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THE USERS' VIEWS ON DIFFERENT TYPES OF INSTRUCTIONAL MATERIALS PROVIDED IN VIRTUAL REALITY TECHNOLOGIES[i]

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Abstract:

Today, it is seen that developing technologies are tried to be used continuously in the learning environments. These technologies have rapidly been diversifying and changing. Recently, virtual reality technology has become one of the technologies that experts have often been dwelling on. The present research tries to determine users' opinions and preferences on the utilization of different kinds of multimedia items (pictures, videos and games) in virtual reality goggles. In this context, participants' opinions were taken through semi-structured interview forms within this research, which is designed as a case study. The data were subjected to content analysis. It is observed that participants liked and preferred virtual reality technologies. The features of the sense of reality, feeling the ambience and providing the possibility of having a tour in this ambience presented by the technologies can be listed as determinants in participants' preferences. In addition to this, it can be said that especially the game type contents of the virtual reality technologies are preferred more than the photos and videos. It is thought that interaction and entertainment factors have a significant role in suck kind of preferences. Moreover the participants have also indicated that the use of virtual reality technologies, especially in social studies classes, may be beneficial. Besides, it is thought that virtual reality technologies can be more useful than in-class methods in the sciences and other fields and the VR technologies will increase permanence by creating active learning environments.

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1. Introduction

The ever-expanding and evolving technology has been mediating many innovations, environments and agents to get involved in our lives. Virtual reality (VR) technology is one of these innovations that offer rich visual environments through technological means, and that are frequently used in everyday life. The VR tools have been reaching the users in different forms day by day. It can be said that the VR, which was seen as an expensive technology when it was first developed, is more accessible today. When the literature is examined, it is seen that many definitions have been made on the VR technology. The VR is defined as a technology that simulates life experiences and builds thoughts by using computers and various accessories, thus promoting communication between people, machines and other entities (Hay, 1997). Additionally, the VR is identified as a new technology that allows users to communicate in a dynamic environment by providing perceptions for sensory organs to feel real and feel like being in another place (Çavaş, Çavaş and Can, 2004; Bayraktar and Kaleli, 2007).

Basically, VR technology is an environment created by the joint operation of software and hardware products. Although VR technology is mainly related to software connected to the computer environment, there is also certain hardware developed to display the contents. The users' sense of presence in the environment and interactivity are tried to be provided by these hardware, which are the basic characteristics of the VR technologies. The hardware components of the VR technologies were created by Kayapa and Tong (2011), and the components of this technology are presented in Figure 1, benefiting from the sub-components and variables table. In addition, Andolsek (1995) indicates three hardware elements that should be in VR environments as; stage, desktop and world of mirrors.

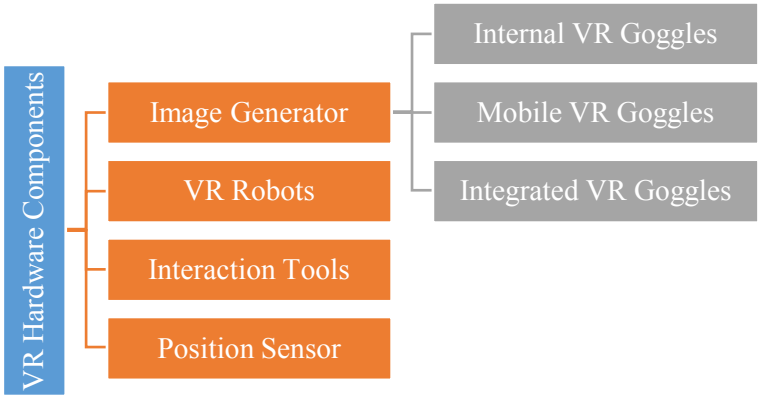


Figure 1: The VR components enlisted by Kayapa and Tong (2011)

Image Generators: These are the devices such as three-dimensional monitors and projections, imaging devices placed on the head, virtual reality goggles, which are used for the visualization of the software data. The VR goggles;

- **Internal VR Goggles**: Set of goggles that contain many components such as lens, screen and sensor, but need a computer or game console to be used and can provide high quality content (HTC Vive and PlayStation VR).
- **Mobile VR Goggles:** Goggles with only image lenses on them and all other components are provided by smartphones. The product is used by placing a smartphone inside (Google Cardboard).
- **Integrated VR Goggles:** Goggles that contain all components and equipment and do not require any additional product for the use (AMD Sulon Q).

VR Robots: Mechanical tool that allows interaction with a three-dimensional environment created via software.

Interaction Tools: Tools such as a mouse, a manoeuvre stick, or a data glove that allow users to interact with the content.

