

Augmented Reality Technology, and It's Effect in Improving the Acceptance to Use It among 7th Graders in Medical Technology Unit

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Abstract

The current study aimed at revealing the effect of augmented reality technology in improving the applicability of the seventh grade students in Medical Technology Unit. The study followed the experimental method according to the design of a pre-post type for the same case. The study sample consisted of 20 students among seventh grade of Beat Dagan school in east Gaza, acceptance scale was used to answer the main question of the study, as the results showed that there were statistically significant differences in the results of the scale of applicability between the pre and post applications in the favor of the post-application, also there is an effect of using the augmented reality technology in increasing students' acceptance to learn. The study recommended to using the augmented reality technology in teaching in order to overcome the problems and obstacles that face students and teachers in presenting scientific knowledge.

Keywords

Augmented Reality Technology, Acceptance for Using Augmented Reality Technology, Medical Technology

1. Introduction

1.1. Literature Review

The 21st century is witnessing tremendous and rapid developments in all fields, as the ruling and dominant element in this century the scientific and the technological progress. Therefore it is necessary to prepare for a new type of learning

that is compatible with the requirements of the age.

In the past few years, modern information technology has been employed in learning environments. In an attempt to overcome the negatives associated with traditional learning environments, it has been shown that some of these technologies have given a clear indication in improving learning outcomes and increasing the motivation to learn. Advances in the field of wireless communication have led to the development of learning into learning in one place (U-Learning).

In the context of the educational policy interest in keeping pace with these developments and advancing the learner in terms of preparation, training and care. It was necessary to adopt new advanced technological means, which are considered Augmented reality technology one of its methods and the most important because it works to link features of real reality with the appropriate virtual element. This leads to improve the perception of the real world that the learner sees or interacts with.

Augmented reality is one of the recent terms that have appeared recently. [Al-Duhaiman \(2020\)](#) defines it as a technology that produces a complex presentation for the user that mixes the real scene that the user sees, and the virtual scene that created by smart devices. The devices enhance the real scene with additional information, pictures, videos, and interactive graphics. Additionally, [Ahmad \(2016\)](#) defines it as a technology that allows converting real two-dimensional images into virtual images and interactive three-dimensional graphics on the screen of smart devices. Thus, it combines real reality with digital information. [Larsen et al. \(2011\)](#) define it as adding digital data, composing and photographing it and using digital methods of the real reality of the environment surrounding the human being, and from a technical perspective. Augmented reality is often associated with smart devices that can be carried. [Khalifa \(2010\)](#) refers to the possibility of merging virtual information with the real world, when someone uses this technology to look at the surrounding environment around him. The objects in this environment are equipped with information that swim around and integrate with the image that the person is looking at, and this technical development has helped a lot in the emergence of this technology, so we see it in personal computers and mobile phones, and we use it in our curricula.

The use of augmented reality technology in education is one of the different forms of e-learning, which depends in its applications on many learning theories. These theories include the behavioral theory that works to prepare the educational situation and provides the learner with stimuli that push him to respond and then enhance this response, and that is the structural theory. It works on building concepts through personal activities and observation, within interactive environments rich in multimedia; finally, social theory considers learning as a social practice ([Omar, 2017](#)). Also, augmented reality technology in its applications depends on the learning process that occurs within the learner and does not focus on the role of the surrounding environment. It also focuses on how to learn, not on the amount of learning. This is why augmented reality technology is considered a step in the direction of modernizing education for future educa-

tion (Ahmad, 2016). Amarji (2017) believes that augmented reality technology helps to understand information and it forms an accompanying supporter for learners that works to clarify ideas and solve problems and helps them to accomplish their duties (Muhammad, 2017). Thus, employing augmented reality technology in the educational process is important because there are many advantages provided by this technology in terms of tools and methods which information, pictures and videos are added to help in understanding the educational scene (Khamis, 2015). Therefore, the researcher believes that this technology is important at this time because of the advantages it offers to facilitate the learning process, especially in light of the spread of COVID 19.

Many studies have been carried out that used augmented reality technology in education, which have proven the effectiveness in the educational process, as the studies of Al Mugren (2020), Ahmad (2020), Liou, Yang, Chen, & Tarnng, (2017), Ahmad (2016), Mushtaha (2015), Dunser et al., (2012), these studies indicated that Augmented Reality as a technology that supports teaching and learning process. Also, it improves the motivation and the attitude for learning, and thinking development. The results of Chen (2013) study showed the effect of augmented reality technology and its ability to facilitate science learning, as well as the effect of augmented reality technology in teaching concepts as in the study of (Al-Husseini, 2016; Freitas & Compos, 2008).

