

QR CODES IN EDUCATION AND COMMUNICATION

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ABSTRACT

Technological advances brought applications of innovations to education. Conventional education increasingly flourishes with new technologies accompanied by more learner active environments. In this continuum, there are learners preferring self-learning. Traditional learning materials yield attractive, motivating and technologically enhanced learning materials. The QR (Quick Response) Codes are one of these innovations. The aim of this study is to redesign a lesson unit supported with QR Codes and to get the learner views about the redesigned material. For this purpose, the redesigned lesson unit was delivered to 15 learners in Balikesir University in the academic year of 2013-2014. The learners were asked to study the material. The learners who had smart phones and Internet access were chosen for the study. To provide sectional diversity, three groups were created. The group learners were from Faculty of Education, Faculty of Science and Literature and Faculty of Engineering. After the semi-structured interviews were held, the learners were asked about their pre-knowledge about QR Codes, QR Codes' contribution to learning, difficulties with using QR Codes about and design issues. Descriptive data analysis was used in the study. The findings were interpreted on the basis of Theory of Diffusion of Innovations and Theory of Uses and Gratifications. After the research, the themes found were awareness of QR Code, types of QR Codes and applications, contributions to learning, and proliferation of QR Codes. Generally, the learners participating in the study reported that they were aware of QR Codes; that they could use the QR Codes; and that using QR Codes in education was useful. They also expressed that such features as visual elements, attractiveness and direct routing had positive impact on learning. In addition, they generally mentioned that they did not have any difficulty using QR Codes; that they liked the design; and that the content should include both superficial and in-depth information.

Keywords: Mobile learning, QR Code, Communication, Distance education

INTRODUCTION

It is possible to say that wider use of the Internet and the decrease in the prices of mobile devices has increased the use of these devices. People can work without any restriction of place and make use of these devices for different purposes. According to Al-Khalifa (2011), one of the most important aspects of mobile phones is their ability to access the Internet anywhere, which makes it possible to reach the information at any time they need. Mobile, namely ubiquitous learning is reshaping the learning environment. From SMSs to Smart Phones, it has changed the way of interaction

between learners and the learning materials. Learners can reach learning objects (video, text, sound etc.) faster than ever before. Since correspondence learning, hard copy materials (course books) are the base materials of learning for open and distance learning courses at Anadolu University ("Acikogretim Sistemi - Tarihcesi," 2012).

According to ABI research (2013), there were 1.4 billion smart phones in the World. A report about the use of smart phones, which was published in 2014, shows that the number had reached to 1.75 billion (eMarketer, 2014). Another study revealed that 89% of the smart phones are used all day (Smartphone users around the World, 2012).

Figure 1 presents the reasons for use of smart phones in the second half of 2011 around the World. According to the data presented in the Table, smart phone owners use their phones for gaming, which is followed by social networks, music and news. Using smart phones for educational purposes is about 11%.

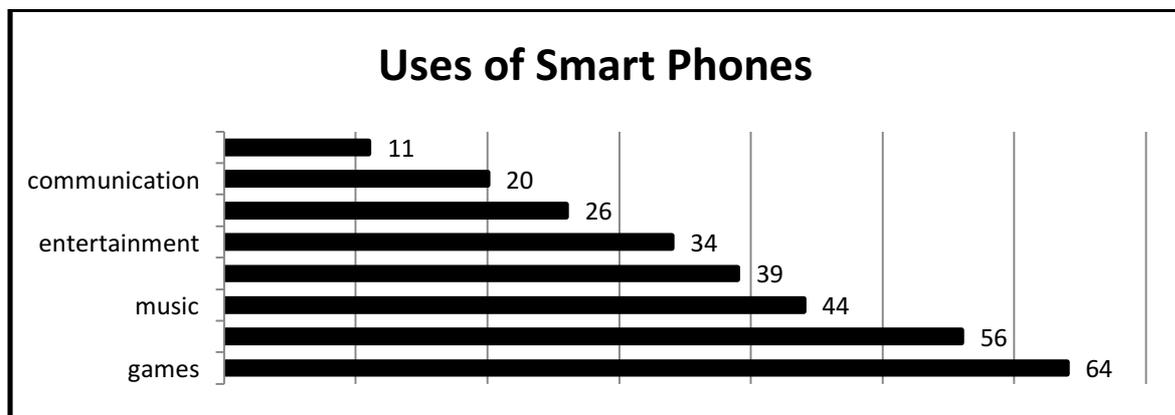


Figure 1:
Uses of Smart Phones

Figure 2 presents the monthly data use for 2013 and 2014. According to the data, there was an increase of 69% in a year. Figure 3 shows the total Internet traffic data in 2000 and mobile Internet traffic data in 2014. According to Figure 3, mobile traffic data in 2014 were thirty times more than the total Internet traffic data in 2000.

