Artículo de investigación

Virtual Reality in Education from the Perspective of Teachers

Realidad virtual en educación desde la perspectiva de los docentes

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Abstract

Virtual reality is the system in which users feel that they are in a virtual world with various equipment and the users interact with this world. With this feature, virtual reality is very useful for many fields of activity, as well as education. Virtual reality applications in education enable students to gain experiences that are dangerous or impossible for them to acquire in real life and learn by doing and living. For this reason, virtual reality is an important innovation for future educational environments.
The population of this study is composed of teachers in private schools in Iraq in the 2017-2018 academic year. One hundred thirty teachers participated in the online questionnaire, 101 of which were considered valid. The sample consisted of 101 teachers who completed the questionnaire. Based on the findings, the results of the research were stated, and recommendations were developed.
As a result of the research, we realized that the vast majority of teachers think that virtual reality is interesting, encourages students to be active, is suitable for students with schematic and visual thinking style, provides students with a general idea about the subject, facilitates the implementation of information, makes it easier to learn, and it provides a quick review of the course they have studied. They also think it requires concentration.

Key Words: Virtual Reality, Education, Educational technology, Augmented Reality

Resumen

La realidad virtual es el sistema en el que los usuarios sienten que están en un mundo virtual con varios equipos y los usuarios interactúan con este mundo. Con esta característica, la realidad virtual es muy útil para muchos campos de actividad, así como para la educación. Las aplicaciones de realidad virtual en educación permiten a los estudiantes obtener experiencias peligrosas o imposibles de adquirir en la vida real y aprender haciendo y viviendo. Por esta razón, la realidad virtual es una innovación importante para futuros entornos educativos.
La población de este estudio está compuesta por maestros en escuelas privadas en Irak en el año académico 2017-2018. Ciento treinta profesores participaron en el cuestionario en línea, 101 de los cuales se consideraron válidos. La muestra consistió en 101 docentes que completaron el cuestionario. Con base en los hallazgos, se establecieron los resultados de la investigación y se desarrollaron recomendaciones.
Como resultado de la investigación, nos dimos cuenta de que la gran mayoría de los maestros piensan que la realidad virtual es interesante, alienta a los estudiantes a ser activos, es adecuada para estudiantes con un estilo de pensamiento esquemático y visual, les brinda a los estudiantes una idea general sobre el tema, facilita La implementación de la información, facilita el aprendizaje y proporciona una revisión rápida del curso que han estudiado. También piensan que requiere concentración.

Palabras clave: Realidad virtual, educación, tecnología educativa, realidad aumentada

Introduction

Development levels of today's societies are progressing in parallel with the science and technology they create (Karasar, 2004). From the general perspective, information technologies, in particular computers, serve as ancillary tools and parameters in the learning and teaching process.

If information technologies are used consciously, it increases the effectiveness of education. When

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used unconsciously and in an uncontrolled way, it is the biggest danger that will cause loss of opportunity and time in education. Therefore, we should be careful and meticulous when choosing these technologies in order to use them in the teaching and learning process (Akkoyunlu, 1998).

Rapid changes in science and technology have made it necessary to change living conditions. These changes have been reflected in the education process in all fields. Because of social expectations and requirements, it has been necessary to make arrangements in learning environments (Akkoyunlu and Kurbanoğlu, 2003).

Especially 21st century students, who are called digital natives", are distinguished from previous generations in such characteristics as wanting very fast access to information, preferring games and visual and graphic elements instead of long texts, having a parallel cognitive structure and performing multiple tasks simultaneously (Bilgiç, Duman and Seferoğlu, 2011, p. 4).

These features that digital natives brought from birth have led to innovations in the world of education. As Thomas and Brown (2016) point out, a new learning culture has emerged. This new generation takes the student into the center of learning the culture. It consists of the following three main elements:

1. New paradigms, theories, and approaches
2. Attributes, characters, and properties
3. New and updated integrated technologies (Cited from Günüç, 2017, p. 8).

Educational technology is based on communication in behavioral sciences and data related to learning. At this point, educational technology intelligently uses the available human resources and non-human resources related to education with appropriate methods and techniques and evaluates the results. In short, educational technology is a branch of science that examines the ways in which individuals reach their specific goals of education (Çilenti, 1988: 54).

The use of technology in education provides many benefits. These benefits can be listed as follows:

- Technology enhances the quality of learning.
- Technology reduces the time that students and teachers spend on achieving the goal.
- Technology increases teacher effectiveness.
- Technology reduces the cost of education without reducing quality.
- Technology makes the student active in their environment (Akkoyunlu, 1998: 4).

The use of technology increases the power of expression and, accordingly, positively improves the student's learning performance, while reducing the time allocated for explanation and practice (Serin, 2015; 2017a). Isman (2005: 1) defines technology as "practical applications for organizing the information used in achieving the specified goals, meeting the requirements and facilitating life."