As Ahmad (2020), Hsiao Chagn, Lin, & Wang (2016), Estapa & Nadolny (2015) confirmed on the necessity of employing augmented reality technology in education at different educational levels, which can improve students' ability to learn as well as increase their motivation towards learning. Du Toit-Brits (2019) recommends, to transform educational environments into self-directed learning environments through practicing new education by motivating students. Moreover, it helps in sharing their love for topics, and implementing teaching curricula that require students to actively learn through encouraging them to engage in learning.

Many researchers believe that the field is still open to perform more studies that use augmented reality technology to examine the importance of its use in education. The results provided knowledge to the students, such as in the studies of (Estapa & Nadolny, 2015; Al-Khalifa & Al-Otaibi, 2015; Hsiao, Chang, Lin, & Wang, 2016; Al-Dahasy et al., 2017).

Ahmad (2020) indicates that stimulating student motivation is one of the important educational goals that educational systems seek to achieve. Thus, it is considered a means that can be used to stimulate learners' motivation that makes them accept to practice learning effectively. And Abdel Latiff, Mahdy, & Abdel Fatah (2020) consider that the orientation towards attention to the learning acceptance among learners is an important topic, especially in light of the rapid developments in the field of technology.

Anderson & Liarokapis (2014) pointed out that augmented reality technology is characterized by a set of advantages, the most important one is interactive

through using it. Also, the combination of truth and assumption in a real environment, and the combination between the explanation of the actual teacher and the digital object that gives the educational position a lot of dynamism and activity, all this leads to increased acceptance to use in education.

In order for augmented reality technology to have an impact on education, students must have the acceptance to use it. Therefore, we find that many studies have recommended the necessity to pay attention to improve students' acceptance in different stages, such as the studies of [Kayacan & Ektem \(2019\)](#), [Shazly \(2015\)](#), [Abdel Karim \(2012\)](#), [Mahdi \(2014\)](#), [Al-Zubaidi & Ahmed \(2013\)](#) which confirmed that students who have the acceptance to use, have better results in achievement and performance.

1.2. Problem of the Research

In light of the foregoing, the researcher has a deep feeling of the necessity to use augmented reality technology in science education. In light of the problems facing science education and in response to global trends that refer to enable students to manage their learning according to their preferences, interests and abilities, the researcher sees the need to use techniques that contribute to improve students' ability to learn. As a result of the large availability of smart devices among general education students, which students use in order to communicate as well to play digital games and browse social networking sites and other programs. The researcher also noticed, through his work in the school curricula, that there are some deficiencies in presenting the curricula and enriching them with practical experiments and videos that explain the mechanisms of work of devices and pictures illustrating the different scientific structures. All of this led to a failure in the students understanding of many scientific knowledge presented in the school curricula, and also led to weakness in their acceptance to learn. This is confirmed by the exploratory study that the researcher carried out before performing the study, and the need for such a study lies in the small number of studies specialized to reveal the effect of augmented reality technology in improving the acceptance to use it. This prompted the researcher to research the acceptance of seventh graders to use Augmented Reality Technology in teaching medical technology unit.

1.3. The Research Question

What is the effect of using augmented reality technology in improving the acceptance among of the seventh graders in medical technology unit?

This question is divided into the following sub-questions:

- 1) What is the level of achieving augmented reality technology to the degree of acceptance to use it in teaching medical technology unit for seventh graders?
- 2) Are there statistically significant differences at ($\alpha \leq 0.05$) in the total average scores in the scale of acceptance to use augmented reality technology before and after the application?

1.4. Research Hypotheses

To answer the research questions, the hypotheses were formulated as follows:

- 1) Augmented reality technology does not achieve an acceptance to use in teaching medical technology unit among seventh graders more than (80%).
- 2) There were no statistically significant differences at ($\alpha \leq 0.05$) between student's scores average in the acceptance of augmented reality technology scale before and after the application.

1.5. Research Objective

The current research seeks to achieve the following objectives:

- 1) Detecting the level of achieving augmented reality technology to the degree of ability in teaching a medical technology unit.
- 2) Identifying the significance of the differences between student's scores in the scale of acceptance to use augmented reality technology before and after the application.

1.6. Importance of Research

The importance of research may:

- 1) The research provides a scale to measure the acceptance of augmented reality technology in the field of teaching science and technology.
- 2) It deals with an important aspect of the educational process, represented in providing solutions and proposals to activate teaching science and technology.

1.7. Delimitation of the Research

- 1) The limits of the research were limited on a sample of the seventh graders who were randomly selected from the seventh grade class of Beit Dajan Basic School (A) to implement the study.
- 2) The results of this research are determined by the tools that were prepared to measure students' acceptance to use augmented reality technology.