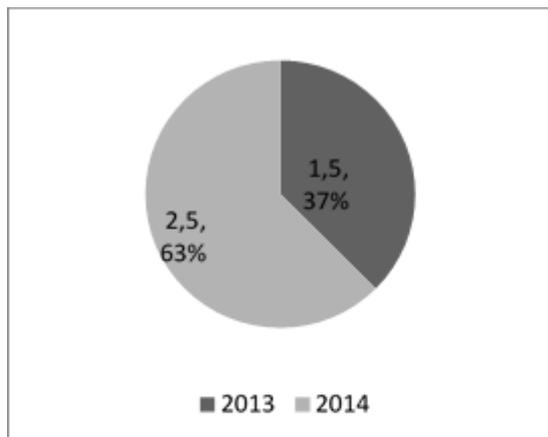


Figure2: Monthly data use in Exabytes (Cisco, 2015)

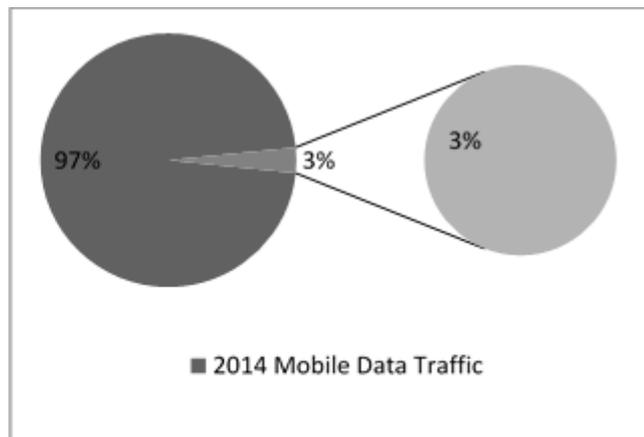


Figure 3: Year 2014 Mobile and year 2000 Total Internet Traffics by percentage (Cisco, 2015)

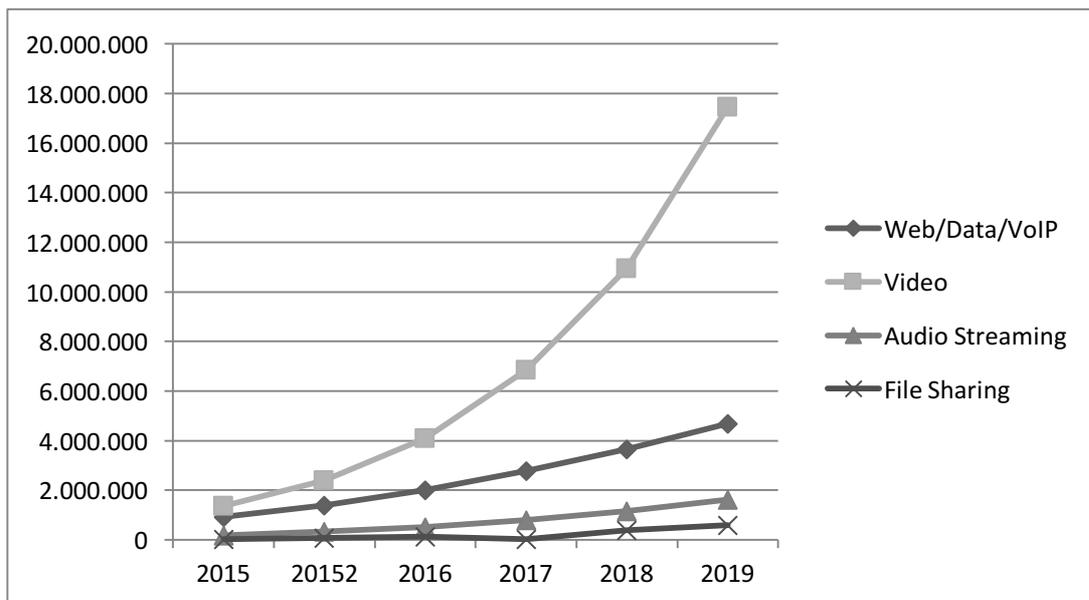


Figure: 1
2015 – 2019 Mobile data traffic by application TB by month (Cisco, 2015)

When the graph in Figure 4 is examined, it is seen that two-third of the mobile data traffic will be of videos.

THEORETICAL BACKGROUND

This study is grounded upon the Theory of Diffusion of Innovations and Theory of Uses and Gratifications. The data in this study were interpreted on the basis of these theories.

Theory of Diffusion of Innovations

The Theory of Diffusion of Innovations put forward by Rogers is based on four factors: innovation communication channel, time and social system. According to Rogers (2003), this diffusion is a process of communication via certain channels between the members of the social system regarding the "new".

