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Contact Address:
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Message from the Editor-in-Chief

Dear Colleagues,

TOJET welcomes you.

Today, technology is developing very fast around the world. This technological development (hardware and software) affects our life. There is a relationship among technology, society, culture, organization, machines, technical operation, and technical phenomenon. Educators should know this relationship because technology begins to affect teaching and learning facilities. For this reason, educators are increasingly using technology in all aspects of their profession (e.g., creating curricula, classroom instruction, work assignments). This trend can be enhanced by educating the educator about cultural and cognitive aspects of technology and technikos, as well as the associated advantages and disadvantages related to educational and human development goals.

When people think of “technology,” they tend to think of human artifacts such as machines, electronic devices, scientific hardware, or industrial manufacturing systems. However, a formal definition (College Dictionary) of technology indicates that it has a more general meaning which includes any “practical application of knowledge” or “manner of accomplishing a task”:

DEFINITION OF “TECHNOLOGY”:

1 : *the practical application of knowledge* especially in a particular area...

2 : *a manner of accomplishing a task* especially using technical processes, methods, or knowledge...

3 : the specialized aspects of a particular field of endeavor <educational technology>

Human’s use of technology involves not only machines (e.g., computer hardware) and instruments, but also includes structured relations with other humans, machines, and the environment. In short, technology is more than a collection of machines and devices. To go beyond simplistic intuitions about technology requires investigation of the human mind and sociocultural environment as well as interactions with technological artifacts.

TOJET is also a technology which affects educators and education systems because it diffuses new development all around the world. It is always successful to diffuse new developments.

I am always honored to be the editor in chief of TOJET. I am always proud of TOJET for its valuable contributions to the field of educational technology.

TOJET is interested in academic articles on the issues of educational technology. The articles should talk about using educational technology in classroom, how educational technology impacts learning, and the perspectives of students, teachers, school administrators and communities on educational technology. These articles will help researchers to increase the quality of both theory and practice in the field of educational technology.

TOJET and other international universities will organize INTE 2023 Conference between July 27-28, 2023 in Rome, Italy.

Call for Papers

TOJET invites article contributions. Submitted articles should be about all aspects of educational technology and may address assessment, attitudes, beliefs, curriculum, equity, research, translating research into practice, learning theory, alternative conceptions, socio-cultural issues, special populations, and integration of subjects. The articles should also discuss the perspectives of students, teachers, school administrators and communities. The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to TOJET.

July 01, 2023

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A Study on Child-Family Relationship in the Use of Digital Media Products

Assoc. Dr. Güven ARIKLI

European University of Lefke, Faculty of Communication Sciences, Department of Radio, Television and Cinema. Kyrenia/TRNC.

Email: guarikli@yahoo.com

Orcid: 0000-0002-5979-5149.

Abstract

Real-life threats are at the root of all possible threats to be encountered on the Internet. All risk headings for the Internet are situations that can be encountered in real life. Therefore, we should pay attention to the risks of the virtual world by learning to use the internet consciously, safely and effectively, and by teaching our children this, just as we make efforts to protect our children from all these dangers in real life. In this research, the role of the family in children's use of digital media, the risks and solutions according to age groups, and the effect on the development of the child are discussed.

Keywords: Child, Learning, Digital Media, Internet, Development and Growth.

1. Introduction

From daily routines to habits, behaviors and attitudes, with the changing and developing time; The same change continues in all areas of life, constantly and rapidly. Someone who is going to eat or drink coffee at a restaurant prefers to sit close to the outlet. Concepts such as focusing on continuous notifications, the number of likes and shares begin to occupy an important place in mental preoccupation. Therefore, digitalization is becoming an indispensable element of daily life. Roles expected from the digitalization process and digital technologies are generally identity creation and self-identity, social relations, lifestyle and activities, life satisfaction and well-being, knowledge and competence, learning and education, economic convenience (earning income, etc.), employment and job finding. (Selweyn, 2019, p. 3). However, in recent years, there have been criticisms that children are enslaved and imprisoned by digital technologies; It is emphasized that the real relationship with technology is not fully known and cannot be correctly interpreted (Heidegger, 2017, p. 79).

In general, it is thought that the way of use and interpretation are effective in deciding whether digital technologies are good or bad. As a matter of fact, in another source, no technology can reverse the current situation; It is emphasized that a child with a large vocabulary will benefit more from Wikipedia, and a child with behavioral problems will be more affected by video games (Toyama, 2015). In the digitalization process, traditional media understanding is replaced by new media with Web 2.0 technologies; It has allowed individuals who are normally viewers or listeners to settle in a more active place as users and members.