1.8. Definition of Terms

A number of essential terms have been mentioned in the current research, and the following is a definition of each:

Augmented Reality Technique: It is defined by the researcher as a system in which the virtual environment (represented by digital data from videos, pictures and texts) is integrated with the real environment (represented by the educational situations in medical technology unit established for seventh graders) through special techniques and methods aimed at improving student's acceptance to study medical technology.

The Acceptance Augmented Reality Technology: the researcher defines it as the degree of the learner's ability to use augmented reality technology in studying medical technology, and it is measured by the overall degree that the stu-

dent gets through the scale prepared by the researcher.

2. Research Procedures

2.1. Research Methodology

The researcher used the experimental approach in carrying out the research, as he adopted one group design, which is one of the experimental designs that depends on the pre and post measurement on the same group. The study sample was chosen randomly from the seventh grade students of the basic stage to apply the pre-scale on it, and after the experimental treatment using Augmented reality technology post scale was applied to measure the difference between the two scales.

2.2. Research Sample

The research sample was randomly selected from seventh graders from Beit Dajan Basic School (A) in East Gaza directorate and amounted to (20) students enrolled in the first semester of the (2017-2018) academic year, and **Table 1** shows the experimental design of research group. With the pre and post application.

3. Research Tool

The ability scale for using Augmented Reality Technology:

3.1. Initial Image of the Scale

The researcher reviewed the educational literature related to the aptitude models used in e-learning such as the aptitude model presented by Liaw, Marek, & Huang (2010), Mahdi (2014) model, where the scale was built in its initial form, and its consisted of (20) Test paragraphs, some of them are positive and others are negative. Five levels have been determined to assess the ability to use augmented reality technology from the student's point of view in all scale paragraphs, (very large (5), large (4), medium (3)), Few (2), very few (1) positive paragraphs, and reflects levels of appreciation in negative paragraphs.

3.2. Validity of the Scale

To ensure the validity of the scale and its validity to measure what was put to, the validity was measured through the following:

3.2.1. Validity of Arbitrators

To verify from the validity of the scale of the ability to use augmented reality

Table 1. The experimental design of the research.

Group	Independent Variable	Dependent variable
Experimental Group (20) students.	Augmented Reality Technology	Acceptance Augmented Reality Technology

technology, it was presented to a group of (5) specialists in the field of curricula and methods of teaching science. In order to express their opinions on the appropriateness of scale paragraphs to the purpose and the accuracy of the scientific linguistic drafting of the paragraphs, and to make appropriate modifications. Where the modifications of the masters of the arbitrators resulted in the exclusion of some inappropriate paragraphs and the addition of others, and some amendments were made in the paragraphs of the scale, thus the scale became in its final form consisting of (20) paragraphs of the ability scale.

3.2.2. The Internal Consistency Validity

An analysis of the paragraphs was made, and the correlation coefficient between the scale paragraphs and the scale as whole was calculated, and all the correlation coefficients between the scale paragraphs and the scale as whole were a statistical significance, as it ranged between (0.54 - 0.87) indicating that the scale paragraphs have a high degree of correlation with the scale as whole, which predicts validity.

3.3. Reliability of the Scale

The scale was applied on an exploratory sample consisting of (10) students of seventh graders from the same school and from outside the study sample, and through this the reliability of the scale coefficient was calculated as whole using the Alpha Cronbach, method, where the value of reliability was (0.83), This scale reassures, and indicates the possibility of using the scale.

3.4. Final Image of Scale

The scale became in its final form consisting of (20) paragraphs, after confirming the validity and reliability of the scale, thus the bony end of the scale is (100) degrees, where the degree that the student deserves depends on each paragraph of the scale, and on its response according to what is known about the responses in Likert scales that contain five responses (very large, large, medium, few, very few), so that the response in the positive paragraphs for each paragraph was given very large (5) degrees and the degree of response is large (4) degrees and the response is medium (3) The levels of the scale were reversed in the negative paragraphs, and the researcher edited the scale material and corrected it, then printed the scale to be ready for use in the research experiment.

3.5. Implement a Search Experiment

The researcher carried out the experiment in the first semester of the year (2017-2018) AD, after all the necessary procedures were set to carry out the experiment, and the time of the experiment took two weeks. Beginning with applying the research tool priori and ended with applying it posteriori. Then writing the degrees and entering the data and processing it statistically using SPSS program.

3.6. Statistical Methods Used in Data Processing

The statistical treatment of the data was carried out using the Statistical Package for Social Sciences SPSS to test the validity of the research hypotheses, and the following statistical methods were used:

- Descriptive statistical methods (arithmetic mean, standard deviation).
- Validity and reliability correlation.
- T-test.

