Literature Review on The Use of Virtual Reality in Special Education: Current Situation and Opportunities

Ümit DEMIR[1]

Abstract

The development of many new technologies, especially virtual reality, provides opportunities for their effective use in education. The effective use of these technological developments in education can offer different opportunities for students and trainers: It is thought that with the increase of research and studies on the use of these opportunities, both social awareness and effective use of these tools have increased. In the current literature review, it has been observed that research on the use of virtual reality applications in special education are extremely limited. This research, carried out in this context, was carried out to reveal the current state of special education in our country and internationally in special education. In this study, the literature review, one of the descriptive research methods, was used. Within the scope of the research, it is aimed to reveal the problems experienced in Turkey and future studies by analysing the studies carried out for private education at the national and international levels. Although virtual reality can offer great opportunities for the academic and social development of students with its ability to appeal to many different senses, it was found in literature review that the software made for special education and the research conducted to determine the effectiveness level of this software were extremely limited. As a result, this study is expected to be a guide in the studies on the virtual reality use for special education.

Keywords: Special Education, Technology use in Education, Virtual Reality

---

[1] Ümit Demir, Assoc. Prof. Dr., Computer Technologies, Canakkale Onsekiz Mart Universtiy
Email: umitdemir@comu.edu.tr

INTRODUCTION

Nowadays, with the rapid development of technology, restrictions on individuals are decreasing day by day. One of these technologies is virtual reality environments. With virtual reality, individuals have the opportunity to create environments close to reality by moving environments that they cannot achieve in real life to the virtual environment (Riva et al., 2016:3; Tepe, Kaleci, & Tüzün, 2016:548). In virtual reality, fictional environments that give users perception of reality are created by using special hardware and software (Ferhat, 2016:724). For this reason, virtual reality can also be expressed as a "reconstruction of reality" as a short definition (Kayabaşı, 2005:151; Krichenbauer et al., 2017:1042). Virtual Reality has entered every aspect of our lives today by showing rapid development in the 1990s that started in the 1980s. In the development of virtual reality, It has been one of the important factors to think that the learning experiences required for the training of pilots, astronauts, and soldiers can be met more easily and at a lower cost (Çavaş, Çavaş, & Can, 2004:114). The development of this technology accelerated with the virtual reality glasses developed by Nintendo in 1995 for entertainment purposes (Ferhat, 2016:730).

In virtual reality applications, various tools are needed to detect the movements of users (Sani-Bozkurt, 2017: 45). These tools are commonly referred to as wearable devices. Wearable devices are devices that provide the user with the opportunity to be integrated into the human body in different ways and are usually used in various pieces of equipment and generally have a connection to a network (Sezgin, 2016). Some of these devices are smart watches, smart contact or optical lenses (Figure 1), data gloves (Figure 2), and HMD hood (Figure 3) (Tepe, Keeper, & Tüzün, 2016:550).
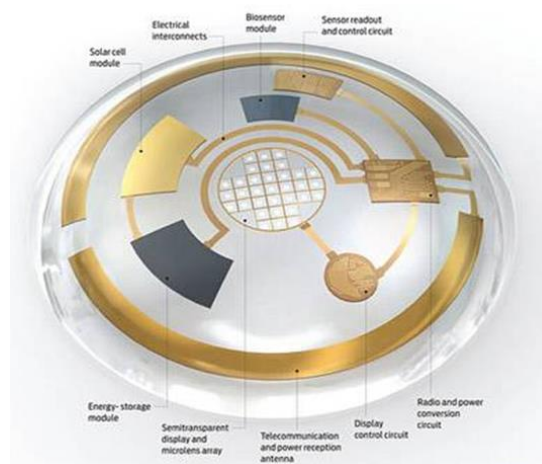

Figure 1. Smart Contact Lens (www.sabenada.com.br)

Figure 2. HMD Hood (Çavaş, Çavaş, & Can, 2014)

Figure 3. The data glove (Lee, Park, Lee, and Kim, 2007)

The different tools provided by virtual reality for users and the different experience opportunities it provides have recalled the issue of their usability in the field of education. In this context, the use of virtual reality environments in the field of education has increased especially at the international level in recent years. With the use of these environments, the quality of the software that will increase the learning and experience levels of the students gains importance.

METHODS

Model of Research

In this study, a literature review was employed as a methodological framework to guide the research. A literature review is defined as the examination of studies on the same subject in line with the determined goals and criteria. The studies that include systematic literature reviews, it is aimed to

direct the studies and practices for the future by identifying the important relationships and practices in the literature. The data obtained in this research are analysed descriptively according to the determined criteria (Gough, Oliver, and Thomas, 2017).