Families should ensure safe internet and computer use for children of different age groups. Today, most of the children's use of information and communication technologies is more advanced than their parents. Families need to have knowledge about the internet and computer technologies, if they do not have enough knowledge on this subject, they should improve themselves, at least learn how to use the internet at a level to guide and supervise their children correctly.

Just as rules are set for children in real life, rules should be set for the virtual environment as well. We should give advice and follow them in virtual environments in order to support the child's conscious use of the Internet and protect it from harm. While these rules change with the age of the child, it is necessary to monitor whether the rules are applied and to ensure that the rules are followed.

Families should use up-to-date antivirus, filter and firewall programs on their computers to protect children from dangers on the internet. Families should encourage their children to let them know when there is something or someone online that makes them feel uncomfortable or threatened (Goodwin, 2018).

2. Method

In this study, traditional literature review was adopted as the research method. In traditional literature review studies; The information dispersed in the relevant literature is handled as a whole, and a link is established between the topics discussed or a synthesis is reached (Baumeister & Leary, 1997). In this context, the child-family relationship in the use of digital media products has been examined based on the literature review.

3. Technology-Media Relationship by Age Group of the Child

• 2-6 Age Group Children

Children in the 2- to 6-year-old age group should not spend more than one or two hours in front of the computer. Families should instill this awareness in their children and ensure that their children comply with the restrictions. Parents should not leave their children at this age alone in front of the computer or the internet, and should always be with them. It should not be forgotten that children of this age period are play children. Therefore, provided that they are under the supervision of their parents, they can be allowed to use computers and the internet and to play games on the computer. However, for the healthy development of the child, it should be supported to allocate proportional time with other activities in his life.

• 7-10 Age Group Children

The daily consumption of children in the 7-10 age group in front of the computer should not exceed one or two hours. This age range coincides with the primary school age, it should not be forgotten that the child at this age is the age to participate in the game or friend groups. Play is an important requirement for a child to socialize. For this reason, the time the child will spend playing games with his friends and studying should be much more than the time he will spend in front of the computer.

The computer should be placed in the common area of the family where all family members can see it easily. Families should agree on what types of sites they can visit with their children, and their drawbacks should be explained without prohibiting them. Families should encourage their children to use a child-friendly or parent-controlled search engine, and attention should be paid to the high-level settings of the search engine used.

• 10-13 Age Group Children

Children in this age group should not spend more than two or three hours on the computer. Although it is difficult with the developing mobile technologies, the computer should be placed in the common area of the family. Since children of this age group are slowly starting to declare their freedom, even if they resist to get the internet in their rooms, no concessions should be made in this regard.

Children should use search engines designed specifically for children, such as “Google Safe Search for Kids” or with parental controls, to browse the Internet. Parents should teach their children of this age not to give information about themselves and their families when using internet communication tools. In addition, an e-mail account can be opened for children of this age period on their behalf, provided that parents can check it whenever they wish. In the opened e-mail account, the e-mail filter must be active against unwanted bad content.

• 14-16 Age Group Children

Families should remind their children in this age range that they should not add people they do not know to their friend lists during the time on social networks, and they should also be on their children's friend list by being a member of these networks and follow their child from there.

Parents should check their children's privacy settings on social networks. The fact that their accounts and profiles on social networks are open to everyone poses a great risk for the child's safety. Parents should inform their children in this age group about internet chats. In addition, in order to satisfy the child's curiosity, the child may be allowed to have short-term internet chats with people he and his family know.

4. Functions of Digital Media Advertisements on Children

Positive functions of advertising, promoting goods and services; It is to save time for the consumer by providing information about where, how and at what price it will be provided and how to use it, and to increase the price and quality competition between companies and to make the consumer profitable (Yengil, Döner Güner, & Topakkaya, 2019).

Through advertisements, children gain marketplace knowledge of the products they encounter; they get ideas from their friends, relatives and their own consumption experiences. During consumption, children learn which product is good or bad, whether the intention of the advertisement is honest, which brands they will prefer, and even that these products have social meanings other than being functional goods (Yılmaz, 2022). Thus, when children are given the opportunity to shop alone, knowing for what purpose and how to use the products promoted in the advertisements, they can make the purchase on their own (Türe, 2021).