With the spread of computer technologies, visuality has come to the forefront in computer environments, and realistic virtual environments have been created. These virtual environments, like all other fields, are of great importance in terms of educational activities. In the information age, we are in, the rapid dissemination of knowledge has revealed the desire of individuals to learn according to their learning speed, which necessitated the development of individual learning tools. Virtual reality environments have also become one of these tools, and we can define virtual reality as a system through which various users have the feeling that they are in a virtual world and interact with that world. Virtual reality is a technology that can be used to provide students with real experiences to ensure permanent and effective learning.

Virtual Reality

Stone describes virtual reality: "virtual reality is an interface between the three-dimensional graphical world and human and real-time computer applications." (Stone, 1995: 5).

It is generally accepted that the basis of virtual reality is in the computer-oriented 3D world. The interfaces of virtual reality allow participants to participate in the environment as a real-time practitioner, including one or more computers and several physical sensations adapted to the three-dimensional environment and several control devices (Ausburn & Ausburn, 2004: 34).

From another perspective, virtual reality is the adaptation of the participants to a real-time, three-dimensional synthetic medium through one

or more computers. Input to the system is performed simultaneously with body movements and verbal commands and with training aids such as rods, data gloves. The result is a simultaneous implementation of the participants' immediate feelings. This simultaneous application allows each participant to feel the real impact of the practice with full adaptation to the synthetic environment.

This effect should be understood in general as visual and auditory; touching can also be understood although it is limited (Boyer, 2002; Cited from Telhan, 2002: 18).

According to Kayabaşı (2005:152), Virtual reality is defined as the technology that enables 3D images and animations created in a computer environment to give the feeling of being in a real environment in the minds of people with technological tools and to interact with these objects in the environment.

The most important concept in virtual reality is that it gives the feeling that it is real. From this perspective, virtual reality is a three-dimensional simulation model that gives participants the feeling of being real and allows them to communicate with a dynamic environment created by computers (Bayraktar and Kareli, 2007: 4).

When we look at the virtual reality at the system level, we see the following definition: In a three-dimensional simulation of a real-world created by the computer, the user senses this simulation environment emotionally with the help of very special devices that he/she is wearing on his body, and he/she can effectively control this artificial world with these devices. In this framework, virtual reality applications allow users to enter the artificial world created by the computer, to experience various experiences there, and to direct it (Deryakulu, 1999: 5).

Augmented Reality (AR) is the presentation of virtual materials or objects interactively in the real environment (Azuma, 1999). In other words, it is the enrichment of a real environment with virtual materials (Serin, 2017b). In another definition, it is defined as: "The visual representation of virtual materials or objects in combination with the real environment through some technological devices (Camera, Smart glasses, Mobile device, etc.)." (Billinghurst and Duenser, 2012; Bujak et al., 2013; Lee, 2012). The basic operating principle of AG applications can be explained as follows: Virtual materials are triggered in a real environment with a visual, pointer, or coordinates of the location.

According to Burdea and Coiffet (2003: 2), virtual reality is a world simulation created using computer graphics, which has an image similar to the real world but is non-static and responsive to user input (Bostan, 2007: 99). With virtual reality, individuals can be found in impossible places, feel as if they are doing experiments that are dangerous to do so that they can have real-life experiences. For example, individuals can visit a museum in a very remote part of the world in a virtual environment, or perform a dangerous science experiment again in a virtual environment, and in doing so, they may forget the tools and feel that they are living in these experiences.

Augmented Reality Application Types and Principle of Working

AR applications are displayed in 3 ways (Wagner & Schmalstieg, 2003). As can be seen in Figure 1, AG applications are developed from the past to the present as marker-based, location-based, and markerless. Pointer-based AR implementations are performed as a virtual pointer or visual materials placed on a visual (Kato & Billinghurst, 1999). Location-based AR applications are performed in the form of triggering and displaying virtual materials in related locations in the real environment by using location information (with technologies such as GPS) (Azuma et al., 2001). In addition to these applications, however, new technologies developed recently on the AR field have introduced a third type. In this new type of AR, applications work without being bound to any markers and involve the individual using the application in interaction with virtual materials in the real environment. Therefore, it is called as Markerless Augmented Reality in the academic field. Today, these technologies are mostly used with new generation optical-based smart glasses (Hololens, Meta 2, etc.). In such an environment, the individual can manipulate virtual materials.