Research Strategy

Before starting the screening process, authors have defined special keywords that can help reach all the publications related to the determined topic. These are defined as "special education", "instructional technologies", and "virtual reality". Different keywords were created from combinations of the determined keywords in different formats among themselves. Accordingly, the keyword phrases are defined as "Special Education and Virtual Reality", "Use of Virtual Reality in Special Education", "Special Education and Training Technologies" and "Use of Instructional Technologies in Special Education". After determining the keyword phrases to be used in the screening process, the field to be scanned in the study is limited in terms of the year. In this context, it was decided to examine more recent studies published between 2010-2020. For this purpose, it was decided to search Anadolu University Library "Databases Collective Search (ABI/INFORM Complete, Cambridge Journals Online, EbscoHost, JSTOR, OECD iLibrary, Oxford Journals, Press Reader, Sage, Science Direct, Science Online, SciFinder, SocINDEX with Full Text, SpringerLink, Taylor & Francis, University of Chicago Press, Web of Science)" and "Google Scholar" databases. Then, the review and review process were started.

Review Process

Within the scope of the study, studies on virtual reality applications in supporting the learning and skill development of special education students were examined using descriptive analysis. The descriptive analysis also called a systematic review, or literature review is expressed as the examination of studies on the same subject in line with the determined goals and criteria (Gough, Oliver, and Thomas, 2017). During the review process, the inclusion and exclusion of the articles in the process were carried out by using the criteria determined by the researchers. The identified inclusion and exclusion criteria are defined below.

Article inclusion criteria:

- Published in a peer-reviewed journal or refereed and published in full-text format

- To be realized the use of virtual reality in private education

- The study is constructed with experimental research methods or includes the literature for the studies carried out,

- Publications written or translated into English and Turkish.

Article exclusion criteria:

- Works published before the year 2000,

- It is the work that does not contain the literature for experimental application for special education or experimental studies that have been carried out.

As can be seen in Figure 4, 84 articles were reached because of the database scan carried out using the determined keyword phrases. The articles reached were examined according to inclusion and exclusion criteria and because of the examination, it was decided that 41 studies did not comply with the research criteria. As a result of the elimination made according to the inclusion and exclusion criteria, it was decided that 9 articles did not meet the research criteria. Considering that up-to-date new publications may emerge during the screening process; a new scan was carried out and no studies matching the criteria were found because of the new scan.
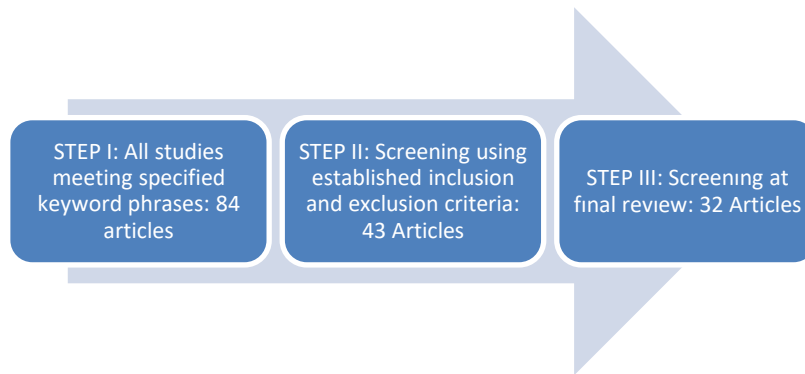
STEP I: All studies meeting specified keyword phrases: 84 articles

STEP II: Screening using established inclusion and exclusion criteria: 43 Articles

STEP III: Screenıng at fınal revıew: 32 Articles

Figure 4. Screening flowchart in the systematic review process

RESULTS

Findings on the Use Case of Special Education and Educational Technologies in Turkey

According to the Ministry of National Education (MEB in Turkish short form) 2016-2017 statistics report, according to student and school statistics, a total of 333,598 students, including

210,150 men and 123,448 women, were studying in 7,823 classrooms in 1,362 schools for special education. According to the 2018-2019 statistics report of MEB, a total of 398,815 students, including 252,835 men and 145,980 women, are studying in 1,489 schools and 9,361 classrooms. There has been an increase of approximately 20% in the number of students in the 2 years. This increase in the number of students increases the importance of meeting the learning needs of students with special needs. In 2010, the Ministry of National Education started the FATİH project (In Turkish short form), which started with the development of technology infrastructure in schools to increase opportunities in education. Despite the elapsed time, the prepared educational software is not yet of sufficient number and quality (Baz, 2016:98-99; Bozkuş, & Karacabey, 2019:24-27). Our special education students have not benefited sufficiently from the change and development of the education and training environment realized with the FATİH project. Applications for special education students on the Education Information Network (EBA in Turkish short form) platform, like other learning content, are extremely few and their nature is a matter of debate. This situation is an indication of how important and urgent it is for our country to work on content development. However, virtual reality applications, which are current learning environments can offer many opportunities in ensuring equality of opportunity in education. The relationship between the level of access of people to education, the level of benefit from the education of those who have access to education, and the level of benefit from education with the inequalities in society is a fundamental issue that is considered in the education process. Today, in the "Sustainable Development Goals" and European 2020 documents of international nature, in documents such as Government Programs at the national level and the MoNE Strategic Plan, the aim is to ensure that everyone benefits from quality education equally. Access to education is the attainment of equal education for students with different characteristics and needs without encountering different practices. For this reason, the education given should be designed and accessed by considering that each child has different characteristics and different needs (Çağlar, 2012: 546). In this context, it will be useful to determine the educational and learning needs of students who need special education.