In his theory, Rogers defined 'innovation' as an idea, an application or an object considered to be new by an individual or organization. An innovation does not have to be a concept or a design that is definitely unknown. It is enough that the individual or organization has not used it before (Berger, 2005). There are five phases in Roger's model: Knowledge, persuasion, decision, implementation and confirmation.

- **Knowledge:** The individual gets informed about the innovation and its use.
- **Persuasion:** The individual evaluates the positive and negative aspects of the innovation and shapes his/her attitudes accordingly.
- **Decision:** In this phase, the individual decides to accept or reject the innovation.
- **Implementation:** This phase exists if the decision phase is completed positively.
- **Confirmation:** The Individual affirms and strengthens the adoption decision (Orr, 2003).

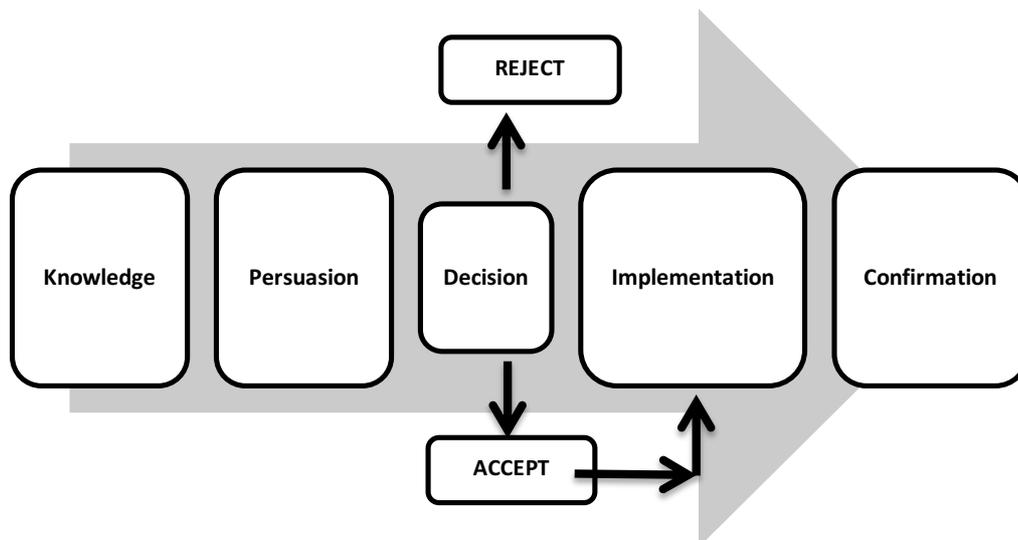


Figure: 2
The innovation-decision process (Rogers, 1995)

Theory of Uses and Gratifications

The theory of Uses and Gratifications was first announced by Elihu Katz. According to Katz, research on communication always focused on the question of 'What does media do for people?' but the real question *should actually* be 'What people do with media?' (McQuail & Windahl, 2010, p.167).

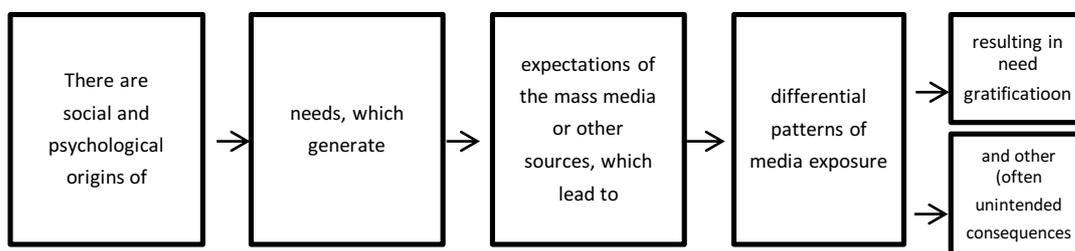


Figure: 3
The Uses and Gratifications approach (McQuail & Windahl, 2010, p.168)

In many studies based on the theory of Uses and Gratifications, *gratifications* obtained were perceived as motivations necessary for certain internet activities. Studies in related literature demonstrated that gratifications mostly included searching for information, entertainment, surveillance, communication between individuals, identity, acquiring status and gains (Charney and Greenberg, 2001; LaRose, Mastro and Eastin, 2001; Papacharissi and Rubin, 2000).

QR CODES

QR Codes consist of black modules arranged in a square pattern on a white background. They are designed to decode the data quickly. It is quite easy to create and use these codes (Pons, 2011).