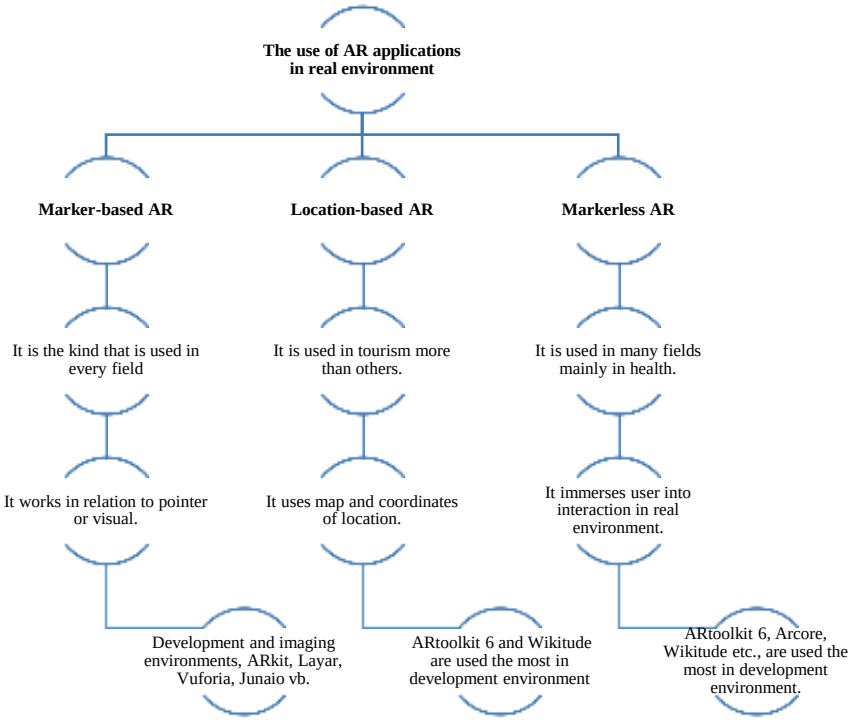

Figure 1. AR application types and features

The devices used to monitor AR applications are divided into two as video-based and optical-based. Video-based imaging is mostly provided with the help of mobile phones, computers, and tablets, while smart-based goggles and helmets are used in optical-based imaging systems (Carmigniani et al., 2011). One of the most important and most popular technological devices that have recently enabled AR applications to work is optical-based imaging devices. In particular, the Hololens smart glasses technology introduced by Microsoft has started a new era among optical imagers in the AR field (Stearns, DeSouza, Yin, Findlater, and Froehlich, 2017). Markerless-based AR applications that work without being connected to any marker and provide an interactive environment by sensing the user's hand movements are the prominent features (Leighton and Crompton, 2017).

Hololens AG applications that emerged in 2015 increased the interaction, and this feature attracted attention in many areas, especially in education (Leighton and Crompton, 2017; Márquez and Ziegler, 2017; Stearns et al., 2017). Smart goggles such as Meta 2, Acer MR, HTC Vive, and Glass and Hololens 2, are part of the AR glasses brands with an increasingly intensive network. Figure 2 illustrates a markerless based AR application environment of Hololense 2.

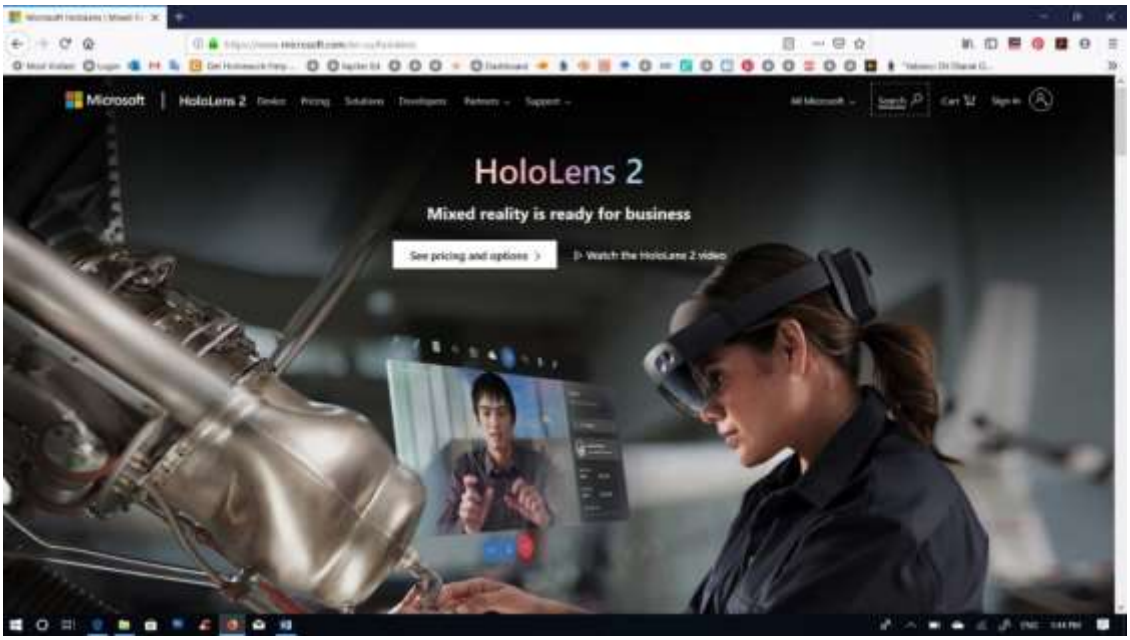

Figure 2. Adapted from https://www.microsoft.com/en-us/hololens

Virtual reality is used in all areas of life. These areas can be briefly examined under seven headings. These areas of application can be listed as follows: Entertainment, Tourism, Production, E-commerce, construction, medicine, and education. One of the areas where AR studies are used extensively in education and training (Leighton and Crompton, 2017).