Findings on Education and Learning Needs

Finding One of the key competencies determined in line with the European Union 2020 targets is social and human competencies (Bilasa and Taşpınar, 2017:131). Within the scope of these competencies, individuals; It is of great importance to enable them to take part in social communication and business life effectively and productively which changes day by day. One of the main objectives of teaching individuals with special education needs is to prepare them to live and work independently in society (Kurtoğlu, Tekinarslan, & Tekinarslan, 2017:186). Children with mental disabilities need to take part in society, develop their social relations, act in line with their

interests and needs, to provide with appropriate environmental conditions to ensure their transition to business and professional lives in terms of laying the foundations of school periods and living independently (MEB, 2000). There is a need for activities that will help individuals with special education needs to access community services safely and independently, and to increase their competence (Karimi, Dias, Pearlman, and Zimmerman, 2014:2). Shopping (Morse and Schuster, 2000; Dipipi-Hoy and Jitendra, 2004), receiving support when lost (Taber, Alberto, Seltzer and Hughes, 2003), riding a bus (Wrigth, &Wolery, 2011), crossing the road (Branham, Collins, Schuster and Kleinert, 1999) are taught to increase the individual's independence and life skills. These skills are among the functional skills and are expressed as community-based skills (Kluth, 2000:19; Hamill, & Everington, 2002; Burcroff et al. 2003:56; Kurtoğlu, Tekinarslan, & Tekinarslan, 2017:186).

Community-based skills are necessary skills to fulfill social life tasks, and it is recommended to be taught by living in natural environments as much as possible (Kurtoğlu, Tekinarslan, & Tekinarslan, 2017: 186). Community-based skills are intensively acquired by special education teachers for children with intellectual disabilities and special education needs. The teaching of life skills in all subjects and situations may not be provided directly in a real-life environment. Since teachers are subject to additional responsibility, limited opportunities again, financial burdens, and the possibility of some skills experiencing security problems in the teaching process, it may be necessary to try teaching in the environment of affinity before it is done in the real environment, and then to transfer it to the real environment and social life (Ayres, Langone, Boon, & Norman, 2006:6; Branham et al., 1999:171; Browder, & Bambara, 2000:543-589; Kurtoğlu, Tekinarslan, & Tekinarslan, 2017:186-187). In the periods when analogy environments did not develop with virtual reality technologies, video technologies were widely used. For this reason, it has been used to support many skills in special education. It is considered important to benefit from past experiences in the organization of virtual reality activities. In this context, in the next sub-heading, studies on the use of video technologies to support the educational processes of students with special needs are included.

Use of Video Technologies for Special Education

It is seen that video technology is used in the teaching of many skills for special education (Tekinarslan, & Tekinarslan, 2017: 186-187). Information on the studies obtained for the studies carried out using video technology is given chronologically in Table 1.

Table 1

Studies Using Video Technologies for Special Education

Studies	Number of Samples	Special Education Status	Experimental Study
Gülsöz (2014)	3 (10 and 11 years old, two girls and one boy)	Students with high-functioning autism	Cold drink preparation and serving
Avcioglu (2013)	5 (11-year-old three girls, two boys)	Students with intellectual disabilities	Greetings
Sani-Bozkurt (2011)	3 (two boys and one girl between the ages of 5-6)	Students with a diagnosis of autism	Soup cooking and first aid
Miller (2010)	4 (18–21 years old)	Students diagnosed with mild intellectual disability	Hotel housekeeping skills
Öncül and Özkan (2010)	3 (women ranging in age from 23 to 37)	Adults with moderate to severe mental retardation	Daily living skills
Halisküçük and Tekinarslan (2007)	3 (male students aged 10-13)	Students diagnosed with intellectual disability	Pasta cooking
Mechling and Gast (2003)	3 (one female and two male students between the ages of 12-18)	Students with moderate mental impairment	Read grocery store shelf articles and find foodstuffs
Mechling, Gast and Langone (2002)	4 (three girls and one male student aged 9-17)	Students with moderate mental impairment	Market aisle reading