Positional Sensor: A set of wearable and navigation based devices.

Sherman and Craig (2002) mentioned four basic elements that exist within the structure of the VR technologies alongside their hardware components. These elements are briefly summarized in Figure 2 (Sürücü, 2017). In fact, the appearance levels of these factors directly affect the success degrees of VR environments.

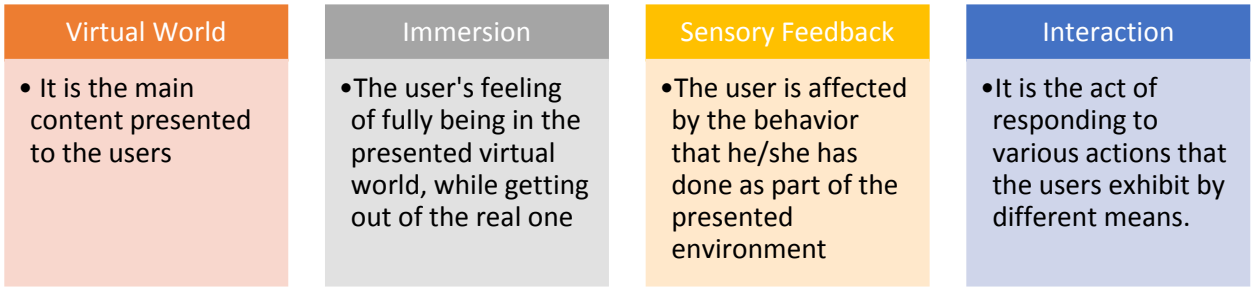


Figure 2: Four Basic Elements of VR Environments (Sherman and Craig (2002))

In addition to conducting research on VR technology in areas such as engineering, education, medicine, sports, and industrial fields, VR technology is spreading more rapidly and expanding its scope in the field of entertainment, tourism activities and other social activities. VR technology has set up its first applications with pictures, videos, three-dimensional images; and this technology has made a serious progress in interactive videos and games. Many interactive multimedia items have been developed in this direction. Each new technological development brings the questions of "*Can it be used in education?*", "*Can it create more effective, efficient learning environments?*" with it.

Therefore, it has begun to be questioned whether VR technology will be effective in improving the instructional environments. In this context, many researchers who work in the field have conducted educational orientations of VR technologies. While some researchers have focused on the specific educational practices of VR technologies (Passing and Eden, 2000; Yalon-Chamovitz and Weiss, 2008); some researchers have investigated various environments of VR technologies in the fields of history-geography and science-mathematics. (Çavaş, Çavaş and Can, 2004, Savage et al., 2009). However, it can be said that, today, VR technologies are used in medical education a little more than in other fields.

As VR technologies are being used at every stage of daily life, it is seen that these technologies are being continuously tested in instructional environments. These tools, which are prevalent in the fields of entertainment and industry, are now in the classroom. In this context, it is important to determine attitudes of users towards these technologies and to examine the effectiveness of VR technologies in learning environments. Considering that VR technologies will begin to be perceived as a learning object in the future, it can be said that the current researches will contribute to the educational aspect of VR technologies. It is also aimed at reaching users' suggestions about VR experiences and in which areas they will be more effective in terms of teaching by using multimedia items through VR goggles. In this context, the following research questions are tried to be answered in the study:

1. What are the general opinions of participants on VR technologies?
    1.1. What are the superior aspects of VR technologies indicated by participants?
    1.2. What are the limitations of VR technologies stated by participants?
2. What are the reasons for preferences and admirations for multimedia items used by participants in VR technologies?
3. What are the participants' recommendations for the utilization of VR technologies for instructional purposes?

2. Methodology

The research is designed as a case study, which is among the qualitative research methods. In qualitative research; situations are not analysed by isolating them from the system of values in which those situations are formed and developed, and the network of relations that are dominant in situations are tried to be interpreted in their own natural environment or revealed their meaning. (Patton, 1997; Neuman and Robson, 2012). This method has been used in order to reach the indigenous information on participants' experiences through their own expressions. Moreover, as Patton (1990)

points out, qualitative research is used to reveal existing phenomena instead of generalizations, even if the researcher provides detailed and rich information.

2.1. Working Group

The sample of the research is constituted by a total of 36 undergraduates, consisting of 21 female and 15 male students, determined by purposive sampling method from 5 different departments of Bayburt University, Faculty of Education. The main objective of purposive sampling method is to meet certain pre-determined significance criteria (Patton, 2014). Participants in the working group consisted of students who had never used VR technology and who took lessons conducted by the researcher. The demographic information of participants is presented in Table 1.

