

Examining Pre-Service Teachers' Opinions Regarding to Augmented Reality Learning

Arttırılmış Gerçeklik Öğrenmeye İlişkin Öğretmen Adaylarının Görüşlerinin İncelenmesi

Çelebi ULUYOL¹, Selami ERYILMAZ²

¹ Gazi University, Gazi Faculty of Education, Department of Computer Education and Instructional Technologies. celebi@gazi.edu.tr

² Gazi University, Institute of Education Sciences, selamieryilmaz@gazi.edu.tr

ABSTRACT

Augmented reality (AR) combines the reality with computer-generated digital information in real time. It has been used different disciplines such as e-learning system, medicine, architecture, e-commerce, etc. It also has various implications in learning and training. In this research, 51 pre-service teachers' opinions from the Department of Computer Education and Instructional Technology in Gazi University in Turkey were identified about augmented reality learning. They answered a student survey which includes six items about the AR, and its use in educational settings. Pre-service teachers think and believe that AR applications can increase the knowledge on the topic, make the course content more enjoyable, increase the motivation towards the course, and has really positive educational advantages. Based on the research results, researchers in the field of education should perform experimental investigations on how AR can be applied in learning and training in future researches.

Keywords: Augmented reality, Pre-service teachers, AR learning

ÖZ

Arttırılmış gerçeklik (AG) bilgisayar tarafından üretilmiş dijital nesnelerin gerçek nesnelere birlikte sunulmasıdır. E-öğrenme, tıp, mimari, e-ticaret vb. gibi birçok alan ve disiplinde kullanım örnekleri bulunan arttırılmış gerçekliğin eğitim ve öğrenme üzerinde de çeşitli etkileri bulunmaktadır. Bu araştırmada Gazi Üniversitesi Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü'nde okuyan 51 öğretmen adayının arttırılmış gerçeklik öğrenme ile ilgili görüşleri incelenmiştir. Veriler öğretmen adayları tarafından doldurulan arttırılmış gerçeklik ve eğitimde kullanımı ile ilgili altı maddeden oluşan anket kullanılarak toplanmıştır. Öğretmen adayları AG uygulamalarının konuyla ilgili bilgiyi arttırdığını ve kurs içeriğini daha eğlenceli kıldığını belirtmiştir. Aynı zamanda kurs boyunca motivasyonu arttırdığını ve eğitimde olumlu etkilerinin olduğunu düşünmektedirler. Gelecek araştırmalarda eğitim ortamlarında arttırılmış gerçeklik kullanımına yönelik olarak deneysel araştırmaların yapılması eğitim alanına sağlayacağı katkı açısından önemlidir.

Anahtar Sözcükler: Arttırılmış gerçeklik, Öğretmen adayları, Arttırılmış gerçeklik öğrenme

INTRODUCTION

Augmented reality (AR) allows digital information to be overlaid onto a real object at any time (Azuma, 1997; Zhou, Duh & Billinghurst, 2008). While virtual reality (VR) users work in digital environment, user work in real environment but with extended digital information in AR. Briefly, Augmented reality bridges the gap between the reality and the virtuality (Chang, Morreale & Medicherla, 2010).

As Jonhson, Levine, Smith and Stone (2010) states, AR history begins in 1960s. In the first AR application, head-mounted display was used through a mechanical or an ultrasonic tracker. Due to the poor capacity of processors, very simple drawings were monitored in real time (Sutherland, 1968). After these applications, other applications were used in different disciplines for visualization, education and other purposes.

Some researchers claimed that learners can support their motivation for training and enhance their practices with AR. A great amount of research was conducted by researchers during the last decade. In spite of these efforts, adopting augmented reality applications in educational settings is still challenging because of integration problems within various teaching strategies. Considering the development in computer processing, memory and graphical systems nowadays, AR use in learning is seen to have a wider use than ever before. In the last decades especially, AR's potential use has begun to be investigated in the literature. Augmented reality applications have the potential to motivate and challenge users in discovering sources and applying them to the real environment (Kerawalla, Luckin, Seljeflot & Woolard, 2006; Perez-Lopez, Contero & Alcaniz, 2010).

Jonhson, Stone, Smith, and Levine (2010) emphasized that "*AR has strong potential to provide both powerful contextual, on-site learning experiences and serendipitous exploration and discovery of the connected nature of information in the real world*" (p. 21). Augmented reality has been used both in- and out-of-school environments during the last two decades. The advanced changes and systems that make AR possible are much stronger than even before. Also wireless personal digital assistants, smart phones,

tablet PCs, and other electronic changes make possible AR use in learning and education. Researchers have applied augmented reality into classroom in some disciplines such as mathematics, chemistry, biology, physics, astronomy, and K-12 education. Shelton (2002) stated that augmented reality has not been used in academic settings due to some issues like sources and lack of awareness regarding the needs for augmented reality.

