The Extent of the Ability of Augmented Reality Technology in Improving Education in Kingdom of Saudi Arabia

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Abstract: Our reality today is witnessing progress in technology in a rapid way, where the mechanisms of education have evolved according to the development of technology, which contributed to increase educational productivity, it made the process of learning more fun, easy instead of relying on traditional teaching methods as it contributed to increase the interaction of students with the learning environment as well as the level increased achievement creative thinking. Augmented Reality is one of the most important techniques that improved the learning and awareness processes. Moreover, contributed to the satisfaction of student's needs and their education effectively, as well as in student's health awareness inside the schools. This paper investigates to study the impact of Augmented Reality technology in education in the classroom and educate students about healthy nutrition, Survey and interviews were conducted among teachers, students, and health advisers to determine the extent of impact AR technology in education in classroom and health awareness, this paper will work to promote the use of Augmented Reality in education.

Keywords: Augmented Reality, Augmented Reality in education, Augmented Reality in classrooms, Augmented Reality in awareness, Augmented Reality in health nutrition

1. Introduction

With every new day, a new concept in the use of information technology is appear in various fields, especially in education field (Nasser, 2018). Using technology in this field can help to enable the learners to change their behaviors, extends their perceptions and gain new skills (Nasser, 2018) . The new technological improvements allowed the use of new learning tools (e.g. Augmented Reality) for education and awareness (Kaufmann, 2003). Augmented Reality (AR) can be define as "the ability to overlay computer graphics onto the real world" (Billinghurst, 2002). AR characterized by the interfaces that allow users to see a mix view of the real world and the virtual world (virtual images) at the same time (Billinghurst & Duenser, 2012). Those interfaces can merge the real world with the virtual images by using smartphones, or tablets, or PCs, or a handheld or head mounted display (Billinghurst, 2002).

Educational environments have an important goal which is encourage the social interaction between the students in the schools (Kaufmann, 2003). By using AR multiple students can share a space of virtual environment contains virtual objects, while remaining interacted in the real world (Kaufmann, 2003). This technology is highly strong for educational purposes while students can communicate with each other and with both the real world and the virtual world (Kaufmann, 2003).

Augmented reality enhances classroom learning, attracts student attention and transforms the traditional learning environment into a supportive and interactive environment where provides virtual examples and adds game play elements to support textbook materials and augmented reality technology has the ability to display things that are hard to imagine and turn them into 3D models, making it easy to understand abstract and difficult content and emulate natural phenomena and their interactions that may not be apparent in real life for students (Billinghurst & Duenser, 2012).

According to the success of Augmented Reality technology in schools' classrooms, it encourages to use AR technology in student's awareness about healthy nutrition and obesity dangers and that can lead to increase student's attention and satisfaction about the kinds of food they eat (Georg Waltner, 2015). Students obesity spread and growing up at a high rate around the world, and that will lead to big and long-term consequences of their health (Georg Waltner, 2015). And to help students to gain awareness about the kinds of food they intake every day, AR has a well-designed and contain a learning resources that are needed (Georg Waltner, 2015).

In this paper two main aspects will be covered the using of Augmented Reality technology in schools' classrooms including the theory and practical parts and using AR technology in student's awareness especially when taking about the healthy nutrition and dangers of obesity nutrition and dangers of obesity.

2. Literature Review

2.1 Augmented Reality Fields and History

The opportunity of using AR technology continues growing than ever as software (including a lot of different Apps) and hardware (smartphones, tablets, PCs) becoming easily available also, the tools that allow the programmers and even non-programmers to build AR applications (Mark Billinghurst, 2015). A wide variety kind of applications can be used in AR technology in different field in medicine,
entertainment (e.g. Games), education, military, manufacturing, and engineering etc. for example, doctors can use AR technology to show medical the inside details of human body or for surgery training, game players can play virtual race cars in real world or fight virtual monsters in the real world (e.g. Pokémon game), the architects can see unfinished building and make some changes needed, and students can mix the virtual objects with the real world in their learning way (Mark Billinghamurst, 2015) (Mehmet Kesima, 2012). Augmented Reality technology starting around 1968 and has widely evolved over the last decade and that concurrently with the transmutation and miniaturization of electronic devices and display screens (Arth et al., 2015). The first Augmented Reality system, which is also the first virtual reality system appear in 1968 and due to the weakness of processing power of computers at that time, only very simple and few drawings could be displayed (Arth et al., 2015). Education is one of the first fields starting to use AR technology in learning and educating students by presenting information using virtual objects and interacting with the real world at the same time (Mehmet Kesima, 2012).