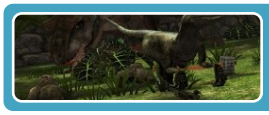
Table 1: Demographic Information of Participants

DEPARTMENT	**Age**			**Gender**	
	18-21	22-25	25+	Male	Female
Computer Education and Instructional Technology	13	-	1	4	9
Mathematics (Primary School)	10	-	-	5	5
Social Sciences	2	-	-	1	1
Turkish	2	-	-	-	2
Guidance and Physiological Counselling	7	1	-	5	4
Total	34	1	1	15	21

2.2. Implementation Environments

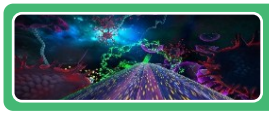
Participants used VR applications which were in the Oculus Home library stored in the mobile device via virtual goggles. The ease of use of VR applications is determined by evaluating its visual quality, its suitability to the level of the working group, and its being interesting. At this point, the opinions of the three field experts were taken and each content was watched separately and passed through the approval process. The designated application contents are shown in Figure 3.

Game1: This VR application is a game of fishing which offers three alternative environments. The game is played through touch keypad superimposed on the VR goggles. This is the application that constitutes the game category in the research.



Video1: This application is an animation that allows to monitor the appearance and movement of a dinosaur in the forest. This application is classified in video category in the research.

Photograph: This application includes images created with 360 degree photographs in order to monitor the historical and famous places in the Republic of Singapore. This application is enlisted in the photo category in the research.



Game2: This VR application is a game that aims to collect protein in the cell. The game takes place in an environment that depends on head movements (such as turning left and right) and time. This application is also placed in the game category.

Video2: This content provides an observation environment towards documentary on glaciers. This application is also classified in the video category.

Video3: This VR application is based on a submarine survey. It is an environment composed of animated images that offer alternatives and enable them to be watched under the sea. This application is also listed in video category.

Figure 3: VR Applications Used in the Research

2.3. Data Collection Tools

In the current research, a semi-structured interview form was used to reach the students' perceptions of the technology after each completed application. Nascente (2001) suggests four techniques in order to identify situation that lead excitement and concerns for students; observation, questionnaires, diaries and interviewing. Merriam and Tisdell (2016) point out that different techniques such as interviewing are effective in collecting data in order to obtain in-depth data in case studies. The interview form was developed by researchers in the direction of the expert opinions.

2.4. Implementation Process

Information on participants and process of the research is given in Figure 4.

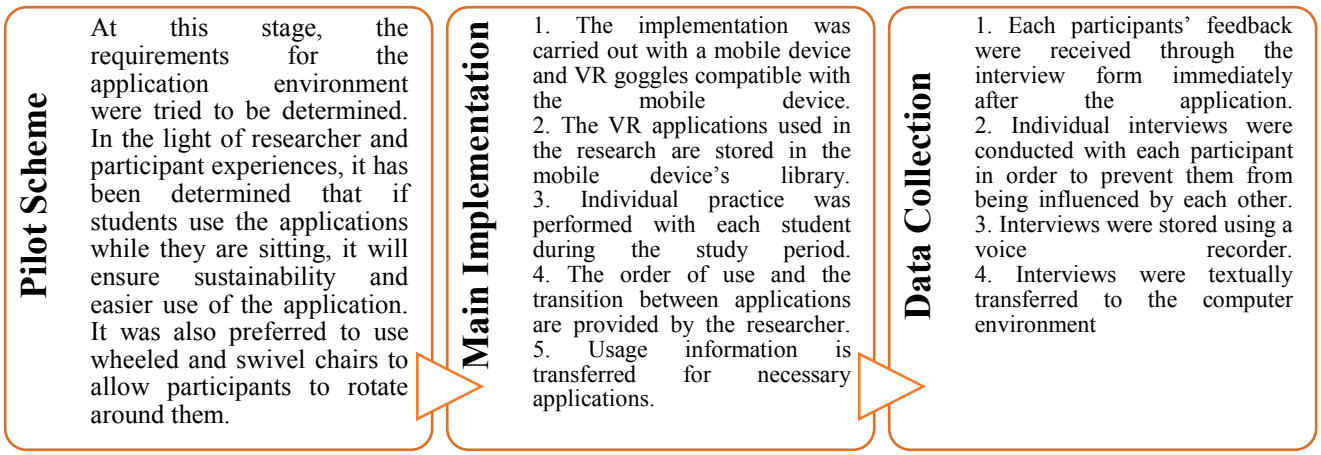


Figure 4: Implementation Process

2.5. Analysis of the Data

Content analysis was used to analyse the data obtained from the participants. Data obtained by content analysis were coded by researchers and related codes were grouped and categorized. The codes and frequency values of codes are presented through tables. Moreover, opinions of the students are also directly included.