The consumer, who is constantly exposed to advertisements, is unable to distinguish between what is luxury and what is needed. Therefore, the consumer cannot find the opportunity to make an evaluation and comparison about the goods or services they want to buy, and they are directed to be brand addicted and sometimes to unnecessary consumption. This leads to economic wastefulness and monopolization (Gürsoy and Aral, 2016).

Advertisements broadcast on television cause excessive interest of children due to the shortness of the subject, the interestingness of the presentation style and the constant repetition. Especially, children aged two or three record what they see in advertisements as a whole with their music and logo, and repeat what they mean, without knowing where to use them. This is the reason why young children can recognize bank and newspaper logos (Aral & Keskin,

2017). However, this situation causes children to get used to perceiving short and simple messages, weakening their listening skills, decreasing their concentration of attention, making it difficult to concentrate on serious issues, thus blunting their thinking abilities, and children's anxiety affects their school success negatively (Budak, 2006).

5. The Effect of Digital Media on the Development of the Child

The use of technological devices paves the way for worrying results regarding the cognitive and affective development of children (Zeybekoğlu Akbaş & Dursun, 2015). Community-based studies show that excessive use of technological tools in early childhood is associated with delays in social, cognitive, emotional, linguistic and motor development in children (Karayağız Muslu & Bolışık, 2009). Findings from these studies include excessive viewing times, watching adult content, reduced parent-child interaction with television, and excessive use of social media.

- **Cognitive Domain**

Although the attention capacity and duration are limited, especially in early childhood, it causes rapid distraction and difficulty in using attention in a controlled manner.

- **Emotional Development Area**

The child who uses social media finds the opportunity to get to know himself and develop his character while using social media. In this way, the child will have the opportunity to develop his social skills. Social media both immobilizes and makes children nervous, and the child becomes irritable. Thanks to social media, the child will continue to be in touch with his friends and the bond he has established with his friends will be strengthened.

- **Psychomotor Development Area**

Children who spend a lot of time in front of digital media products, overweight children gain even more weight, and the risk of future cardiovascular diseases increases. Skeletal and muscular system damage may occur due to sitting positions in front of media products.

- **Personal Development Area**

It interferes with eating and sleeping patterns. A child watching TV while eating swallows without chewing. If he is constantly in front of media products, the child's laziness increases and he tries to get his parents to do his personal care, homework and other needs.

- **Language Development Area**

Since children's divergent thinking in their own world in media products reduces their communication with individuals, there is a delay in speaking and forming sentences. He cannot form a regular sentence. His speech becomes the language of the internet.

Conclusion, Discussion and Recommendations

Children spend most of their day using the internet, phone, tablet or watching television. It is the most important duty of parents to regulate their children's social media shares and the time they spend on the internet. It should be ensured that the child uses social media correctly, with which he interacts a lot during the day.

Children under the age of 10 should not allow parents to use the Internet. Parents must also be members of the social media used by the child and keep the child under follow-up. Families need to do research and be conscious about using social media positively. If the age of the child using social media is below the legal age, the account must be removed by the parents. Privacy settings should be given importance, and it is absolutely necessary to set who can see the child's private information. Children should not share their address information, phone number and age on social media. In this regard, parents should warn their children in the most effective way.

Parents should be able to turn off the TV and computer from time to time. should not allow their children to watch every program; TV programs should be selected and watched. In addition, families should check whether the sites that children can access are safe on the Internet, and children should be taught that they should never share their personal information on the Internet.

The time children spend on the Internet should be limited. Children under the age of 10 should be under the full supervision of their parents when using the Internet. Instead of visual stimuli, they should be directed to physical, auditory and mental activities. For example theatre, music etc. such as arts events, sports, group activities, summer camps, courses, etc. to participate in activities and socialize.

We should try to be a positive model for the child with our own attitudes and attitudes. Computer and internet use can be very useful and therefore necessary for children, but the sites they access and the games they play should be suitable for their life, psychological and social development. In this context, it is important to have parental control of any game site before offering it to children. As a result, we must ensure that the child uses it in a controlled manner; It is also not the right approach to completely ban television and the Internet for children. Controls and limitations should be determined together by talking to them.