2.2 Augmented Reality in Students Education

Augmented reality has had an effective impact on education, where this technique contributed to create a safe learning environment for students. (Rauschnabel, 2018.)

(Cabero-Almenara, 2019) The study was conducted to measure the performance of students achievement in teaching using augmented reality technology. After providing the class with augmented reality techniques and display the educational material using this technique -the results resulted in the extent of raising the level of educational attainment of students compared to the grades they had obtained through the use of traditional methods in teaching.

(Sahin, 2020) A study was conducted on middle school students to determine the effect of augmented reality technology on their educational attainment where students divided into two groups, both groups taken a (course on the solar system), the first group studied this unit using augmented reality technology and the second group studied the unit itself using traditional teaching methods, it was observed that students in the first group had higher scores in academic achievement and positive attitudes towards the course than those in the second group, and that because students find it difficult to learn abstract concepts such as the solar system, here augmented reality can able see abstract concepts through 3D virtual objects.

(Sayed, 2011) Introduce the so-called (Augmented Reality Student Card), where students can interact with learning materials effectively and successfully as well as have the ability to visualize different learning objects and helps bring meaning to ideas that are difficult to understand.

(Wojciechowski, 2013) They built an augmented reality environment that helps students conduct experiments chemical such as experimenting with the interaction of the sodium piece with water, resulting in a substance called sodium hydroxide, which is considered exothermic substance and there many of interaction and experiences that can be conducted in an augmented reality environment.

(Cai, 2014) They studied the use of augmented reality technology in the formation of chemicals on number of secondary school where this technique helped to improve the teaching methods in the chemical world.

(Dünsler, 2012) Presented on how to create non-traditional interactive books supported by the use of augmented reality technology in the teaching of science subjects, where the use of these books supported by augmented reality contributed to the development of students' knowledge level and interaction with different educational attitudes.

(Ibañez, 2014) They designed and developed applications using augmented reality technology to study electromagnetic signals where this application helped students to understand the scientific material effectively.

(Akçayır, 2016) Augmented Reality technology helps to configure positive and motivational feelings toward science education without fear of failure.

(Hsu, 2008) Previous research and studies have confirmed that augmented reality technology has helped both teachers and students understand the subject matter and strengthen the motivation of education.

2.3 Augmented Reality in Students Awareness

Using technology in healthcare field became more common around the world. The most essential issues how can easily reach the nutritional information like calorie, nutrition and health alternatives (Muhammad Zulfakar Bayua, 2013). Health awareness is a critical part in health care of students in their daily life. It so important to establishing a health awareness base for students at an early stage since that will encourage them to follow a healthy lifestyle with full satisfaction of them (Moayyad Hamza Ghunaim, 2016). It is also critical for students to have control to some "self-assessment tool" (like using AR technology) to give preliminary diagnostic and to give tips at an early stage to prevent any health complications in future (Moayyad Hamza Ghunaim, 2016).

To improve the prevention of a lot of diseases (e.g. cardiovascular, diabetes etc.) becomes more and more important with the time, as malnutrition become the most popular issues in the society while most of people know the importance of healthy nutrition (Georg Waltner, 2015).

Enabling Augmented Reality technology to:

- Provide the health nutrition awareness of the students inside or outside the schools.
- Simplifies meal choices.
- Easily suggest the better alternative of the junk food.

And that all to achieve a core purpose which is improve student's overall health (Georg Waltner, 2015). Different applications using AR technology (e.g. MANGO project) are available now, some of it depends on manual input of food
and food volume and some depend on image-based food recognition. These applications not only focused on counting calorie intake, it also provide a diet plans or detailed nutritional information as well as the health alternative food (Georg Waltner, 2015).

