistan, in 2003. He is a research student of Ph.D from Faculty of Ocean Engineering Technology And Informatics, University of Malaysia, Terengannu (UMT), Malaysia.. Currently, he is a Lecturer at Jazan University.

Dr. Mohamed Saad Eldin Mohamed is Associate Professor in Instructional Technology Department – faculty of education at the university of New Valley, He has more than 20 years experience in academic and research works. His research interesting in several fields such as Virtual Realty, Mooc, LMSs, and many others. He participated in many conferences in eLearning and educational technology.