Virtual reality and education

In the education sector, virtual reality applications provide students with real-life experiences and shorten the learning time and extend the retention of information. Not only do students have the opportunity to examine a volcano that is dangerous to be nearby, but it is also possible to develop historical knowledge by walking around the streets of the capital city of an ancient civilization that lived years ago. As such, it is possible for an individual who is trained in piloting to have a flight experience before a real flight, as well as to ensure the safety of the pilot candidate and other people. The same security situation exists in the field of medical operation training or science and technology experiments.

It can be said that academic studies on AR have become more and more important, especially in many specialties education in the last 20 years (Abdüsselam and Karal, 2015). In researches conducted at the K-12 and higher education level regarding the use of AG in educational settings, it is observed that AR technology increases students' interest and academic achievement in the lessons (Bower et al., 2014; Küçük, Yılmaz, and Göktaş, 2014). It is also known to make lessons and learning more fun (E. Gün, 2014; Yılmaz, 2014).

While AR applications could only be used via computers previously, mobile applications, which have become widespread in recent years, have started to be used in mobile devices such as smartphones and tablets. Mobile AR applications are applications that can create AR using a mobile device by using location, picture, or pointer icon (Erbaş and Demirer, 2015, p. 804). When the researches about AR applications are examined, it is observed that the effective use of new technologies such as AR in education may affect students' imagination (Arıcı, 2013), develop their creativity and increase their motivation and attitudes towards the lesson positively (Ersoy, Duman and Öncü, 2016). Especially in the teaching of science subjects, findings such as transforming the learning process from abstract to concrete and thus increasing academic success are the most significant effects of AR technologies on the education process. The use of these digital materials has reached more accessible and usable dimensions, especially in the teaching of applied sciences, where the use of technological tools and equipment such as mathematics, geometry, and science is needed more (Serin, 2017c). With the widespread use of the internet in digital media, hyper environments (video, audio, animation, pictures, etc.) and web 2.0 tools have

been used more in learning and teaching environments (Andersen, 2007; Greenhow, Robelia, and Hughes, 2009). Today, besides these technological tools, new applications are developed and used in learning environments through mobile and wearable technologies. One of these innovative digital technologies is Augmented Reality (AR) technology.

The development environments (SDKs) and AR imaging scanners that can be used to develop AR applications in mathematics and geometry are listed below (See Figure 3). These development environments and scanners allow developers and researchers to develop AR applications.

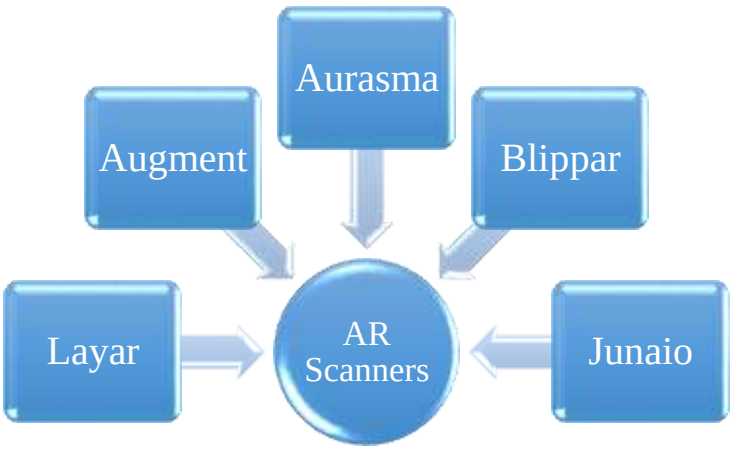

Figure 3. AR Development Environments and AR Scanners

The AG scanners, named in Figure 3, operate in such a way that the virtual materials of the AG application to be developed are transferred to a cloud of the scanner and displayed on a predetermined pointer with the aid of the mobile application of the scanner. With AG scanners, users who do not have programming skills are able to easily develop AG applications by preparing models and markers (Grubert, Langlotz, and Grasset, 2011). However, AG application development environments (SDKs), which require programming skills and are developed for more professional AG applications, are used more frequently in many areas, especially academic studies (Yuen, Yaoyuneyong, and Johnson, 2011).