As a result of the analysis of the data obtained, regarding the process of using the students' VR technologies; opinions about VR technology and its applications, most-liked multimedia items, preferences and anticipations, and usage-recommendations are determined in categories.

2.6. Limitations

The current research has the following limitations.

- Study is limited to undergraduate students.
- In the research process, the determined free applications were used.

3. Results

In the scope of the present research, participants' views on applications through virtual reality goggles were examined in detail and general findings are presented in this section by applying content analysis and descriptive statistics analysis.

3.1. What are the general opinions of participants on VR technologies?

When the general opinions on VR technologies are examined, it is seen that all of the participants are aware of this technology. However, only 11% of participants stated that they had used this technology previously. As a result of the interviews, 95% of participants expressed that they liked VR technologies, while the remaining 5% (N = 2) stated that they disliked.

3.1.1 What are the superior aspects of VR technologies indicated by participants?

As a part of the research, the superior aspects of the participants on VR technologies were determined. The results of the interviews in this context are summarized in Table 2.

Table 2: Superior aspects on VR Technologies

Superior aspects on VR Technologies	**f**
Feeling of Reality	28
Feeling in Ambience	21
Opportunity of having a tour	8

As a result of the interviews, it was seen that the participants were focused on the most feeling of reality of the VR technologies. Participants noted that they were very excited and entertained especially in the content presented there. Apart from this, there are frequent opinions expressed by the participants that VR technologies provided a feeling of being in the ambience. Participants emphasized that they were curious about the content and examined the environment presented in this regard to the finest detail. Some participants also noted that these applications ensure opportunities for having a tour. In this context, participant opinions are given below.

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> "*It was very influential and very realistic to me. The section under the ocean was the most exciting part for me. Especially when shark approached and collided me, bubbles came out and I felt like I was drowning*." (P2)

> *"You really feel as if you are inside and I realized that I have acrophobia, I feel very tense especially in train games. Very nice, very fun, I liked it very much, especially I was scared of dinosaur. It was too high when I was traveling to Singapore and I was a bit scared when I feel like I could fall, but the shots were pretty good." (P12)*

> *"It was so beautiful and so realistic that I felt like a dinosaur approach or something. For example Singapore was one of the places I wanted to visit and I liked it so much that I had the chance to see it without going there." (P13)*

> *"You turn around all the way, you feel like you're up there, you feel like you're in that environment, like you are one of those people there. The dinosaur was very realistic." (P20)*

> *"When Dinosaur approached, I felt a little mmm and when I bended while I was playing the game, I felt like I was falling but I didn't, it was exciting." (P22)*

3.1.2. What are the limitations of VR technologies stated by participants?

It has also been noted that despite the fact that VR technologies have reached a high level of appreciation as a result of the interviews with the participants, there are some limitations as well. These limitations are summarized in Table 3.

Table 3: Limitations of VR Technologies

Limitations of VR Technologies	*f*
Low resolution - Image quality (Blur, Freezing)	15
Dizziness	5
Insufficient interaction	4
Eye burns	2
Isolation from the real world	1

When the opinions of the participants are examined, it is seen that the resolution and the image quality are especially important in the contents presented. The low resolution and the defects in the image quality have affected participants' appreciations. In addition, for some of the contexts, participants have emphasized physical limitations such as dizziness and burning of their eyes. Some of the participants have also stressed that there should be more interaction in the presented contents. Moreover, participants mentioned that VR technologies can move the user out of the real world after a certain period of time which is another limitation. In this context, participant opinions are given below.

> *"... It was so nice to have that dinosaur approaching me and breathing towards me. I would have had that feeling more if the image quality was a bit better." (P1)*

> *"In fact, while I was wearing VR goggles, I had dizziness after a certain time. It was a little tiring." (P3)*

> *"... It was all good I liked it except it strained my eyes." (P15)*

> *"...picture quality was not very good, so I think it did not reflect the feeling of reality very well." (P4)*

3.2. What are the reasons for preferences and admirations for multimedia items used by participants in VR technologies?

Participants were presented different types of contents including videos, games and photos. The necessary information about these contents is given in Figure 3. The status of the participants on liking these contents was examined. As a result of the obtained data, it was seen that their status on liking contents including video and game categories were in a similar level, and the participants preferred the content based on photos less. The obtained data are summarized in Table 4.