Using QR Codes for education is another way of using the Internet. Quick Response (QR) codes are versatile. A piece of long multilingual text, a linked URL, an automated SMS

message, a business card or almost any information can be embedded into the two-dimensional barcode. With moderate equipped mobile devices, QR Codes can connect users to the information quickly and easily (LAW, SO, & 蘇永華, 2010).

Since 2011, using QR codes has been used in different forms. According to comScore MobiLens (2011), 1 out of 5 smart-phone owners in U.S. scanned QR codes. Canada and Germany both saw near 16% of smart-phone owners scanning QR codes in a month, while the UK and Spain (home to the most penetrated smart-phone markets) saw just 12% of their participants scanning QR codes. (*Source: comScore MobiLens, 3 mon. avg. ending Dec-2011*)

QR codes are used in a wide range of areas like media, street banners, all places leading to web sites, music, video and social networks (Arslan, 2011). According to Walsh and Andrew (2011), some of the beneficial uses of QR Codes include bridging printed materials to electronic materials, reaching voiced materials, opening embedded videos, providing libraries with external resources and reaching appropriate help.

QR Codes in Education

It could be stated that studies on use of QR Codes in education were generally conducted in the field of mobile learning. Review of the related literature revealed that mobile devices were used while using QR Codes. According to So (2008), the most important aspect of mobile learning is the trilogy of 'location independence', 'time independence' and 'meaningful content'. These three basic features are among characteristics of mobile learning, and they differ from e-learning and web-based learning due to these features (Law & So, 2010).

The rising speed of mobile technology is increasing and penetrating all aspects of human life. Therefore, this technology plays a vital role in learning different dimensions of information. Today, a clear shift from teacher-centered learning to student-centered learning causes students to find technology more effective and interesting than ever before (Miangah, 2012).

In an experimental study conducted on the use of QR codes in education (Rikala & Kankaanranta, 2012), the views of 76 learners and of their teachers from four different-level schools were determined. The results of the study revealed that the learners were eager and motivated to use the QR codes. As for the their teachers, they approached cautiously to the use of QR codes in education and mentioned the likelihood of various difficulties to be experienced in relation to the preparation of lesson units and time. In addition, in the study, it was found that QR codes could motivate learners and draw their attention to class since these codes support learning and provide opportunities both for independent learning and for cooperative learning.

In another study carried out by McCabe and Tedesco (2012), QR codes were used via smart phones for direct connection with the subjects within the scope of the course of mathematics. In the study conducted with 14 learners, all the learners reported positive views about the QR codes prepared for the course of mathematics. In such a course process, 83% of the learners stated that they prepared for the following lesson better and did their homework more productively, and 67% of them stated that there was an increase in their course marks and that they found it easy to use QR codes. In addition, as revealed by the most important finding obtained in the study, 83% of the learner experienced less stress when they studied for the lessons with the help of QR codes. According to the learners, the reason was that it was instantly possible to access the necessary information via QR codes without having to ask their peers or teachers.

Hernández-Julián & Peters (2012), in their study conducted to compare doing homework online with doing homework on paper, found that an electronic environment could make it easier to access an instructional material and that it did not significantly influence learning.

Al-Khalifa (2011) developed a Mobile Snapshot Response system with QR Codes. The system aimed at helping improve the communication between teachers and their students. Rivers (2010) designed a task-based QR Code system for English language teaching. In the study, the researcher explained how the system was developed, applied and tested. It was found in

the study that the learners enjoyed and benefited from the system while using it to carry out the course activities. Liu, Tan and Chu (2007), in their study, developed a learning system to improve learners' English language levels with the help of QR Codes. The study revealed that the QR Code system helped learn English.

Chen, Teng, Lee and Kinshuk (2011) conducted a study to allow access to digital materials through QR Codes in paper-based reading tasks. The results suggested that direct access to digital resources using QR codes does not significantly influence students' reading comprehension.

In their study, Ozcelik and Acarturk (2011) aimed at reducing the spatial space between printed and online resources using QR Codes. In this empirical study carried out with 44 university students, the students were divided into two groups (paper + mobile phone and paper + computer). In the study, it was concluded that thanks to QR codes found in course books, mobile devices contribute to learning since it is easily possible to access information online.

Baker (2010) used QR Codes in his study titled "Making Physical Objects Clickable: Using Mobile Tags to Enhance Library Displays". The researcher reported that libraries should contain both physical and electronic media and that the mobile labeling technology *between these two* environments will provide a solid basis for new generation libraries.

Hwang, Wu, Tseng and Huang (2011) developed a learning platform using QR codes via cell phones which are low-priced and which have a camera and internet connection. This empirical study showed that the learners using the platform demonstrated meaningful improvements in terms of learning efficiency and learning achievement.