When the opinions about augmented reality technology are examined, it is seen that augmented reality provides effective and high-quality education, enables learning by doing and experiencing, provides active participation in classes, and supports permanent learning. Besides, it is observed that the use in educational environments increases due to ideas such as being interactive and increasing motivation (İbili and Sahin, 2013; Uluyol and Eryılmaz, 2014; Yılmaz and Batdı, 2016; Wojciechowski and Cellary 2013). Today, a variety of teaching materials can be designed through augmented reality applications. These materials can be visualized in three dimensions and can create a sense of touch and movement by creating interaction between the user and the materials. Besides, user controls such as editing and modifying these materials can be provided (İbili and Şahin, 2013; Le and Kim, 2016).

In a study by Di Serio, Ibáñez and Kloos (2013) on the effect of augmented reality on the motivation of students with secondary school students in Spain, they concluded that the attention, interest, confidence, and satisfaction of the students increased. Sayımer and Küçüksaraç (2015), in their study titled "The contribution of new technologies to university education", raised questions about whether AR applications increase interest and motivation for unfavorable courses/subjects, 66% of the students answered as "yes", 24% answered as "partially", 10% answered "no". The students who answered this question positively stated that with AR applications, lessons, or subjects could become more entertaining and attractive so that their interest would remain on the subject for longer.

As an example of virtual reality applications in education, historical places created in the virtual environment can be given. The students can see the people of that region wandering the streets while wearing the Egyptian Pyramids. Additionally, virtual museums can be used in education. Examples of these museums include the Smithsonian National Museum of Natural History in the United States. On the official website of the Smithsonian National Museum of Natural History, virtual tours can be made within the museum (see Figure 4). Thus, a student in Erbil can walk around the corridors of this museum without going to America.

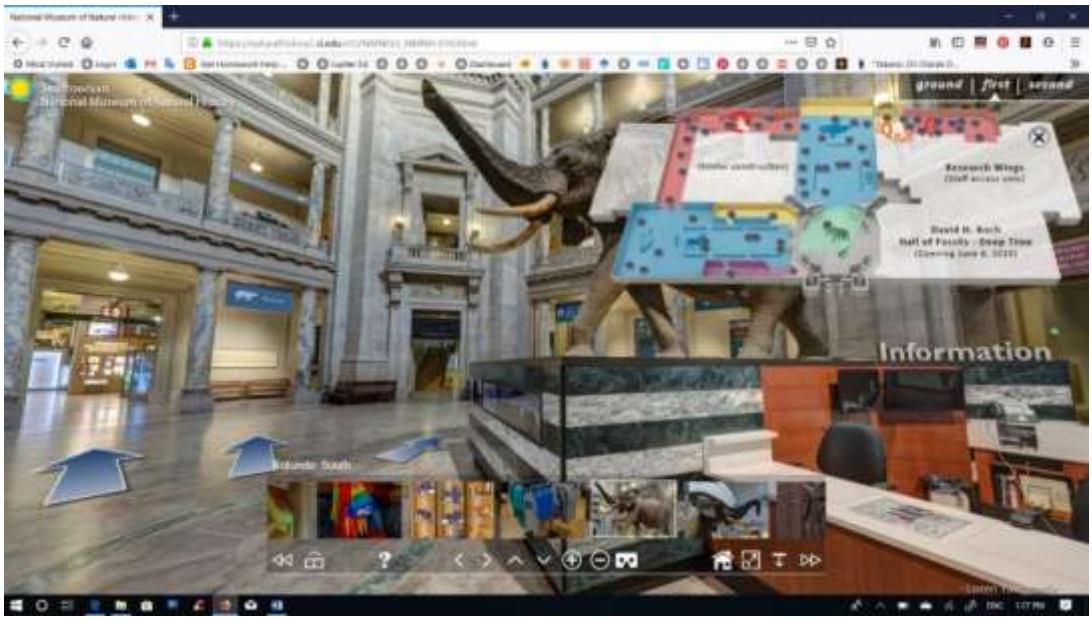

Figure 4: Smithsonian National Museum of Natural History - Virtual Tour
Adapted from https://naturalhistory2.si.edu/vt3/NMNH/z_NMNH-016.html

With the use of virtual reality in education in the future, it will bring a different dimension to education and contribute to lifelong learning.

The student first sees a three-dimensional coordinate system in front of him, then he/she can select one of the seven basic objects from the panel in hand, create them, see these objects in the coordinate plane, and calculate the intersection points of the objects. Options such as "delete, save" are also available on the menu. If the student selects a menu button without selecting the correct base object, he/she will come across an audible warning. The participants consisted of 14 students aged 22-34 studying in Vienna, 13 high school students, and 9 university students studying to become mathematics and geometry teachers. As a result of the research, the researchers observed that the students could easily adapt to this new technology without requiring a long introduction knowledge about the system, it was determined that they performed the task in a shorter time than they did on paper and all students wanted to experience the virtual reality again.