Table 3: Participants' appreciation status according to content types

Types of Content	Contents	Liking Status		Disliking Status	
		f	%	f	%
Game	Game 2 (Cell Game)	16	32,6	3	7,5
	Game 1 (Fishing Game)	5	10,2	8	20
Video	Video 1 (Dinosaur)	13	26,5	2	5
	Video 3 (Ocean)	7	14,2	1	2,5
	Video 2 (Glacier)	1	2	18	45
Photograph	Photograph (Republic of Singapore)	7	14,2	8	20

When Table 4 is examined, it is seen that the Game 2, which contains motion items in the game category, is the most popular content. In addition, Video 1, which includes excitement-fear elements, is among the mostly liked contents. Moreover, the Video 3, which is an animated version of the life forms under the ocean, and the content of the photographs that show historical, famous places and natural beauties of the Republic of Singapore have also been appreciated by users.

In addition to the liked contents, it was seen that the participants' level of appreciation of the Video 2 content, which is especially related to glaciers, has decreased too much. Furthermore, the photographs were also among the less preferred contents for the participants. Moreover, although game category is appreciated, the Game 1 content in which fishing activity is included is not highly preferred by the participants.

The positive and negative factors that influence participants' overall appreciation of contents have been examined in detail. The overall views of participants on their preference are presented in Table 5.

Table 4: Reasons of Participants' Preferences on Contents Presented by VR Technologies

Reasons of Preference on VR Application	f
Realistic	15
Interesting	8
Funny	6
Interaction	4
Focusing	3
Supporting previous experiences	2
Ease of use	1

As shown in Table 5, it can be said that content which offers particularly realistic experiences is preferred more. Additionally, funny and interesting elements offered by contents are among the reasons that affect participants' preferences. Furthermore,

interaction between content and user is one of determining factors that affects the reason for preference.

Moreover, participants' reasons of not preferring the VR applications were examined as well, within the scope of the study. The general opinions of participants' reasons for not preferring are presented in Table 6.

Table 5: Participants' Reasons for not Preferring VR Technologies

Reasons of not Preferring VR Applications	f
Not-interesting content	20
Low resolution	9
Inadequate Interaction	4
Difficulty in use	4
Technical problems	3
Fearful content	3
Dizziness	1

Poor attractiveness is one of the most important factor which affects participants' preferences negatively. That is, participants tend to prefer interesting contents more. In addition, low resolution problem of content is also indicated as an important limitation factor in participants' preferences. Furthermore, inadequate interaction with the content and difficulty in use has also influenced the participants' preferences.

In addition to the general appreciation of the participants, opinions that affect their liking status according to all types of content are also examined in detail and presented in Table 7.

Table 6: Detailed Presentation of Participants' Preferences on Each Type of Contents

Code	**f**	**Code**	**f**
Positive Opinions on Photographs		**Negative Opinions on Photograph**	
Feeling in Ambience	**5**	Inadequate Interaction	**4**
Interesting	**5**	Not Interesting	**3**
Reality	**4**	Lack of Feeling in Ambience	**2**
		Resolution	**1**
Positive Opinions on Videos		**Negative Opinions on Videos**	
Reality	**11**	Resolution	**11**
Feeling in Ambience	**3**	Not Interesting	**2**
Excitement	**3**	Inadequate Interaction	**2**
Conspicuousness	**1**	Fear	**2**
		Internet Connection Problems	**1**
		Complex Content	**1**
Positive Opinions on Games		**Negative Opinions on Games**	
Fun	**8**	Not Interesting	**6**
Reality	**6**	Dizzy	**4**
Interaction	**5**	Difficulty in Use	**3**

Feeling in Ambience	**5**	Unrealistic	**3**
Focusing	**3**	Resolution	**3**
Interesting	**2**		
Excitement	**2**		

When the participants' general opinions on the photographs are examined, it can be seen that there are three factors which affect participants' views positively; feeling of being in the ambience, attracting interest and being realistic. On the contrary, when users feel lack of interaction with photographs and they don't find those photographs interesting, the photography contents are preferred less than the others. Furthermore, in the content of photographs, lack of feeling in ambience which is unique to this content, has also been observed. In this context, participant opinions' samples are given below.

"... My favourite content was Singapore trip. It was interesting to me because I was very curious about it." (P13)

"... My favourite content was photography of Singapore ... I felt like I was there with Goggle. It gave me a sense of reality." (P30)

"The content that I liked the least was photography. I do not know, but it may be because there is not much movement in that context." (P6)

"... The least I liked, Singapore, was indeed inactive. ... in others, I was still not moving, but it was nicer when the content was moving itself. It would be better if you also had an option of walking in Singapore." (P19)

When the participants' views on videos presented by VR technologies are examined; it has been seen that these contents are preferred because of high level of the feeling in ambience and the feeling of excitement caused by these videos. However, low resolution, poor attractiveness and lack of interaction in videos affect users' preference in the negative direction.