4. Research Results

To answer the research sub-questions, the researcher tested the hypotheses and the results were as follows:

4.1. Results Related to the First Question

The first question states: **What is the level of achieving augmented reality technology to the degree of acceptance to use it in teaching medical technology unit for seventh-graders?**

To answer this question, it is necessary to verify the correctness of the first hypothesis, as follows:

“Augmented reality technology does not achieve an acceptance to use in teaching medical technology unit among seventh graders more than (80%).”

To verify the validity of this hypothesis, the researcher used T-test for one sample and the following **Table 2** shows that.

It is evident from the previous table that the value of the computerized “T” is greater than the tabular “T” value in the ability to use augmented reality technology, and this is statistically significant, as the value of the calculated average is more than the value of the critical average, which corresponds to (80%) according to (Mahdi, 2014) study which was adopted by the current study, thus we reject the zero hypothesis and accept the alternative hypothesis that states: “Augmented reality technology does not achieve a degree of acceptance for use in teaching medical technology units among seventh-grade students that is more than (80%)”.

4.2. Results Related to the Second Question

The second question states: **Are there statistically significant differences at a significant level ($\alpha \leq 0.05$) in the total average scores in the scale of acceptance to use augmented reality technology before and after the application?**

To answer this question, it is necessary to verify the correctness of the second hypothesis, as follows:

Table 2. The arithmetic means, standard deviations, “T” value and its level of significance for acceptance scale in the medical technology unit and the level of quality (80%).

scale	Means	S.D	df	T-test	sig
The acceptance using Augmented Reality Technology	95.20	1.361	19	312.793	0.001

“There were no statistically significant differences at ($\alpha \leq 0.05$) between student’s scores average in the acceptance of augmented reality technology scale before and after the application”

To verify the validity of this hypothesis, the researcher used T-test for two linked samples, and the following **Table 3** shows that.

It is evident from the previous table that the computerized “T” value is greater than the tabular “T” value in the ability scale as whole, and this indicates that there are statistically significant differences in the ability to use augmented reality technology in medical technology unit between the pre and post applications in favor of the post application. In this way, we accept the zero hypothesis that states: “There were no statistically significant differences at ($\alpha \leq 0.05$) between student’s scores average in the acceptance of augmented reality technology scale before and after the application”. We accept the alternative hypothesis that states “There were statistically significant differences at ($\alpha \leq 0.05$) between student’s scores average in the acceptance of augmented reality technology scale before and after the application”

It is also evident from the previous table that the size of the impact of augmented reality technology on the ability of using it in medical technology unit of seventh graders was large, and this indicates that learning using augmented reality technology has achieved a large impact on its acceptance to use.

5. Discussion

The researcher believes that the reason for this may be because to:

1) The learner interacted with the augmented reality technology, which provided the opportunity for the student to develop the acceptance towards, and it also raises questions, research and investigation in the learner, so he uses the technology accurately, searching to answers the questions, so it contributes to help him in thinking about all the issues and problems faced him in studying medical technology.

2) Augmented reality technology helped on presenting scientific experiments and chances that are difficult to find in the textbook.

3) The medical technology unit is provided with augmented reality technology contained a set of three-dimensional displays, visual effects, movement, graphics and images, which contributed effectively in enriching the educational situation, so its resulted in attracting student’s attention, and increasing their ability to learn, and their sense of enjoyment, satisfaction and desire to use technology.

Table 3. The arithmetic averages, standard deviations, “T” value and its level of significance for the scale of the acceptance of augmented reality technology in the medical technology unit as whole.

Scale	Group	N	Mean	SD	T-test	sig	η^2	Effect size
Total Scale	Pre-test	20	23.50	4.729	65.012	0.000	0.99	Large
	Post-test	20	95.20	1.361				

The results of this research are consistent with Ahmad (2020), Al Mugren (2020), Al-Duhaiman (2020) & Ahmad (2016) study, which showed the effectiveness of the augmented reality in developing visual thinking skills, motivation, and achievement. A study of Mushtaha (2015) achieved effectiveness in developing creative thinking and the attitude towards science. The results of the study Chen (2013) showed an effect on students who studied with augmented reality with cooperative couples. The study of El-Sayed (2011) showed that the augmented reality technology increased the ability of imagination, and also showed a positive effect in favor of the experience. Sumadio & Rambli (2010) study results confirmed that there is a harmony among the users of augmented reality applications in learning environments.

6. Recommendations

In light of the research results, the researcher recommends the following:

- 1) Make use of augmented reality technology to overcome the problems and obstacles facing students and teachers in teaching science.
- 2) Hold training courses for teaching faculty members on how to link virtual reality, represented by augmented reality technique with real reality.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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