Designing a Lesson Unit Supported with QR Codes

In this study, QR Codes were added to a lesson unit of Computer-101 course book for Anadolu University Open Education Faculty. As can be seen on figure 7, we created a twitter account, a Facebook support page and QR links to the digital form of the course book. As Bolter & Grusin (2000) mentioned, hypermedia aims at addressing multiple and different senses of human. Use of more senses for hearing, seeing, smelling and touching, learning increases learning. Instead of the medium, the instructional methods cause the learning (Clark & Mayer, 2008), but using different media provides ability to use different strategies.



Figure: 4
Cover page showing Twitter and Facebook Support pages

In Figure 8, there are two different QR Codes from the lesson unit? The upper one leads to a video about the subject, and the other leads to a Wikipedia page.

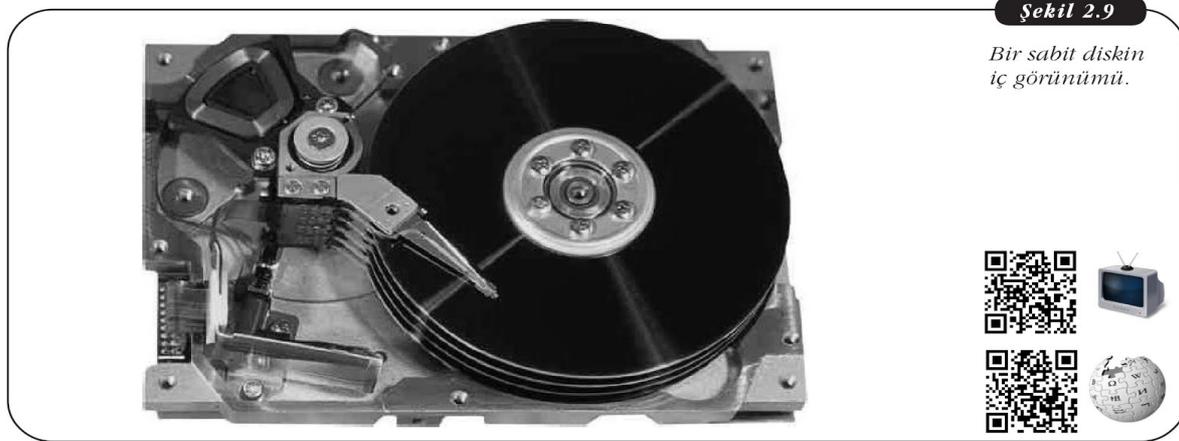


Figure: 8
Using QR Codes in the lesson unit

In Figure 9, the QR Codes link to Google images and Flash videos.

Ses Araçları

Çizim ve fotoğraflardan sonra sesin de sayısallaştırılıp bilgisayar yardımıyla işlenmesi gündeme geldi. Bir kişisel bilgisayarın ses işlemek amacıyla kullanılabilmesi için ek donanımlar gerekir.

Günümüzde normal olarak her kişisel bilgisayar bir ses kartına ve basit bir hoparlöre sahiptir. Böylelikle bir müzik CD'sini seslendirebilir. Dolayısıyla bir kullanıcı bilgisayar kullanırken bir yandan da müzik dinleyebilir. Ancak bilgisayarların hoparlörleri, müzik tutkunlarının talep ettiği ses kalitesini sağlamaktan uzaktır. Bu yüzden daha kaliteli ses üretebilen ses düzenleri gerekir. Bilgisayara bağlanabilen çok çeşitli ses düzenleri pazarlanmaktadır.

Bir kullanıcı eğer kendi kaydettiği sesleri işlemek isterse, sesin bilgisayara aktarılmasını sağlayacak mikrofonlara ihtiyaç duyar. Bu amaçla kullanılacak ve çok farklı hassasiyetlere sahip mikrofonlar vardır.

Hoparlör bilgisayara nasıl bağlanır?

Figure: 9
Google images and Flash videos

METHODOLOGY

The present study was designed as a case study. According to Creswell (2009), case study is a qualitative approach in which the investigator explores a bounded system (a case) or multiple bounded systems (cases) over time through detailed, in-depth data collection involving multiple sources of information (e.g., observations, interviews, audiovisual material, documents and reports) and reports a case description and case-based themes.

In this study, the researchers redesigned a lesson unit of the course book by adding QR codes. The QR codes linked the learner to web sites, applications and social networks related to the subject to be taught.

Participants

The participants in the study were 15 students from Faculty of Education, Faculty of Science and Literature and Engineering Faculty of Balıkesir University in the academic year of 2013-2014. In the study, the purposeful sampling method was used. In this

method, the researcher decides whom to include in the study and chooses the participants most appropriate to the purpose of the research (Balci, 2004).