Freitas and Campos (2008) implemented SMART (the System of Augmented Reality for Teaching). SMART uses augmented reality technology for learning in 2nd grade-level. The system superimposes 3D objects, such as a car, truck, and airplane. So learners engage with these models in learning environment. Younger people spend a great deal time in gaming. Freitas and Campos (2008) experimented various researches with 54 students in Portugal. The results showed that SMART system increases user motivation, and it has also a positive impact on learning.

Augmented reality systems may be grouped into three categories: marker-based, markerless, and location-based AR (Butchart, 2011). The marker-based augmented reality work with markers like 2D matrix. The markerless AR works with real world objects like booklets or printed materials that have no markers. Location-based AR tracks object from the device's location sensors like GPS. AR system should have real and virtual world with interaction (Azuma, 1997). The educational use of AR can be illustrated for seamless interaction between virtuality and reality (Billinghurst, 2002).

As Billinghurst (2002) states, augmented reality is not a new technology, the potential use of AR in education warrants further investigation. During 2008-2010, researches related to augmented reality use indicate that it is a rising trend in learning and the number of academic publications handling augmented reality is increasing (Martin et al., 2011). Andujar et al. (2011) designed the AR laboratory (ARL), which provides augmented reality technologies in the scientific fields. El Sayed et al. (2011) developed ARSC (Augmented Reality Student Card), which helps learners visualize learning objects, interact with them effectively. You and Neumann (2010) developed augmented reality system using mobile devices, which enhances museum guide performance. In

last decade, augmented reality applications were integrated into printed books with QR (Quick Response). Moreover; Juan, Llop, Abad and Lluch (2010) developed an augmented reality game for users learning words. Especially in last years, many studies are observed in various disciplines in Turkey. Küçük, Yılmaz and Göktaş (2014) applied augmented reality in an English course in secondary schools. According to the results, students enjoyed the AR applications and desired these applications in the future different lessons. Güngör and Kurt (2014) investigated three different augmented reality glasses on mobile devices. Tülü and Yılmaz (2012) reviewed the different types of AR use in education. Erbaş and Demirel (2014) evaluated different applications of AR using Google Glass in educational settings. İbili and Şahin (2013) developed an interactive 3D Geometry book and used it in an experimental study. The results showed that AR 3D geometry book supports learning of difficult geometry subjects.

It is especially highlighted that experimental studies are scarce in the literature, and it is also suggested that experimental studies should be conducted related to AR use in the classroom setting. For this purpose, in this research, an experimental study was conducted and the opinions of pre-service teachers' were reported. This study aims to contribute experimental results to the research about the use of AR in education. The main purpose of this study is to determine the views about the use of augmented reality technology by pre-service teachers. Their opinions are vital for the experimental data related to the AR use in the research literature.

METHODOLOGY

The study was conducted in a 65-minute laboratory session. In the first 15 minutes, researchers informed participants about the research and afterward, augmented reality material was shown to the learners in the session. In the next 25 minutes, they tested AR material themselves with camera-equipped laptop computers. They took the AR paper in front of the camera and they saw the results on the camera. In the next 25 minutes, pre-service teachers' opinions have been specified. The participants were asked about their opinions using the survey.

Participants

51 students from the Department of Computer Education and Instructional Technology from Gazi University in Turkey participated in the research. 34 of the students were male students. All participants were undergraduate students with ages ranging from 18-27.

Procedure

First, researchers explained the augmented reality technology on projection in the laboratory. Then they showed some examples related to AR applications. Students watched the small applications on Youtube. Afterwards, researchers distributed one paper for every student. There was a Quick Response (QR) code in the middle of the paper. There were approximately 15 laptop computers in the laboratory, and all of them had an integrated camera. AR application was prepared by researchers using an augmented reality development kit (Metaio Creator) basically. After downloading the AR software to the laptop, students worked with it and showed the QR code to the camera in the software. They showed basically a 3D model on the laptop screen. When they turned the paper with their hands, the model turned also on the camera. Pre-service teachers experimented the augmented reality during 25 minutes approximately.

Data Collection Tool

Data was collected through a student survey developed by the two researchers for testing and evaluating the AR use in education. Before applying the survey, it was controlled by three experts in the instructional technology field who had doctoral degree. After various revises, a pilot study was conducted with eight students. The survey took final version after students' feedback. It has six questions on the 1-5 Likert scale. 1 is strongly disagree, 2 is disagree, 3 is no opinion, 4 is agree, and 5 is strongly agree in the scale.