While the development of AR technologies is seen as time-consuming and costly due to technological limitations, especially when it is used for the first time, the field of application has expanded and started to be used in almost all areas of life with current developments (İçten & Bal, 2017).

Method

This research was carried out with a screening model in accordance with the characteristics of the subject, and the purpose of the research, the characteristics of the research population, and the sample. As a result of the literature review on the subject, an appropriate questionnaire was created. The questionnaire was prepared using Google form. The data obtained with this survey was used in the study. The study was used together with quality and quantity methods. In this study, both quantitative and quantitative data were obtained.

The population of the research consists of teachers in private schools in Iraq in the 2017-2018 academic year. In order to start the research, the necessary permission was obtained from the principals. 14 middle school and 15 high school teachers were given brief information and a link to the online questionnaire. One hundred thirty teachers participated in the online questionnaire, and 101 of these questionnaires were accepted as valid. The sample consisted of 101 teachers who completed the questionnaire. The results of the survey were evaluated with the IBM SPSS Statistics 20 program. Kolmogorov-Smirnov test was applied in SPSS.

Research Objectives

To observe the usage of visual learning methods in teaching across Iraq
To understand the opinions of secondary teachers across Iraq on visual learning software in the teaching process

Results and discussion

The distribution of students' responses to the questionnaire items is given in Table 1.

Table 1. Distribution of responses to survey items

Item		Answers				
		Absolutely Disagree	**I do not agree**	**I'm hesitant**	**I agree**	**I absolutely agree**
1. Encourages students to be active.	Percent	7.9	14.85	15.84	46.53	14.85
	Frequency	8	15	16	47	15
2. Suitable for students with intensive attention.	Percent	5.94	19.8	20.79	40.59	12.87
	Frequency	6	20	21	41	13
3. Helps students with visual thinking style	Percent	8.91	10.89	13.86	43.46	22.77
	Frequency	9	11	14	44	23
4. Helps learners whose special abilities are not developed.	Percent	5.94	15.84	22.77	43.46	11.88
	Frequency	6	16	23	44	12
5. It gives students a general idea about the subject.	Percent	5.94	10.89	13.86	53.46	15.84
	Frequency	6	11	14	54	16
6. Facilitates the application of information	Percent	4.95	12.87	15.84	48.51	17,82
	Frequency	5	13	16	49	18
7. It enables students to learn quickly.	Percent	6.93	12.87	17,82	45.54	16.83
	Frequency	7	13	18	46	17
8. Requires students to plan their work in advance.	Percent	4.95	25.74	32,67	27.72	8.91
	Frequency	5	26	33	28	9
9. It makes it easy to grip.	Percent	5.94	13.86	16.83	47.52	15.84
	Frequency	6	14	17	48	16
10. Requires concentration.	Percent	7.92	15.84	16.83	46.53	12.87
	Frequency	8	16	17	47	13
11. Suitable for students with strong judgment.	Percent	4.95	18.81	23.76	37.62	14.85
	Frequency	5	19	24	38	15
12. It makes it easier for students with intuitive thinking to learn.	Percent	3.96	16.83	25.74	41.58	11.88
	Frequency	4	17	26	42	12
13. is interesting.	Percent	4.95	12.87	10.89	46.53	24.75
	Frequency	5	13	11	47	25
14. It helps students who are open to schematic thinking.	Percent	8.91	12.87	15.84	40.59	21.78
	Frequency	9	13	16	41	22
15. It helps students who can react quickly.	Percent	4.95	15.84	31.68	36.63	10.89
	Frequency	5	16	32	37	11

When we look at the teachers' answers to the questionnaires given about virtual reality;
In Item 1, "Virtual reality encourages students to be active," 15 teachers (14.85%) absolutely agree, 47 teachers (46.53%) agree, 16 teachers (15.84%) are hesitant, 15 teachers (14.85%) chose to disagree, and 8 teachers (7.9%) absolutely disagree.

In Item 2, "Virtual reality is suitable for students with intense attention," 13 teachers (12.87%) absolutely agree, 41 teachers (40.59%) agree, 21 teachers (20.79%) undecided, 20 teachers (19.8%) disagree, 6 teachers (5.94%) chose absolutely disagree.

In Item 3, "Virtual reality helps students with visual thinking style," 23 teachers (22.77%) absolutely agree, 44 teachers (43.46%) agree, 14 teachers (13.86%) undecided, 11 teachers (10.89%) disagree, 9 teachers (8.91%) absolutely disagree.

In Item 4, 12 teachers (11.88%) absolutely agree, 44 teachers (43.46%) agree, 23 teachers (22.77%) undecided. 16 teachers (15.84%) disagree, 6 teachers (5.94%) absolutely disagree.
In Item 5, "Virtual reality allows students to get a general idea about the subject", 16 teachers (15.84%) absolutely agree, 54 teachers (53.46%) agree, 14 teachers (13.86%) are hesitant, 11 teachers (10.89%) disagree, 6 teachers (5.94%) absolutely disagree.