The students who were chosen for the study met the criteria of having a "smart" phone and having access to the Internet using their phones. These students were divided in three groups:

- Group 1: Second-grade students from the Department of Computer and Instructional Technologies in Necatibey Education Faculty
- Group 2: Third-grade students from the Department of Mechanical Engineering in of Engineering Faculty
- Group 3: Students from the departments of Physics, Chemistry and Biology in Faculty of Science and Literature

The purpose of choosing these groups was to analyze different perspectives of students from different departments.

Data Collection

In this study, the researchers aimed at determining the learners' views about the lesson unit supported with QR Codes. For this purpose, semi-structured interview questions were prepared. According to Ozguven (2004), semi-structured interviews provide an opportunity to make some changes during the interview for unpredictable situations.

The process of preparing the interview questions began with draft questions and continued by getting expert opinion. After expert opinions, the necessary changes were made, and the interview questions were applied to three students as a pilot study. The purpose of the pilot study was to understand if the questions were clear, open-ended and consistent with the aim of the study.

In line with the purpose of the study, there are six questions:

- What was your level of knowledge about the subject before the study? After this lesson unit, what do you think your level of current knowledge about the subject is?
- Did the QR Code supported lesson unit have positive influence on your learning? How effective it was on your learning?
- What should the content of QR Codes be? (Text, Links to videos, texts, audios or images)
- What problems did you experience while using the QR Codes?
- What do you think about the design of QR Codes on pages? What are your suggestions?
- Should QR Codes be used for details or for enhancement? (Enhancement; with same difficulty but with different perspectives, like a simple video, detailing; further information for whom it may concern)

Data Collection Process

Interviews were held in one of the researcher room in Necatibey Education Faculty main campus. Total of 15 students participated the study. In the first phase, the participants were informed about aim of the research. During the meeting, detailed information was given to the participants about the purpose of the study and about the research method. The participants were also informed about such topics as installation of the necessary software, link to the support page and contact information. The students were asked for their consent and informed that the interview would be recorded and the recordings won't be used for any other purpose.

Following the first meeting, the course material (the computer course lesson unit supported with QR Code) was given to the participants, and they were asked to study the material for two weeks. In addition, a group was formed on a social network website, and the students joined to this group. The aim of the group was to provide technical support for the learners having trouble with QR Code application.

After two weeks, the time and place for the interviews were determined according to the participants' choices. Each interview took approximately five minutes. After the interviews, the audio records were transcribed. According to the pre-prepared coding draft, the questions and the students' answers were analysed and reviewed.

Data Analysis

For the analysis of the data, inductive coding and descriptive analysis were used. Inductive coding was used to reveal the concepts from the data and the connections between the concepts. In descriptive analysis, the data are summarized according to previously-set themes. For the purpose of emphasizing the views, direct quotations are frequently used. The findings obtained are interpreted based on the cause and effect relations (Yildirim and Simsek, 2008).

The researchers, without making any changes on the records, converted them into written texts. For validity issues, an expert was asked for his opinion. According to Yildirim and Simsek (2008), if more than one researcher analyzes the data together, coding reliability must be studied. It is a must to reach .70 or higher for the reliability of the data.

The researchers and the expert independently coded the data into appropriate themes. The codings were compared, and it was found that since the reliability value was higher than .70. Thus, the coding was found reliable. The data, which were placed according to the interview chart, were defined, and the results obtained were supported with direct quotations.

FINDINGS

After the analysis, the data were coded, and the themes were created. The findings were interpreted according to the theories of Diffusion of Innovations and Uses and Gratifications. The findings obtained via the research questions were as follows: Awareness of QR Code technologies, types and aims of using QR Codes, QR Code contribution to learning, and proliferation of QR Codes.

Awareness of QR Code Technologies

When the participants were asked about their awareness of QR Code technology, the following findings were obtained:

Table: 1
Awareness of QR Code

<i>Themes</i>	<i>Frequency (f)</i>
<i>No knowledge</i>	<i>6</i>
<i>Awareness</i>	
<i>Advertisements</i>	<i>3</i>
<i>Medicine Boxes</i>	<i>5</i>
<i>Posters</i>	<i>3</i>
<i>TV – Internet</i>	<i>2</i>

Types and Aims of Using QR Codes

According to participants' answers about their preferences of using QR Codes and about what their contents should be, the following findings were obtained:

Table: 2
Types and Aims of Using QR Codes

Themes	Frequency (f)
<i>Preferences of use</i>	
<i>Video</i>	14
<i>Image</i>	5
<i>Leading to social networks</i>	7
<i>Audio files</i>	4
<i>Download links</i>	5
<i>Preferences to content</i>	
<i>Surface information</i>	3
<i>Deep information</i>	1
<i>Surface and deep information</i>	11

When the participants' views about using of QR Code were analyzed, it was found that almost all of the students agreed on video directing. The other ideas were linking to images, social networks, audio files and download links.