"... I liked videos the most, my favourite video was the one with dinosaur. Because it was the most realistic." (P3)

"... I did not like the first thing about the glaciers that I watched. Because the video was very confusing and short. For example, a car comes and three men are coming in and it is very short and confusing that I did not like it very much." (P7)

"... If the image quality were higher, those glaciers would be seen much better…" (P16)

"... the video related to glaciers, because I did not really understand that video. Quality of image was not very good either. And I do not like the part of the photos that I have seen. Because there are no moves." (P31).

When participants' opinions on game contents are examined, it is seen that entertainment is the most important reason for preferring the games. Besides, the feeling of reality and the interaction with the content are among the reasons of preference as well. Though, poor attractiveness, physical problems (such as dizziness and eye burns) and difficulty to play can be listed as reasons for the participants in not preferring them.

"I liked the cell game more. Because the cell game is more exciting to me." (P4)

"... The cell game was very good. Because the cell game was more alive and more realistic, I felt like it was inside. The fish game was not so realistic, I felt like I was playing in the internet café or on the computer, but the cell game was more realistic just like I was driving in a simulation." P10)

"... my favourite was cell game. Because it was very funny for me to play by turning my head to the left and right." (P6)

"...I like fishing game at least .... I'm not really a fan of playing a lot of games, so I did not like game content." (P33)

3.3. What are the participants' recommendations for the utilization of VR technologies for instructional purposes?

The participants were asked whether they would like to use VR technologies for instructional purpose within the scope of the research. In this context, 92% of the participants (N = 33) stated that the use of VR technologies in learning environments would be very useful and they would like to have such an education. However, 8% of the participants (N = 3) declared that VR technologies are good but their utilization in learning environments will not be effective and they do not want to have any education using this way.

The interviews with the participants were subjected to content analysis. In this context, the participants have suggested some lessons and areas where more effective learning can be achieved through VR technology. Table 8 presents the data for the recommendations for such utilization areas.

Table 7: Participants' recommendation for utilization of VR technologies

Code	**f**
Geography	13
History	11
Mathematics - Geometry	7
Biology	7
Computer	6
Chemistry	5
Physics	5
Medicine	4
Psychology	2
Turkish Literature	2
Gymnastic	1
Music	1

The data in Table 8 show that participants think that VR technologies can be used in a wide range of areas in education. It seems that the use of VR technologies may be more effective particularly in social sciences. In addition, the use of VR technologies in science is seen as beneficial to participants. The detailed reasons for these preferences of the participants are presented in Table 9.

Table 8: Reasons behind participants' recommendation on use of VR Technology in instructional purposes

Code	**f**
Permanent learning	13
Amusing learning environment	11
Facilitating learning process	7
Attracting	6
Giving a different perspective	2
Possibility to travel	2
Getting rid of limits in terms of subjects in the class	1

As it can be seen in Table 9, the participants emphasize that VR technologies can create permanent learning experiences. It is also indicated by the participants that these technologies provide amusing learning environments and these technologies can facilitate learning processes. Additionally, it is stated that these technologies can be seen as important tools to increase students' interests in the classes as well. In this context, participant opinions are given below.

"I would like to use this technology in education. I think it will be more effective if any historical places or battlefields are taught by these goggles in history or geography classes." (P3)

"It may be history, even though I do not like history very much, it might be better to learn it with 3D videos, and I would have had more interest and fun." (P13)

"We have stories at the end of our book, for example, those stories can be animated by this way, or I think it would be better for us to show Orhon Inscriptions or Cyrillic alphabet with such goggles in Turkish classes." (P11)

"For example, these technologies can be used in physics classes. Cogwheels could be described better by 3D videos. It can be explained better how cogwheels operate, the ratio of cogwheels to small cogwheels, or turning ratios. Additionally, students could conduct more experiments by these technologies, maybe they could mix wrong chemical elements which would lead an explosion in the video and they would feel so afraid, in the end, they could have learnt better by experiencing it by the VR technologies." (P1)

"For example, I do not like social studies classes at all, if I had been taught social studies lessons in this way, such as historical things were explained visually, it would be better for me, I would not fall asleep at least or I would feel like I was there." (P12)