In Item 6, "Virtual reality facilitates the application of information," 18 teachers (17.82%) absolutely agree, 49 teachers (48.51%) agree, 16 teachers (15.84%) are hesitant, 13 teachers (12.87%) disagree and 5 teachers (4.95%) absolutely disagree.

In Item 7, "Virtual reality enables students to learn quickly," 17 teachers (16.83%) absolutely agree, 46 students (45.54%) agree, 18 teachers (17.82%) are hesitant, 13 teachers (12.87%) disagree, 7 teachers (6.93%) absolutely disagree.
In Item 8, "Virtual reality requires students to plan their work in advance," 9 teachers (8.91%) absolutely agree, 28 teachers (27.72%) agree, 33 teachers (32.67%) are hesitant, 26 teachers (25.74%) disagree, 5 teachers (4.95%) absolutely disagree.

In Item 9, "Virtual reality makes it easy to grip." 16 teachers (15.84%) absolutely agree, 48 teachers (47.52%) agree, 17 teachers (16.83%) are hesitant, 14 teachers (14 13,86%) disagree and 6 teachers (5,94%) absolutely disagree.

In Item 10, "Virtual reality requires concentration," 13 teachers (12.87%) absolutely agree, 47 teachers (46.53%) agree, 17 teachers (16.83%) are hesitant, 16 teachers (15.84%) disagree, 8 teachers (7.92%) absolutely disagree.
In Item 11, "Virtual reality is suitable for students with strong judgment," 15 teachers (14.85%) absolutely agree, 38 teachers (37.62%) agree, 24 teachers (23.76%) are hesitant, 19 teachers (18.81%) disagree, 5 teachers (4.95%) absolutely disagree.

In Item 12, "Virtual reality makes it easier for students with intuitive thinking to learn.", 12 teachers (11.88%) absolutely agree, 42 teachers (41.58%) agree, 26 teachers (25.74%) are hesitant, 17 teachers (16.83%) disagree, 4 teachers (3.96%) absolutely disagree.

In Item 13, "Virtual reality is interesting," 25 teachers (24.75%) absolutely agree, 47 teachers (46.53%) agree, 11 teachers (10.89%) disagree, 13 teachers (12, 87%) are hesitant, and 5 teachers (4,95%) strongly disagree.

In Item 14, "Virtual reality helps students who are open to schematic thinking," 22 teachers (21.78%) absolutely agree, 41 teachers (40.59%) agree, 16 teachers (15.84%) are hesitant, 13 teachers (12.87%) disagree, 9 teachers (8.91%) absolutely disagree.

In Item 15, "Virtual reality helps students who can react quickly." 11 teachers (10.89%) agree strongly, 37 teachers (36.63%) agree, 32 teachers (31.68%) undecided 16 teachers (15.84%) disagree, 5 teachers (4.95%) strongly disagree.

Kolmogorov-Smirnov test was used to examine the distribution of the answers given to the questionnaire items. Since the p-value for all survey items was less than .05, the distribution of the responses to the survey items was not normal. Therefore, a non-parametric test was applied.

The researcher found out that 22.75% of respondents gave negative opinion on "Encourages students to be active," whereas 61.38% of respondents provided positive opinion.

The researcher found out that 23.74% of respondents gave negative opinion on "Suitable for students with intensive attention," whereas 53.46% of respondents provided positive opinion.

The researcher found out that 19.8% respondents gave a negative opinion on “Helps students with visual thinking style,” whereas 66.23% of respondents provided positive opinion.

The researcher found out that 21.78% of respondents gave a negative opinion on “Helps learners whose special abilities are not developed.” whereas 55.34% of respondents provided positive opinion.

The researcher found out that 16.83% of respondents gave negative opinion on “It gives students a general idea about the subject.” whereas 69.36% of respondents provided positive opinion.

The researcher found out that 17.82% of respondents gave negative opinion on “Facilitates the application of information,” whereas 66.33% of respondents provided positive opinion.

The researcher found out that 19.8% of respondents gave negative opinion on “It enables students to learn quickly.” whereas 62.37% of respondents provided positive opinion.
The researcher found out that 30.69% of respondents gave negative opinions on “Requires students to plan their work in advance.” whereas 36.63% of respondents provided positive opinion.

The researcher found out that 19.8% of respondents gave negative opinion on “It makes it easy to grip.” whereas 63.36% of respondents provided positive opinion.

The researcher found out that 23.76% of respondents gave negative opinion on “Requires concentration.” whereas 59.4% of respondents provided positive opinion.

The researcher found out that 23.76% of respondents gave a negative opinion on “Suitable for students with strong judgment.” whereas 52.47% of respondents provided positive opinion.

The researcher found out that 20.76% of respondents gave negative opinion on “It makes it easier for students with intuitive thinking to learn.” whereas 53.46% of respondents provided positive opinion.