It is seen that video technology is used in the teaching of skills such as the preparation and presentation of cold drinks (Gülsöz, 2014), greeting (Avcıoğlu, 2013), basic first aid applications in home accidents (Ergenekon, 2012), soup cooking and first aid skills (Sani-Bozkurt, 2011), teaching hotel housekeeping services (Değirmenci, 2010), daily life skills (Öncül and Özkan, 2010), pasta cooking (Halisküçük, & Tekinarslan, 2007). When the studies abroad aimed at teaching life skills using video technology were examined, Mechling, Gast, and Langone (2002) found that computer-aided video teaching was effective in reading the market signs and aisle locations for students with moderate intellectual disabilities. In Mechling and Gast (2003), they taught three mentally disabled students to read the writing on the shelves in the mall and to find the places of foodstuffs in the market with video-assisted instruction. In video-supported teaching, texts, photographs, and video recordings were frequently used in this research. With video-supported teaching, it has benefits for students to embody learning. However, there are deficiencies in experiencing learning close to real life. In video-assisted teaching applications, controlling teaching with drag-and-drop applications such as product and product name matching (Mechling, & Gast, 2003) has been the preferred method in this research. Virtual reality environments are much more advantageous than video-supported teaching in terms of the real-life association and experience that students learn. Topics realized with the use of visual video can be realized by creating student experience opportunities in virtual reality environments. In this way, the learning and skill acquisition processes of students can be supported at a higher level. In the next section, studies on the use of virtual reality in general education processes are included.

Findings on Virtual Reality Applications in Teaching Processes

The utilization of virtual technologies, with their various advanced features, has been demonstrated to promote active learning among students. Thanks to VR, students can interact with virtual environments, understand complex concepts more easily with the possibility of personal experience, and learn by doing/experiencing new experiences (Martín-Gutiérrez et al., 2017:478). In this context, when the research on the use of virtual reality in teaching is examined; Linking virtual technologies to students' academic achievement and motivation (Bacca, Baldiris, Fabregat, Graf, and Kinshuk, 2014; Di Serio, Ibáñez, and Kloos, 2013; Harris and Reid, 2005; Holley, Hobbs, & Menown, 2016; Martín-Gutiérrez et al., 2015; Sotiriou, & Bogner, 2008), which relates students to social and cooperative skills (Kaufmann, Steinbügl, Dünser, and Glück, 2005; Martin-Gutiérrez, Saorín, Contero, Alcaniz, Perez-Lopez, and Ortega, 2010), and the cognitive and psychomotor development of students (Zhou et al., 2008). The experimental studies on the use of virtual reality applications in teaching processes are given chronologically in Table 2.

Table 2

Experimental Studies on the Use of Virtual Reality Applications in Teaching Processes

Studies	Number of Samples	Special Education Status	Experimental Study
Di Serio, Ibáñez, and Kloos (2013)	69 Participants (13–16 years old)	No	Effect on motivation for a visual arts course
Martin-Gutiérrez et. al. (2010)	25 University students	No	Motivation for the electrical engineering electrical machines course
Sotiriou and Bogner (2008)	119 Exhibitors (15-16 age range)	No	Motivation for innovative science education

When these academic researchers in Turkey are examined, since 2014, studies on the use of wearable technologies such as virtual reality glasses in education have started to increase (Sezgin, 2016: 410). In the literature review conducted by Sezgin (2016), 83 pieces of research could be reached. Only 14 of these investigations were carried out semi-experimentally and fully experimentally. From these developments in virtual reality and wearable technologies in educational technologies, special education has started to benefit.

Findings on the Use of Virtual Reality in Special Education Processes

Students with special educational needs may have significant differences between their mental development and their physical development. Therefore, the questioning abilities, language skills, emotional and behavioural maturity, and the development of independence of these children

may occur later (Klein and Arieli, 1997:299). Therefore, it can support the learning of special education students with technological facilities such as virtual reality technology. With the developments in technology, it is seen that the use of technology in special education has increased.

Virtual real learning environments have the closest experience opportunities to real life within the learning environment of the student. Special education students, like all students, need learning materials and tools that appeal to as many senses as possible. It is very difficult for software that does not have the desired level of educational features and contains standard lectures and multiple-choice tests in which students are not very active to provide sufficient benefit to students (Gökdaş and Kayri, 2005:11). For this reason, the realization and dissemination of virtual learning environments that will enable students to actively participate in the learning process and learn are extremely important in terms of increasing the quality of the teaching process (Shin, 2017: 1834). In this context, the virtual reality teaching software to be prepared must be multiplied by addressing multiple senses at the same time and learning information resources. The interaction in the teaching material can increase the quality and permanence of teaching by enabling students to be more active as the number of senses is increased (Tatlı, 2018:3). Virtual reality equipment allows students to participate more effectively in learning life with their perceptive arms and 3D image facility. It can be said that this has a very important value, especially for individuals with memory problems. Because individuals who receive information visually and experience it with different senses can keep them in their memories for a longer time. Virtual reality technology does not only address individuals visually as in video-supported teaching but also appeals to other senses of the individual to experience close to real life. In the literature, it is emphasized that individuals with special educational needs have positive effects on the understanding and expression of emotions, establishing eye contact, attention focus, and acquiring game and safety skills in learning environments where virtual environments are used (Boser, Goodwin, & Wayland, 2013). In addition, for people who have deficiencies in the process of initiating the process of communication and interaction in real life, virtual learning designs can be created in which people can live in virtual situations and increase their communication and interaction competencies (Sani-Bozkurt, 2017:46). Virtual reality environments have also started to be used in the teaching of social life skills. The studies reached for the teaching of social life skills are given chronologically in Table 3.