"Yes, I would like to have this type of education. I think that it will be effective because each person does not have the same learning style. For example, in a geography class, a teacher can't explain glaciers no matter how much he/she talks about it, but with this technology, students would learn way too much easier and I think it would be more permanent." (P5)

"Anatomy fits perfectly with these technologies. We have examined structure of the human body in physiology class. For example, the muscles of the human body or we have studied structure of the brain in the scope of this class. If we had used VR goggles in these physiology classes, we could have better examine whole brain or any cell, it would be much better." (P19)

"For example, while we are working on fishes in a biology class, we can't all go under the sea, but if we had this VR goggles, we could all examine fishes under the sea. We can look at the cell topic again with these videos. It will be more permanent. It would therefore be

more motivating for students. Actually, I was studying in the maths/physics department and we had no chance to do experiments in high school. But if we could experiment with these glasses, I think it would be more permanent for us. Or some games can be developed for children for their mathematic classes by these videos." (P34)

Participants who do not wish to use VR technologies for instructional purposes have indicated that these technologies can't be used continuously, but they can be used as supporting material with educational purposes. Furthermore, participants also said that VR technologies could affect social lives of learners negatively, and these practices could become tedious in time. It is also pointed out that the use of VR technologies in educational environments may not be effective because of the fact that they could have different effects on different individuals and also the cost can be high.

4. Conclusion, Discussion and Recommendations

In the context of this research, in which the participants' views on VR environments and various multimedia items in these environments are tried to be determined, it can be said that the level of appreciation for the different types of applications developed for VR technologies is considerably high. It is thought that such a high level of appreciation shown from the users can be explained by the fact that the VR technologies have never been tried by participants previously. Moreover, this new technology could increase participants' curiosity and therefore their appreciation as well. Yet, it is indicated in the literature that newly added technologies to learning environments have influenced the motivation positively (Bayraktar and Kaleli, 2007).

It is thought that high level of preference rates can be explained by the fact that VR technologies evoke the feeling of being in ambience and feeling of reality. This is also stated as a common explanation, which is used in the definition of VR technologies, in the literature. (Bayraktar and Kaleli, 2007; Çavaş, Çavaş and Can, 2004). It can also be said that VR environments provide great facilities for individuals, who are unable to travel for various reasons (poverty, physical and mental disability, time limit etc.). McLellan (1996) concluded that the VR technology is an alternative technique for students, who are physically disabled while he/she has adequate learning ability at the same time. This situation can also reduce the limitations of individuals in learning environments to a minimum level.

There are some limitations as well as favourable views towards the preference of VR technologies. It can be said that the most important ones are the low resolution and image quality problems in the content. It is thought that the inherent defects in

resolution and image quality prevent the feeling in ambience and reality which are considered as the most important superior aspects of enjoying VR technologies. In addition, it has been seen that VR technologies are directly related to the suitability of image quality which is considered as a main determinant in assessing effectiveness. For this reason, it is considered that the content to be used should be vivid with high resolution, which affects the users' preferences. Zara and Slavik (2003) points out that the visual quality of virtual VR technologies could be lower than the actual conditions and that would cause some problems that the users would deal with. Additionally, interactivity is determined as an important factor in VR technologies. Inadequate interaction can be said to have an effect on participants' preferences. Sherman and Craig (2002) have emphasized in their research that interactivity is one of the four essential characteristics of VR. Chavan (2014) also stresses that designers are working extensively on issue of inadequate interaction which is defined as one of the greatest limitations of VR technologies. It can be said that VR technologies can cause some physical effects as well (eye burn, dizziness, etc.). This can reduce the effectiveness of VR technologies in long-term usages. Accordingly, this situation and the result that the participants recommend the utilization of VR technologies as support materials for instructional purposes can be more effective in learning environments supports each other.

Participants have preferred games more than photos and videos offered in VR technologies. Similarly, Chavan (2014) states that VR technologies are particularly suitable for videogames. Identically, videos have been found more effective in whole types of VR technologies. However, it can also be said that the content composed of photographs is not as preferable as the others. It is believed that users find the other contents more realistic than photos and they can feel themselves in the ambience more. Moreover, it is seen that interaction with contents are another key determinant. That is to say, more active the participants are while using them, more satisfied they are with the content. Pimental and Teixeira (1995) pointed out that interactivity is one of the most fundamental characteristics of VR in their study. Further, Monahan, McArdle, and Bertolotto (2008) stated that interactions in VR environments keep the learners' interests alive and make it fun to learn. Considering this fact, it can be said that the lack of interaction in the virtual reality environments directly affects participants' preferences. Additionally, another important determinant for the users is the attractiveness of the content. Also, resolution and image quality affect the liking status of contents presented with VR technologies. Furthermore, technical and physical problems experienced by users are among the factors that affect users' preferences as well. In addition to these, previous experiences of the users are seen to be influential on users' preferences. In

other words, users' opinions on activities in his/her daily life he/she performs either willingly or unintentionally can be similar to those of his/her opinions on activities offered by VR technologies. In this context, it can be said that the activities that support the previous experiences of the users may also affect his/her preferences.