On this topic student named Alper mentioned:

"... I prefer video and social networks. Because there are already images and texts in the book, but (using) videos wasn't not possible. By using QR Codes it's now possible to use videos. Also, I think social network sites used by a lot of people are easier and useful in terms of reaching the necessary information."

Most of the participants came to an agreement that separate QR Codes should be defined both for surface information and for detailed information abusing QR Codes. Regarding this, a student named Berk said:

"I think there must be both of them. Everyone should find something in an environment addressing large populations. There could be different levels of QR Codes."

QR Code Contribution to Learning

The participants were asked about if using QR Codes for education had positive effect on their learning. If so, which features of QR Codes were contributing to their learning? The findings are presented in the Table below.

Table: 3
QR Code Contribution to Learning

Themes	Frequency
<i>No positive effect on learning</i>	-
<i>Positive effect on learning</i>	15
<i>Visuals</i>	9
<i>Ease of use</i>	5
<i>Direct leading</i>	8
<i>Attractiveness</i>	9
<i>Updatable information resource</i>	5

About the reasons and positive effects on learning, all of the participants shared the same idea that QR Code supported lesson unit had positive effects on learning. When the reasons were investigated, the following themes were found: positive effect of visuals, ease of use, direct leading, attractiveness, and updatable information resource. A student named Mansur said:

"Of course it has positive effects on learning. It is more interesting than an ordinary book, so we can spend more time. In addition, there is an easier and updatable content. It is quickly updatable. I think I prefer someone teaching me to reading. That's why I found it useful".

Proliferation of QR Codes

The participants were asked for their ideas about proliferation of QR Codes to examine whether they would use QR codes or not; whether using QR Codes were effective; which factors would be the causes and which factors would restrain the use. The Table shows the findings obtained.

Table: 4
Proliferation of QR Codes

Themes	Frequency
<i>The factors that would restrain the use</i>	
<i>Difficulties and technical problems in the process of transition to new technologies</i>	5
<i>Lack of academic staff who know how to use QR Codes</i>	10
<i>Preference of different technologies</i>	2
<i>Lack of necessary equipment</i>	9
<i>Need for technological knowledge</i>	14
<i>It will be effective to use QR codes</i>	
<i>Boredom with course books can be avoided</i>	8
<i>Direct links reduce the loss of motivation</i>	7
<i>Using multiple media together enriches the content</i>	11

In addition, the participants listed the reasons for not using this technology as follows: lack of teachers/academic staff who know how to use the technology; other available technologies to prefer, lack of necessary equipment to use the technology, and if so, there is a need for technological knowledge.

When the problems regarding the use of QR Codes in the lesson unit were examined, it was found that most of the learners did not experience any problem. Those who had problems reported that they experienced problems regarding fixing the cam angle, resolution and connection issues. The participants favoring the use of QR Codes reported that QR Codes acted like multimedia and that they could thus help reduce the routinized structure of books. In addition, according to the learners, they experienced less motivation loss, and enriched content would have positive effect on learning. One student, Alper, expressed his ideas as follows: "... when I become a teacher, I am planning to use QR codes. They help make learning more meaningful. Direct linking to the resources does not cause any loss of time helps reach where you want to We don't lose time searching on the net. In addition, videos and audios available are very helpful."

Mansur said *"I think it's favorable. Young people may get bored while reading books, I think so, and I prefer this method."*

DISCUSSION

This study aimed at identifying the views of the participants about the QR Code supported lesson unit. The results revealed that the participants achieved a consensus on the positive effects of QR Code on learning. They stated that they would use QR Codes in the future. This result could be explained with the theory of diffusion of innovations. According to the theory of innovations, through five stages of the theory students got informed about QR Codes if they haven't before, developed positive attitudes, accepted the innovation, implemented by using the QR Code application and confirmed they would like to use it in the future. In addition, the finding obtained is parallel to those reported in other studies conducted by Susono & Shimomuro (2006), Liu, Tun & Chu (2007), Hwang, Wu and Huang (2011) and Law & So (2010). According to the findings, participants find QR Codes effective in terms of visuals, ease of use, direct linking, attractiveness and updatable information sources. In addition the results of other studies carried out by Miangah (2012), Rivers (2010) and Law & So (2010) also support the results obtained in the present study.

It was found that most of the participants were aware of QR Codes. Use of QR Codes in education was considered to be an innovation. This result shows similarity with the 65% response of 'YES' to the question of "Have you ever seen a QR Code before" directed in a study titled QR Code Usage and Interest Survey conducted by MGH (2011). The participants' responses were listed as ads, medicine boxes and TV-internet. This result is also consistent with the findings reported by MGH (2011).