Table 3

Studies Using Video Technologies for Special Education

Studies	Number of Samples	Special Education Status	Experimental Study
Smith et al. (2016)	3 (one female, two males between the ages of 22 and 25)	Students diagnosed with intellectual disability	Ability to navigate
Cheng and Ye (2010)	3 (one girl, two boys aged 7-8)	Students with an autism diagnosis	Social communication skills
Cheng et al. (2010)	3 (three boys aged 8-10)	Students with an autism diagnosis	Developing empathy
Passig (2009)	87 (41 girls, 46 boys aged 9-21)	Students with mild to moderate intellectual disability	Sequential time/process perception
Josman et al. (2008)	6	Students diagnosed with autism spectrum disorder	Crossing the street
Mitchell, Parsons, & Leonard (2007)	6 (three girls and three boys between the ages of 14 and 15)	Students with an autism diagnosis	Social communication skills
Self et al. (2007)	8 (two girls aged 6-12, six boys)	Students diagnosed with autism spectrum disorder	Security skills

Carrino et al. (2019) and Wrigth and Wolery (2011) have developed virtual reality software that has enabled them to safely experience the learning of crossing the street, getting on the bus on the desired line, getting off at the stop where they need to get off, and communicating with the passenger/driver, which are the life skills needed by special education students. There is no experimental application in these studies. In another study on the acquisition of basic social skills such as sitting in buses and cafes (Mitchell, Parsons, & Leonard, 2007), they concluded that virtual reality environments were effective in the acquisition of this achievement by 6 students diagnosed with autism. Another study on life skills is a study on the development of address and direction skills. Smith et al. (2016); In their study of three post-secondary school students with special needs, they concluded that this software, which they developed, improved the students' navigational skills. Self et al. (2007) developed a virtual environment based on a real-situation scenario for how to act in emergencies such as fire and offered students the opportunity to experience such environments in advance. Cheng and Ye (2010) have set up a virtual communication environment for special education students to develop social competence skills such as communication, which is another skill they need. At the end of the 17-day experimental process, the participants achieved improvement in their mutual social interaction levels. In another study on empathy teaching (Cheng et al., 2010), 3 students between the ages of 8-10 developed empathy skills after practice. Josman et al. (2008) have developed a virtual reality software to provide 6 children diagnosed with autism with the ability to cross the street as part of life skills teaching. At the end of the experimental process, they concluded that the children gained the cross-crossing behaviour at a sufficient level. Passig (2009) tried the virtual reality software developed by 87 participants between the ages of 9-21 to provide sequential time perception (sequencing step sequential steps) competence, which is one of the situations where

special education students have cognitive problems. It has been concluded that the experience of the students and their competence in ranking the process steps have increased.

The utilization of virtual reality technology allows for the presentation of complex or abstract concepts to individuals with intellectual disabilities in a simplified and engaging manner, by virtue of its ability to transport them to a virtual environment. In this environment, the content is presented in a game format and provides individuals with more efficient learning opportunities. Komşul (2012) concluded that according to the opinions he received from special education teachers for virtual reality software prepared for the teaching of geometric shapes and positions (front, back, inside, outside), the software can increase the learning of its students by embodying.

DISCUSSION AND CONCLUSIONS

When the virtual reality software made in the literature is examined, it is seen that the software made for special education and the research conducted to determine the effectiveness level of this software are extremely limited. However, virtual reality can offer great opportunities for the academic and social development of students with its ability to appeal to many different senses. For this reason, it is thought that the studies to be carried out in this field are of great importance. However, no experimental study has been reached to measure the effectiveness level of the virtual reality environment in our country. Only Aykora et al. (2019) have been found to investigate the sporty motion apps using the XBOX game console. In this research, ready-made software developed for XBOX was used. Considering the point reached by virtual reality in education at the international level, it is thought that this situation is an important deficiency. Thanks to the sets (kits) created for virtual reality, the student can perform qualified and permanent learning by interacting with many structures at the same time audibly, tactile, and visually. In this context, one of the important student groups that this technology provides learning opportunities is special education students.