In other hand, obesity is related with a lot of chronic diseases like, cardiovascular diseases, diabetes, arthritis etc., which has many pad effects on the health and social aspects. The results of the National Survey of Health Information showed that, the rate of those who are overweight in school age is 23% and the rate of those who are obese in school age is 9.3% (D. Shaker Alamri, 2016). The Ministry of Health and Ministry of Social Affairs collaborate with each other and working together with the Ministry of Education to launched an initiative called "RASHAQAH" to reduce obesity rates for students in Saudi Arabia schools' (D. Shaker Alamri, 2016).

Augmented Reality technology can play an important role in students' awareness about health nutrition estimation and the training them to control the kinds of food they eat, the number of meals per day and the health alternatives (Thomas Stütz, 2014) . With the advance of evolving mobile devices (e.g. smartphone, tablets, PCs etc.) AR technology become a very recent field especially when it using the food identification as an application to calculating the calories and determine the health alternatives (Luciano Oliveira, 2014).

Through the previous studies, Augmented Reality technology has proved its effectiveness in schools in the classroom and health awareness. In addition, Augmented Reality technology facilitated the process of education and it suits all ages and scientific levels and different disciplines.

3. Methodology

In this paper two research methods were used which are the quantitative research method and the qualitative research method (Semi-structured or Mixed method). The qualitative research method has some features like: The open-ended question, the interviews, the documented data. In other hand, the quantitative research method includes some features like: The performance data, the observational data, it used with the predetermined data, the census data and statistical analysis etc. It's so effective and successful when searching for answers of questions that are: Measurable questions, Direct questions, to what reach, when asking about percentage, How many/much questions (Creswell, 2017).

The semi-structured (mixed) research methods includes features of both methods (Quantitative and Qualitative): both use open/closed-ended questions, both use predetermined data, and both have statistical and text analysis (Creswell, 2017). Considering of all these features of the semi-structured research method it was chosen in this paper, to collect a good data, rate, percentages, feedback and answers regarding the use of Augmented Reality technology in student's education and awareness in Saudi Arabia schools.

4. Data Collection

4.1 Interview

To support the survey results, a plan is made to organize several interviews with many schools’ teachers, health advisers, and students from ABHA city, Saudi Arabia. A set of invitation sent to many schools to participate in the interviews but only one school responded, which is “The fifth middle school in ABHA city, Saudi Arabia.

The first interview was conducted with five of teachers to collect specific information about the use of augmented reality technology in education and especially in classrooms, another interview was conducted the school’s health adviser to gather some data about the impact of using AR on the health awareness of students in Saudi Arabia schools, the third interview was with a group of 12 students from different stages in the middle school. The results of the interviews were consistent with the responses to the questionnaire where teachers and students explained that the use of AR technology creates an interactive environment between the teacher and the student and reduce the risks that may occur in some practical experiences on the reality ground and it will achieves tangible results in an experiential learning processes when it is the school supported by technology and the Internet. In other hand, the health adviser explained applications AR such as “EYE DECIDE” App, which play an active role in educating students about health awareness due to the weak health nutrition cultural of the student. The teachers clarify that the success of the use of augmented reality technology in education depends on the degree of the teacher's knowledge and skills to use this technology and deal with it wherefore courses should be offered to teachers and students on how to use this technique. Finally, both teachers and students emphasized that the use of AR technology gives students, teachers a lot of stimulus other than the use of traditional teaching methods and indoctrination. Also, the health adviser encourages the idea of build a reliable school application from the Ministry of Education in Saudi Arabia that allows students to monitor their daily meals and the number of calories they consume and monitor their weights with the help of the school health adviser.

4.2 Questionnaire

To build the questionnaire an online Google form was used to reach the target participants. The sample contained schools in Jeddah and ABHA cities. It took around three weeks to finish collecting the data. The survey targets the schools: include the students, the teachers and the school's health advisers.