The researcher found out that 17.82% of respondents gave negative opinion on “is interesting.” whereas 71.28% of respondents provided positive opinion.

The researcher found out that 21.78% of respondents gave negative opinion on “It helps students who are open to schematic thinking.” whereas 62.37% of respondents provided positive opinion.

The researcher found out that 20.79% of respondents gave negative opinion on “It helps students who can react quickly.” whereas 47.52% of respondents provided positive opinion.

As in other fields, their reflections on the education process attract the attention of experts. When the studies related to AR are examined, it is seen that different studies have been conducted regarding the effects on education. In particular, studies in this field are becoming widespread due to the fact that AR applications provide students with the opportunity to experience the reality by addressing the sensory organs through a virtual application, attracting the attention of the students more in relation to traditional methods, learning with fun and at the same time providing the permanence in learning.

Today, AR applications are used in many sectors, especially in education. The AR, which has been used for different purposes in many specialties in education, is also preferred in mathematics and geometry. In recent years, Mixed Reality technology (Martín-Gutiérrez, Mora, Añorbe-Díaz, and González-Marrero, 2017) which especially emerged with Microsoft's Hololens project, developments such that Google and Apple provided developers with some development environments in the field of AR, have revealed the great potential of virtual environments (Rauschnabel and Ro, 2016). Since it is a material that supports learning, it can be said that the use of such virtual materials in mathematics and geometry education has positive aspects.

According to the findings of the research, the majority of teachers expressed their views as follows:

Virtual Reality is interesting.

It encourages students to be active.
Suitable for students with schematic and visual thinking.

It gives students a general idea about the subject.
It facilitates the application of information.
It provides quick learning.
It makes it easier to grip.

It allows students to quickly review the course they are studying.

It requires concentration.

From this point of view, it can be said that teachers agree that virtual reality makes many contributions to teaching.

The most important supportive results of using AR applications in education have been expressed as increasing motivation, increasing interest, and eliminating misconceptions (E. T. Gün & Atasoy, 2017).

The fact that studies conducted in math and geometry education through AR support permanent learning develops 3-dimensional thinking skills and provides meaningful learning also supports these ideas (E. Gün, 2014; Salinas, 2017).

The most important point here is how to benefit from technology in the education process and how to integrate technology into education. In addition, it is now a necessity for teachers to know the characteristics of the new generation they will address and to construct the teaching-learning process with appropriate teaching methods.

The results of another study show that teachers have a positive approach to using augmented reality applications in their courses. At some points, even though teachers do not agree that these practices help create a constructivist environment, the overall conclusion shows that augmented reality practices support constructivist teaching processes. In this context, it may be suggested to teachers to integrate augmented reality applications into their courses.

Conclusion

The researcher would like to conclude the outcomes of first research objective were found out that there will be many teachers across Iraq are using visual learning vastly during their teaching process and expensive for educational organizations. Teachers opined that the availability of data sources is difficult, and the content will change based on the subject. The second research objective's outcome revealed that the vast majority of teachers stated the following about virtual reality: Visual learning is interesting in the lessons, it encourages students to be more active, it is more suitable for students with schematic and visual thinking style, it provides students with a general idea of what they have just learned, it facilitates the implementation of the information obtained from the topics described in the course, it provides faster learning than other methods, it makes easier to understand the issues, it helps students to review their course more permanently and quickly, and it requires concentration.

As a result of the research, researcher realized that the vast majority of teachers think that virtual reality is interesting, encourages students to be active, is suitable for students with schematic and visual thinking style, provides students with a general idea about the subject, facilitates the implementation of information, makes it easier to learn, and it provides a quick review of the course they have studied. Respondents thought that virtual learning requires concentration.

Further Recommendations

According to the results of the research, the following suggestions were developed.

- Teachers and schools should be supported to use augmented reality in their lessons.

Virtual Reality can be opened in the Education Technology course in their curriculum so that prospective teachers can have experience in virtual reality. By showing various videos about the applications in this field, prospective teachers' knowledge about Virtual Reality applications and their interest in this subject can be increased. Pre-service teachers should be able to experience a simple virtual reality application during their undergraduate education. In this way, the prospective teachers will see the benefits of this technology by themselves, which makes them more motivated to apply this technology to their students.

Study Limitations

In this study conducted in 2017-2018, the results of 101 questionnaires were evaluated from 130 questionnaires filled by 29 teachers working in 29 private middle and high schools in accordance with the education system in Iraq. Kolmogorov-Smirnov test was performed with the SPSS 20 program, and the results were evaluated. Since the findings of this study in Iraq are regional and limited to several schools and teachers, the findings obtained in this study cannot be generalized and cannot be limited to this region, considering that the findings in other studies will differ.

Scope for further research

The research can be carried out under different demographics, and different respondents may be verified to get more accurate information. Further research can be carried out with university faculty members at higher sample size.

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