FINDINGS AND RESULTS

Pre-service teachers' opinions about the use of augmented reality in education are summarized in Table 1.

Table 1. Pre-service Students' Opinions about the Use of AR in Education

Statement	M	SD
I believe that AR can increase my knowledge on the topic	4.41	0.60
AR can make the course content much enjoyable	4.56	0.69
AR can increase the motivation towards the course	4.33	0.55
AR has educational advantages	4.45	0.67
AR can be used in every course in the faculty	3.16	0.35
AR will be used recently in the classrooms	4.51	0.51

M=Mean, SD= Standard Deviation

As seen in Table 1, pre-service teachers strongly agree and believe that AR can increase the knowledge on the topic. The mean score of pre-service teachers who believe that AR can increase their knowledge on the topic is 4.41. They think that AR can make the course content much enjoyable and can increase the motivation towards the course. They also strongly agree that AR has educational advantages and it will be used recently in the classrooms. Another finding is that they are hesitant about the use of AR in every course in the faculty. The mean score of pre-service teachers who believe that AR can be used in every course in the faculty is 3.16.

According to the research results, pre-service teachers have positive opinions about the use of augmented reality. In this laboratory session, they saw and tested themselves only an augmented reality course material. After testing the AR and completing the student survey, it is clearly seen that they really think that AR has positive impact on educational use in the classroom.

According to the observations made by the researchers, they were having fun when they saw the AR objects on the camera. They shared their opinions, talked to other friends,

they also discussed something with the technology. Most students tried AR technology with camera again and again.

One important point in the results is that pre-service teachers are hesitant about the use of AR in every course in the faculty as seen in Table 1. When the researchers asked the reasons for this, they answered that they have no exact opinions about the AR use in some courses in the faculty such as mathematics, geometry, sociology, physics, etc.

DISCUSSION AND CONCLUSION

Research results indicate that pre-service teachers express their opinions positively regarding the use of AR in educational settings. Starting from this point, the future of AR technology in education looks bright. There are still issues when using AR in education and training. Therefore experimental research should be conducted to evaluate the effectiveness of AR use in education. Various questions are still available in terms of cost-effectiveness when compared to traditional teaching methods (Lee, 2012). Lee (2012) also states that there is much optimism about the role of augmented reality in education for the future. Constantly evolving technologies are strong to deliver AR applications via mobile phones, tablet PCs, and internet technologies.

In this research, pre-service teachers may have seen the first augmented reality application in the faculty. New augmented reality systems for education and training will continue to be designed and developed to become more advanced than ever. In a few years later, considerable researches from the field of education or instructional technology will be conducted for different purposes. It is also considerable that there are still not enough evidence about the effect of AR use on motivation in the courses. Therefore, research should be done about the effectiveness of augmented reality use on motivation in the future. Based on the research results, AR can convert classroom ambiance much enjoyable, efficient and interactive than ever before. Augmented reality leads students to engage on the topic in a variety of interactive ways, and it can also help the individuals on their own learning way.

In this study, pre-service teachers stated that AR can help making the course content more enjoyable. This means that it has the potential to enhance the learning by providing information at the right time and right place. Students take their own control on learning when interacting with AR content. Besides, all these scaffolds provide motivating, and engaging them in learning environments.

Eventually, despite this study results and potential advantages of AR use in education, there are still lack of experimental studies regarding the AR use in school settings for educational purposes. Researchers should carry out experimental studies beginning the analysis and towards the evaluation phase about the AR use. Moreover, there are still a need about the use of AR in different disciplines effectively.

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SUMMARY

Bilişim teknolojilerinin hızla gelişmesi ve mobil teknolojilerin yaygınlaşması ile görsel teknolojiler fazlasıyla önem kazanmaktadır. Mobil cihazların yaygınlaşması ve her geçen gün çok daha fazla insana ulaşması ile artan mobil uygulama talepleri, geliştirilen uygulamaların sayısının artmasını, uygulama kütüphanelerinin zenginleşmesini sağlamaktadır. Arttırılmış gerçeklik teknolojileri de aslında uzun bir geçmişe sahip olmasına rağmen eğitim ortamlarında kullanılabilir uygulamalar olarak yeni yeni popüler hale gelmekte ve geliştirilmektedirler.