There are many important researches in the literature to mention. Monahan, McArdle and Bertolotto (2008) and Başaran (2010) referred to the use of VR technologies with instructional purposes, as well as in the areas of entertainment, military and industry (Burdaa and Coiffet, 2003; Çavas, Çavas and Can, 2004). In this context, the present research argues that utilization of VR technologies in classes especially in the social context can be more appropriate and effective. It is thought that VR technology will particularly affect the inner motivation of learners positively especially in classes such as history and geography which requires verbal content and visualization of past events. Hence, it can be said that utilization of VR technologies in social classes like history and geography can be positive and motivating elements which will lead positive results. It is also seen that VR technologies can be used in a wide range of areas from science to music. It is stated in studies that VR-supported learning materials are suitable to be used as supportive elements for students in order to stimulate any subject in their minds and to learn them by experiencing it especially in fields such as geography, chemistry, biology, anatomy. The wide utilization areas of VR technologies are reported in detail. (Başaran, 2010; Chavan, 2014; Çavas, Çavas and Can, 2004; Driver, 2017).

The utilization of VR environments in the learning process is thought to provide particularly permanent learning experiences which can be explained by the fact that users' presence in that environment and he/she experiences it by himself/herself. It is thought that the participants have a desire to take part directly in the learning process and activities, and that is why they are more likely to appreciate the technologies that enable it. In this context, according to Bakas and Mikropoulos (2003), the use of VR technology in teaching processes provides a positive attitude towards learning in students. Chavan (2014) stated that VR environments isolate users from the real world, which increases their attention towards the content presented. Therefore, it is important for users participating in the process to think that VR technologies will provide permanent learning which is a crucial element in education. Other findings in the field about the VR technologies' impact on permanent learning support this claim. (Aretz, 1991; Chen et al., 2007; Shin, 2003).

The VR technologies are also able to create funny and easy learning environments. Chavan (2014) notes that VR technologies can create easier and more comfortable learning environments. There are some researches in the field highlighting

that VR supported education increase motivation, provide fun and give opportunity to experience. (Burdea and Coiffet, 2003, Andolsek, 1995, Winn, 1995, Barab et al., 2001, Arıcı, 2013). For example, Tansal, Kaleci and Tüzün (2016) state that VR technologies can influence learners' motivation positively. However, Chavan (2014) states that some experiences in VR environments may not perfectly fit to the real world, so users who succeed in the VR environment may not exhibit the same success in the real world. Besides, it is understood that VR technologies increase the desire to learn and curiosity in users. Regarding this situation, Bingöl (2008) stated that the use of VR technology in photography increases general interest in the museums and the users really wish to go to the museum they visited in the virtual reality.

It can be said that VR technologies are seen as important tools that have any contents which are not possible to be experienced in the class environment for various reasons. (Hardiess, Meilinger and Mallot, 2001, Monahan, McArdle and Bertolotto, 2008, Zara and Slavik, 2003). Roussou (2004) and Nooriafshar, Williams and Maraseni (2004) state that VR technologies can be used when the utilization of real objects or real word is extremely hard or impossible, and when using the real object is insecure or very costly. Besides, the sense of reality presented by VR environments can be very effective in learning environments. Nooriafshar, Williams and Maraseni (2004) underlined that the inclusion of real-like visuals and devices in the system strengthened teaching process, made it easier for users' adaptation to the environments, and allowed users to easily change their roles according to changing circumstances.

In summary, the following superior aspects may be arisen by the use of VR technologies in instructional environments;

- Interest, motivation and curiosity of learners towards the class can be increased.
- Interaction of learners can be achieved by situations or objects that can't be brought into learning environments.
- Entertaining learning environments can be created.
- Permanent and easy learning experiences can be developed.
- Equal opportunities can be achieved by making more use of the learning processes of individuals with various disabilities.

4.1 Recommendations

- Current research has been conducted on undergraduate students. Different results can be obtained in individuals at different learning levels.
- Free software is preferred for the study. Better results can be achieved by using different applications.

- The number of samples can be increased to generalize the results to wider masses.
- The opinions on different types of content have been examined within the scope of the study. More in-depth information can be gained by focusing on one of the content types.

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