The participants agreed that the QR Code technology should be used for the spread of QR Codes. This finding is consistent with those obtained in other studies carried out by Ozelik and Acarturk (2011) and by Rikala & Kankaanranta, (2012). In this context, the participants' expectations and gratification of these expectations were effective.

The main factor preventing the use of QR Codes is the need for enough technological knowledge to install and use the application. Other factors can be summarized as difficulties in transition to a new technology, lack of academic staff who knows how to use QR Codes, learners' preferencing other technologies, and lack of necessary hardware. Mobile devices and improvements in Internet, both in terms of speed and content, have positive influence on diffusion of QR Codes.

Similar findings were also obtained in a study carried out by Rikala & Kankaanranta, (2012). The difference from this study is Rikala & Kankaanranta (2012) mentioned the probable difficulties to be experienced in preparing QR code contents and pointed out that such applications were likely to take a lot of time and that there was a need for more examples regarding its use.

The participants mostly shared the same idea about using the QR Codes reporting that they preferred to access the videos. In addition, the participants also favored the feature of being directed towards social networks that leads learners to cooperate. Depending on this statement, it could be stated that the dimensions of communication and cooperation are necessary for learning. The dimensions of communication (Al-Khalifa, 2011) and cooperation (De pretro & Frontera, 2012) are findings obtained in studies conducted on the use of QR codes in education. When considered from the perspective of institutions, it could be stated on the basis of Uses and Gratifications Theory that the participants were satisfied with easy access to the learning content, direct linking and accessing rich content using QR Codes.

The diffusion of innovation theory has five phases namely knowledge, persuasion, decision, implementation and confirmation (Rogers, 1995). In the knowledge stage, the learners were mostly familiar with QR Codes. Although they mentioned that they had never seen QR Codes in the field of education. The participants and the researcher

discussed whether using QR Codes for education would be effective or not. All of the students stated that there will be positive effect on learning. This can be named as persuasion stage.. At the decision phase, the participants were asked for the reasons that made them use course material supported with QR Codes. It was found that rich media, high motivation, ease of use, and direct link affected their choice of use. The findings obtained in this phase were similar to those reported in other studies conducted by Law & So (2010) and Rikala & Kankaanranta, (2012) (easy use and motivation). During the two-week review of the lesson unit, all of the learners used all the QR Codes. There is a time difference between users, some did it in a faster than the others. At the confirmation phase, the participants were directed questions about whether they were thinking of using QR Codes in the future. All of the students answered answered that if possible they would use QR Codes in the future. The interviews revealed that using QR Codes for education would be beneficial and attractive. That would have positive effect on learning. This result is consistent with the view reported by Rikala & Kankaanranta (2012) that learners want to re-experience QR code-aided learning and that such applications better be used for education.

It is possible to say that the learners who had reviewed the QR Code supported lesson unit experienced the confirmation phase. The participants previously had knowledge about what the QR Code is, what is it used for and how it can be helpful for learning. They expressed positive opinions about increasing QR Code use for educational purposes. In addition, it is also possible to say that QR Codes completed its diffusion among the learners who reviewed the lesson unit.

Conclusion

CONCLUSION

Its' possible to argue that augmented reality applications offer novel interations between human and environment using mobile devices. The ubiquity of information systems dilutes the boundaries of electronic and non-electronic tools, devices and environments. The era of information societies requires processing, transmitting and storing more data and information in an increasing trend. QR Codes can contain more information when compared to a regular barcode. Digital equipments like camera equipped mobile devices and related applications lead the proliferation of QR Codes. On the other hand the printed or the paper-based materials are still essential for deployment of information like books, newspapers, research papers, letters etc. Using QR Codes on printed materials like course books may enhance the attractive and elucidative aspects of printed materials.

Although not many related studies have been conducted in the field of education, they are generally used for supportive purposes. The research on QR Codes shows that they were favored because of direct linking, merging rich contents and making them more enjoyable. Motivation is one of the key factors of learning for open and distance-learning learners. QR Code supported enjoyable learning environments may help learners to maintain their motivation. QR Codes especially used in libraries are becoming more common worldwide by uses and gratification (of QR technology?). It acts as a bridge linking the physical environment to the virtual environment. As in the rest of the World, In terms of Turkey, it is generally used in health-related environments, ads and bulletins.

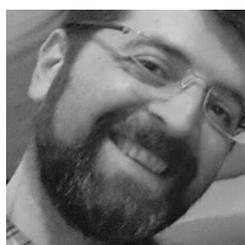
Although it is easier to use QR Codes, it is not possible to use them without technological necessities. It is also possible to argue that being accustomed to a technology may make the new technology easier to learn and use. In this perspective the use of QR Codes would increase in line with the increase in the related technologies like smart phones and tablets.

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