In virtual reality learning environments, students have the opportunity to continue their movements in the virtual environment they use as if they were living in real life. It can be ensured that experiences that are impossible to design in real life are created and students gain experience in their learning lives. Students can perform more effective learning by participating in the application process as they wish according to their learning speed (Sani-Bozkurt, 2017: 46). In the literature, it was seen that the studies on the effects of the software for the application of virtual reality in education and the virtual reality software developed on the learning/development processes of the students were limited. No national experimental studies, especially for special education, have been found. However, in recent years, there has been an increase in the number of students benefiting from special education services in our country. While 257.266 students benefited from special education in

the 2014-2015 academic year, 285.172 students benefited from this education in the 2015-2016 academic year. However, proportionally, 1.64% of the total number of students benefit from special education. The number of students receiving inclusive education has also increased in primary school students (Education Reform Initiative 2015-2016 Report). In this process of improvement in quantity, the quality of education is also of great importance. In this context, it is of great importance that all students benefit from educational opportunities equally and adequately. In this context, it is of great importance that the general planning made in our country is supported very well locally. Since education is a special and individual study, general applications may not provide the expected outputs. In addition, addressing multiple senses in increasing the quality of learning is important both in terms of the permanence and quality of learning. Currently, it is seen that the learning materials to support the learning of special education students are extremely limited. For this reason, it is thought that it is important to examine the studies on the use of video in special education before virtual reality and to consider it in terms of giving an idea to the current studies.

When the results of the research and the current situation are evaluated, the following recommendations have been introduced.

a) Taking into account the studies carried out abroad in the current literature, educational software for special education at the national level should be prepared.

b) The software to be prepared for special education should not be software that appeals to the visual sense by using only the glasses feature. Applications and software should be developed in which students will use features such as the arm apparatus of virtual reality and thus give them the chance to experience/experience the learning life one-on-one.

ACKNOWLEDGMENT

REFERENCES

Avcıoğlu, H. (2013). Effectiveness of video modeling in training students with intellectual disabilities to greet people when they meet. *JESTP, 13*(1), 466-477.

Aykora, Ü. E., Tekin, A., Aykora, D., Tekin, G., Gündoğdu, E. K., Çalişir, M., & Duyan, M. (2019). The effect of sports virtual reality applications applied to children with moderate intellectual disabilities on the development of some force parameters. *TURAN: Center for Strategic Studies, 11*(42), 196-202.

Ayres, K. M., Langone, J., Boon, R. T., & Norman, A. (2006). Computer-based instruction for purchasing skills. *Education and Training in Autism and Developmental Disabilities, 41(*3), 253.

Bacca, J., Baldiris:, Fabregat, R., & Graf: (2014). Augmented reality trends in education: a systematic review of research and applications. *ET&S, 17(*4), 133–149.

Baz, F. Ç. (2016). Evaluation of FATİH project in terms of technique, hardware, and content. *Electronic Journal of Gumushane University Institute of Social Sciences, 7*(15), 196-209.

Bilasa, P., & Taşpınar, M. (2017). Identification of key competencies within the scope of lifelong learning: A situation analysis for Turkey. *Journal of National Education, 46*(215), 129-144.

Boser, K., Goodwin, M. S. & Abowd, G. (2013). *Technology tools for students with autism.* Baltimore*:* Paul H. Brookes Publishing Company.

Bozkuş, K., & Karacabey, M. F. (2019). The Use of Information Technologies in Education with the FATİH Project: How Far Have Come Taken?. *Education as You Live, 33*(1), 17-32.

Branham, R. S., Collins, B. C., Schuster, J. W., & Kleinert, H. (1999). Teaching community skills to students with moderate disabilities: Comparing combined techniques of classroom simulation, videotape modeling, and community-based instruction. *Education and Training in Autism and Developmental Disabilities,34*(2), 170-181.

Browder, D. M., & Bambara, L. M. (2000). *Home and community*. NJ: Prentice-Hall.

Burcroff, T. L., Radogna, D. M., & Wright, E. H. (2003). Community forays: Addressing students' functional skills in inclusive settings. *TEC, 35*(5), 52-57.

Carrino, F., Cherix, R., Omar, A. K., Mugellini, E., & Wunderle, D. (2019). *Bus simulator in virtual reality for young adults with intellectual disabilities.* 4th Gamification ve Serious Games Symposium. HE-Arc, HES-SO.

Cheng, Y., Chiang, H. C., Ye, J., & Cheng, L. H. (2010). Enhancing empathy instruction using a colla-borative virtual learning environment for children with autistic spectrum conditions. *Computers ve Education, 55(*4), 1449-1458.

Cheng, Y., & Ye, J. (2010). Exploring the social competence of students with autism spectrum conditions in a collaborative virtual learning environment–The pilot study. *Computers ve Education, 54*(4), 1068-1077.

Collins, A., Joseph, D., & Bielaczyc, K. (2004). Design research: Theoretical and methodological issues. *The Journal of The Learning Sciences, 13*(1), 15-42.

Çağlar, S. (2012). Right of accessibility for persons with disabilities and accessibility in Turkey. *Journal of Ankara University Faculty of Law, 61*(2), 541-598.