Bir arttırılmış gerçeklik sistemi, gerçek dünyanın bilgisayar tarafından oluşturulan nesnelere tamamlanmasıdır. Arttırılmış gerçeklik sistemleri tam olarak görme duyusuna bağlı olarak tanımlanmazlar. Aynı zamanda arttırılmış gerçeklik sistemleri potansiyel olarak duyma, dokunma ve koku duyuları için de geçerlidir. Arttırılmış gerçeklik ortamları da fiziksel dünya ortamına sanal nesnelere eklenmesiyle oluşturulurlar. Bu ortamların oluşturulmasında sanal nesnelere fiziksel ortama eklenmesi ve bu ortamda değiştirilmesi gibi farklı yollar izlenebilir. Arttırılmış gerçeklik aslında çok geniş bir tanıma sahiptir, gerçek dünya ile ilişkilendirilen bütün sanal objeler bu tanıma göre arttırılmış gerçeklik olarak tanımlanabilirler. Bu durumda GPS uygulamaları, TV yayınlarında kullanılan betimleyici etiketler, özel gözlükler vasıtasıyla görüntülenen çeşitli sanal ortamlar ve daha sonrada örnekleri verilecek olan birçok durum arttırılmış gerçeklik tanımı kapsamına girebilir.

Arttırılmış gerçekliğin temel unsurları şu şekilde sıralanabilir: Fiziksel dünya, üzerine eklenmiş dijital bilgi ile zenginleştirilir, çeşitli bilgiler fiziksel dünya ile birlikte görüntülenir, çeşitli bilgiler gerçek dünyadaki konuma bağlı olarak ve kişinin bakış açısına göre görüntülenir ve arttırılmış gerçeklik deneyimi interaktiftir. Yani kişi istediği takdirde bu bilgileri değiştirebilir ve yeni bilgiler ekleyebilir. Dolayısıyla bu teknolojinin, özellikle mobil teknolojilerin ve internetin çok hızlı bir biçimde geliştiği

ülkemizde, eğitim ortamlarına entegrasyonu ile ilgili deneysel çalışmalar yapma zorunluluğu doğmaktadır. Bu araştırmanın temel amacı ise deneysel çalışmalar öncesinde, öğretmen adaylarının arttırılmış gerçeklik öğrenme ile ilgili görüşlerini belirlemektir.

Araştırma 65 dakikalık laboratuvar ortamında gerçekleştirilmiştir. İlk 15 dakika içerisinde, katılımcılara araştırma ile ilgili açıklamalar yapılmış, sonrasında ise arttırılmış gerçeklik materyali öğrenenlere gösterilmiştir. 25 dakika boyunca, öğrenenler laboratuvarsa bulunan kameralı diz üstü bilgisayarlarından arttırılmış gerçeklik materyalini test etmişlerdir. Katılımcılar arttırılmış gerçeklik kâğıdını kamera önünde tutmuşlar ve ekranda sonucu görmüşlerdir. Uygulamanın ardından ise katılımcılara materyal ile ilgili olarak görüşleri araştırmacılar tarafından oluşturulan bir anket yoluyla toplanmıştır. Veri toplama aracı arttırılmış gerçekliğin eğitimine yönelik maddelerden oluşmaktadır. Anket öğretim teknolojileri alanında üç uzman tarafından kontrol edilmiş ve sekiz öğrenci ile pilot çalışmada test edilmiştir. Pilot çalışmanın ardından ankete son şekli verilmiştir.

Gazi Üniversitesi Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü'nde öğrenim gören 51 öğrenciden elde edilen bulgulara göre, öğretmen adayları, arttırılmış gerçekliğin konu hakkında bilgiyi artıracağına inanmaktadır. Arttırılmış gerçekliğin içeriği daha eğlenceli hale getireceğini ve ders süresince motivasyonu arttıracağını belirtmişlerdir. Arttırılmış gerçekliğin eğitimsel avantajlarının olacağını düşünenlerin sayısı oldukça yüksek iken, fakültede her derste bu teknolojinin rahatlıkla kullanılabileceğini düşünenlerin sayısı ise ortalama seviyesinde çıkmıştır. Gelecekte arttırılmış gerçeklik teknolojisinin sınıflarda kullanılacağını düşünenlerin sayısı ise oldukça yüksektir.

Öğretmen adaylarının arttırılmış gerçeklik öğrenme ile ilgili olarak birçok avantaj belirtmelerine rağmen, konu ile ilgili olarak çeşitli deneysel çalışmaların yapılması gerekmektedir. Üstelik teknolojinin kullanımı ile ilgili çeşitli problemlerin olduğu da bilinmektedir. Gelecek çalışmaların bu teknolojinin etkililiğini ortaya çıkarmaya ve yaşanan problemleri ortadan kaldırmaya yönelik deneysel çalışmalar olması önemlidir.