The survey was sent to around 150 persons from different schools to be filled out, but only 103 participants had filled it. The questionnaire aim is to collect the data about the number of schools that are using Augmented Reality technology in education or awareness processes (how many teachers using it in the classrooms and how many health advisers using it in health awareness filed). Also, to measure the willingness of the students, teachers, and health advisers...
to use the AR technology to improve education and increase health awareness. Further to measure the willingness of the students and the health advisers about build a reliable school application from the Ministry of Education in Saudi Arabia that allows students to monitor their daily meals and the number of calories they consume and monitor their weights with the help of the school health adviser. The questionnaires have identified three main factors which can be highlighted as follows:

1) The importance of using Augmented Reality technology in education.
2) The importance of using Augmented Reality technology in health awareness filed.
3) The willingness of dealing with AR technology in schools.

5. Data Analysis

5.1 Discussion of the Quantitative Data

After collecting the data in the questionnaire, the results from indicated that 53.4% of the participants did not have any about what is the Augmented Reality technology and 91.2% did not using Augmented Reality technology in education filed. Where in figure 3 indicate that 94.1% of the participants did not used Augmented Reality technology in health awareness or in classroom education. (Figure 1)

While 91.2% of the participants elucidated the importance of using AR technology in schools in the areas of awareness and education and 93.2% of the participants welcomed the idea of build a reliable school application from the Ministry of Education in Saudi Arabia that allows students to monitor their daily meals and the number of calories they consume and monitor their weights with the help of the school health adviser (Figure 1).

5.2 Discussion of the Qualitative Data

It was clear that by using Augmented Reality technology in schools in education and awareness areas, will help to facilitate the clarification of information to students, present the materials in more practical way, conducting scientific experiments in case of the absence of the required requirements to conduct the experience and in experiments that may be somewhat dangerous. In addition, it can encourage the students to monitor their weight and nutrition, give the students a interesting way to control the number of meals the intake and the number of calories in each meal.

Some of the schools clarify that because of the situation of the devices and network and the training of the teachers and the health advisers it still they are not ready to use the AR technology.

6. Results

In this section, the result will be explained using Augmented Reality technology in schools in Saudi Arabia and that depending on the questionnaire and the interview, which were construct for the students, the teachers, and the health advisers working in the schools. Through the data collection phase, some of the schools were using some programs and applications in the classroom or in the awareness lectures for students inside the school and that only for displaying some photos, or videos, or PowerPoints presentations that may or may not support the lessons inside the classroom or the lectures in students awareness field, and these only by using the projector or smart board devices. But most of the schools that participated in the survey or in the interview did not use the Augmented Reality technology and some of them did not even have a network connection or the appropriate hardware/software needed. Considering to those issues, many of the students, teachers, and the school health advisers have shown a full interest and willingness to use the AR technology in the class rooms and in students’ awareness. Depending on all the above data that are responded from participants, it proves the need for applying AR technology in the schools, and it show how this technology will enhance the education and awareness processes in the schools. Thus, this supports the need and goal of this paper.

7. Conclusion

The focus on the quality and outcomes of education is one of the signs of growth any country, recently there has been great interest in how to use the technology of augmented reality to serve education and awareness in their various forms, where the previous literatures pointed to Augmented Reality technology have successfully enhanced the education process, it support practical experiences through providing interaction environment enables the students of raise their educational attainment levels, enable parents to participate in the study of their children. Moreover contributed this technology to rises level of the health awareness for students in schools. AR technology is one of most efficient ways to allow students to conduct dangerous experiments by safe ways; it increases the efficiency of the level of student
education and helped to reduce the costs that may be spent on traditional teaching operations. Furthermore, education can be a great successful when supporting all schools in Saudi Arabia with the technology, the internet, the hardware needed for run augmented reality technology effectively.

In future, Augmented Reality applications will have a major impact on changing students learning ways and their nutrition behavior in schools, bringing them to the stage of adapting to their surroundings to facilitate their interaction. Finally, we call on educators, schools health advisers, those interested in education to invest this technology more broadly in all its fields and employ them as the focus in the education and awareness fields.

References


Author Profile

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