Çavaş, B., Çavaş P. H., & Can, B. T. (2004). Virtual reality in education. *TOJET, 3*(4), 110-116.

Miller, H. D. (2010). *The effectiveness of the strategy of being a model with video in the teaching of hotel housekeeping skills to individuals with intellectual disabilities* (Master's Thesis). Anadolu University, Institute of Educational Sciences, Eskisehir.

Di Serio, Á., Ibáñez, M. B., & Kloos, C. D. (2013). Impact of an augmented reality system on students' motivation for a visual art course. *Computers ve Education, 68*, 586-596.

DiPipi-Hoy, C., & Jitendra, A. (2004). A parent-delivered intervention to teach purchasing skills to young adults with disabilities. *JSE, 38*(3), 144-157.

Education Reform Initiative (2017). (https:www.egitimreformugirisimi.org/egitim-izleme-raporu-2015-16/) Last Access Date :24/10/2019

Ergenekon, Y. (2012). Teaching Basic First-Aid Skills against Home Accidents to Children with Autism through Video Modeling. *JESTP, 12*(4), 2759-2766.

Ferhat: (2016). The reality of the digital world, the virtuality of the real world is virtual reality as a digital media product. *TRT Academy Journal, 1*(2), 724-746.

Gough, D., Oliver, & Thomas, J. (2017). *An introduction to systematic reviews.* Sage.

Gökdaş, İ., & Kayri, M. (2005). Problems in terms of e-learning and turkey, solution suggestions. *Journal of Yüzüncü Yıl University Faculty of Education, 2(2)*), 1-20.

Gülsöz, T. (2014). *The effectiveness of teaching the ability to prepare and present cold drinks to students with high-functioning autism with a video model* (Master's thesis). Necmettin Erbakan University, Institute of Educational Sciences, Konya.

Halisküçük, E. S., & Tekinarslan, İ. Ç. (2007). The effectiveness of being a model with video in teaching pasta cooking skills to students with intellectual disabilities. *Abant İzzet Baysal University Journal of Faculty of Education, 7*(2), 113-127.

Hamill, L. B. & Everington, C. (2002). *Teaching students with moderate to severe disabilities: An applied approach for inclusive environments.* New Jersey: Merrill Prentice Hall.

Harris, K., & Reid, D. (2005). The influence of virtual reality play on children's motivation. *CJO, 72*(1), 21-29.

Holley, D., Hobbs, M., & Menown, C. (2016). The augmented library: Motivating STEM students. Networks, *19*, 77-84.

Josman, N., Ben-Chaim, H. M., Friedrich:, & Weiss, P. L. (2008). Effectiveness of virtual reality for teaching street-crossing skills to children and adolescents with autism. *IJHD, 7*(1), 49-56.

Kaufmann, H., Steinbügl, K., Dünser, A., & Glück, J. (2005). General training of spatial abilities by geometry education in augmented reality. *Annual Review of CyberTherapy and Telemedicine: A Decade of VR, 3*, 65-76.

Karimi, H. A., Dias, M. B., Pearlman, J., & Zimmerman, G. J. (2014). Wayfinding and navigation for people with disabilities using social navigation networks. *EAI Endorsed Transactions on Collaborative Computing, 1*, 1–13.

Kayabaşı, Y. (2005). Virtual reality and its use for educational purposes. *TOJET, 4,* 151-158.

Klein, P. S., & Arieli, M. (1997). Mediated learning and its application to the enhancement of mathematical abilities in children with Down Syndrome. *JLD, 1*, 299-320.

Kluth, P. (2000). Community-referenced learning and the inclusive classroom. *RASE, 21*(1), 19-26.

Komşul, M. Z. (2012). *The use of virtual reality technology in the education of children with intellectual disabilities and the development of an exemplary application* (Master's Thesis). Trakya University, Institute of Natural and Applied Sciences, Edirne.

Krichenbauer, M., Yamamoto, G., Taketom, T., Sandor, C., & Kato, H. (2017). Augmented reality versus virtual reality for 3d object manipulation. *IEEE transactions on visualization and computer graphics, 24*(2), 1038-1048.

Kurtoglu, S., Tekinarslan, E., & Tekinarslan, I. C. (2017). Effectiveness of computer-aided video instruction in teaching individuals with intellectual disabilities the ability to withdraw money from a cash machine. *Ankara University Faculty of Educational Sciences Journal of Special Education, 18*(02), 185-208.

Lee:, Park, K., Lee, J., & Kim, K. (2017). User study of VR basic controller and data glove as hand gesture inputs in VR games. *International Symposium on Ubiquitous Virtual Reality.*

Mechling, L. C., Gast, D. L., & Langone, J. (2002). Computer-based video instruction to teach persons with moderate intellectual disabilities to read grocery aisle signs and locate items. *JSE, 35*(4), 224-240.

Mechling, L. C., & Gast, D. L. (2003). Multi-media instruction to teach grocery word associations and store location: A study of generalization. *Education and Training in Developmental Disabilities,* 62-76.

Martín-Gutiérrez, J., Saorín, J. L., Contero, M., Alcañiz, M., Pérez-López, D. C., & Ortega, M. (2010). Design and validation of an augmented book for spatial abilities development in engineering students. *Computers ve Graphics, 34*(1), 77-91.

Martín-Gutiérrez, J., Fabiani, P., Benesova, W., Meneses, M. D., & Mora, C. E. (2015). Augmented reality to promote collaborative and autonomous learning in higher education. *Computers in Human Behavior, 51*, 752-761.

Martín-Gutiérrez, J., Mora, C. E., Añorbe-Díaz, B., & González-Marrero, A. (2017). Virtual technologies trends in education. *EURASIA, 13*(2), 469-486.

M.E.B. (2017). National Education Statistics Formal Education. Publications. (https:sgb.meb.gov.tr/meb_iys_dosyalar/201709/08151328_meb_istatistikleri_orgun_egitim_2016_2017.pdf)Last Access Date :30/01/2020

M.E.B. (2019). National Education Statistics Formal Education. Publications. (https:sgb.meb.gov.tr/meb_iys_dosyalar/201909/30102730_meb_istatistikleri_orgun_egitim_2018_2019.pdf)Last Access Date :30/01/2020

Mitchell, P., Parsons, & Leonard, A. (2007). Using virtual environments for teaching social understanding to 6 adolescents with autistic spectrum disorders. *JADD, 37*(3), 589-600.

Morse, T. E., & Schuster, J. W. (2000). Teaching elementary students with moderate intellectual disabilities how to shop for groceries. *ECX, 66*(2), 273-288.

Öncül, N., & Özkan, Y. (2010). Teaching daily living skills to adults with moderate and severe mental disabilities using video modeling. *Anadolu University Journal of Social Sciences, 10*(3), 143-156.

Passig, D. (2009). Improving the sequential time perception of teenagers with mild to moderate mental retardation with 3D immersive virtual reality (IVR). *Journal of Educational Computing Research, 40*(3), 263-280.

Riva, G., Baños, R. M., Botella, C., Mantovani, F., & Gaggioli, A. (2016). Transforming experience: the potential of augmented reality and virtual reality for enhancing personal and clinical change. *Frontiers in Psychiatry, 7*, 164.

Sani Bozkurt, S. (2011). *Effectiveness and efficiency of the video model in which peer and adult models are used in the teaching of role-playing skills to children with autism* (Master's Thesis). Anadolu University, Institute of Educational Sciences, Ankara.

Self, T., Scudder, R. R., Weheba, G., ve Crumrine, D. (2007). A virtual approach to teaching safety skills to children with autism spectrum disorder. *eTOC, 27*(3), 242-253.

Sezgin, S. (2016). Gamification of learning and teaching: game-based methods and strategies for study and training. *Journal of Open Education Practices and Research, 2*(1), 187-197.

Sezgin: (2019). Wearable technologies in education: Opportunities and trends. *Journal of Mehmet Akif Ersoy University Education Faculty, 1*(40), 415-18.

Shin, D. H. (2017). The role of affordance in the experience of virtual reality learning: Technological and affective affordances in virtual reality. *Telematics and Informatics, 34*(8), 1826-1836.

Smith, C. C., Cihak, D. F., Kim, B., McMahon, D. D., & Wright, R. (2017). Examining augmented reality to improve navigation skills in postsecondary students with intellectual disabilities. *JOSET, 32*(1), 3-11.

Sotiriou:, & Bogner, F. X. (2008). Visualizing the invisible: augmented reality as an innovative science education scheme. *ASL, 1*(1), 114-122.

Taber, T. A., Alberto, P. A., Seltzer, A., & Hughes, M. (2003). Obtaining assistance when lost in the community using cell phones. Research and Practice for Persons with Severe. *Disabilities, 28*(3), 105-116.

Dessert, A. (2018). *Some cognitive characteristics that influence learning in online multiple learning environments and their relationship to academic success* (Master's Thesis). Hacettepe University, Institute of Educational Sciences, Computer Education and Instructional Technologies, Ankara.

Tepe, T., Kaleci, D., & Tüzün, H. (2016). *New trends in educational technologies: virtual reality applications*. 10th International Computer and Instructional Technologies Symposium.

Wright, T., & Wolery, M. (2011). The effects of instructional interventions related to street crossing and individuals with disabilities. *Research in Developmental Disabilities, 32*(5), 1455-1463.

Zhou, F., Duh, H. B. L., & Billinghurst, M. (2008, September). Trends in augmented reality tracking, interaction and display: A review of ten years of ISMAR. In *2008 7th IEEE/ACM International Symposium on Mixed and Augmented Reality* (pp. 193-202). IEEE.