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Evaluating Information Technology Teacher Training Undergraduate Programs in Turkey*

Meltem KURTOĞLU ERDEN

Uşak University, meltemkurtoglu@gmail.com, ORCID ID, 0000-0003-2438-438X (Corresponding Author)

Süleyman Sadi SEFEROĞLU

Hacettepe University, sadi@hacettepe.edu.tr, ORCID ID, 0000-0002-5010-484X

ABSTRACT

The purpose of the current study was to evaluate the undergraduate program of the Computer Education and Instructional Technology (CEIT) Department. CEIT department is an undergraduate program that trains information technology teachers. The study group of the study, which was designed according to the descriptive research model, was consisted of 461 CEIT graduates, who were selected by using the convenience sampling methods. Three instruments were used to collect data; a “Personal Information Form”, the “Pedagogical Competence Perception Scale for the CEIT Graduates”, the “Technological Competence Perception Scale for the CEIT Graduates”. The data collection tools were developed by the researchers.

When the results of the study are evaluated it is seen that the CEIT curriculum supports the participants in the acquisition of pedagogical competence more than the acquisition of the technological competence. When the pedagogical competence perceptions of the graduates are considered, it is seen that the graduates have high level competence perceptions about “Educational Planning and implementation, developing educational software and materials, educational communication competences, security and ethics in the use of information and communication technologies during the educational process, planning and implementation of the projects”. When their perceptions of their technological competence are examined, it is seen that the graduates have moderate level of competence perceptions about “ability to solve problems in relation to the hardware installation and using visual software”, while they have low level of competence perceptions about “ability to use system software and security of network and system”.

In this study, it was understood that the undergraduate program of the CEIT department, which trains future teachers of information technologies courses, is more sufficient in terms of developing pedagogical competence and less sufficient in terms of developing technological competence in students. In this context, the contents of the courses in the CEIT undergraduate program should be updated. Additionally, some studies should be conducted in order to develop the technological competence skills of the students attending the department.

Keywords: Department of computer education and instructional technology, curriculum evaluation, competence, technological competence, pedagogical competence.

1. INTRODUCTION

In this section, the problem statement, purpose and significance of the study, research problem and sub-problems, and theoretical basis of the study are discussed.

1.1. Problem Statement

The Department of Computer Education and Instructional Technology is among the departments that were decided to be opened in 1997 with the restructuring of the faculties of education. The purpose of the department as of 1998, when it was first established, was to train Information Technology (IT) teachers, who would work in the primary and secondary education institutions affiliated to the Ministry of National Education (MoNE), would acquire basic professional knowledge and skills and would develop and teach the educational methods and techniques necessary for functional use of computers and other educational technologies.

Another goal the CEIT department was to train computer-assisted education professionals competent in the fields of designing, developing, implementing and evaluating educational materials and software (Seferoğlu, 2007). On the other hand, it has been revealed over time that it is expected from the pre-service teachers who will graduate from the CEIT department not only to support their students in acquiring computer literacy skills but also to promote the effective use of technology in the learning-teaching processes.

The first graduates of the CEIT departments in 2002 did not face any difficulty in being appointed as teachers to the public schools affiliated to the MoNE. In fact, between the years of 2003 and 2006, CEIT graduates were one of the teacher groups with the highest rate of appointment (YÖK, 2007). However, the effectiveness of IT teachers

in schools gradually decreased when IT courses were converted into elective and non-graded courses after 2007. In addition, the assumption that students come to school with basic computer skills has led to the complete removal of IT courses from primary and secondary schools. Accordingly, in recent years, it has been observed that CEIT graduates have not been appointed as IT teachers or that a very limited number of appointments have been made (MoNE, 2012). On the other hand, with the changes made in 2012, IT courses have been made mandatory again for some grades, even though the number of course hours is low (MoNE, 2012).

With the launch of the FATİH Project in 2010, CEIT graduates started to consider that IT teachers would be given important responsibilities in this process (Kurtoğlu & Seferoğlu, 2012). However, there is no study investigating the current status of CEIT graduates and also there is no change in the number of CEIT graduated appointed as teachers. It is possible to say that as the chances of being appointed as a teacher have decreased, the CEIT graduates have started to search for work areas suitable to their knowledge and skills. Research demonstrates that some students who are planning to find a job in areas other than MoNE spend their free time in acquiring skills they may need in their future jobs (Karataş, 2010; Kurtoğlu & Seferoğlu, 2012). When the findings of a study conducted on the graduates of the department are examined, it is also seen that the graduates of the department have opportunities to work in different work areas (Durmaz, 2012). While those, who graduated in the early years, had the chance to work in public or private schools as teachers, consultants, education program consultants, instructional technologists or academicians in the universities (Altun, 2009), it is observed that recent graduates are participating as qualified personnel in the information sector, where there are many job opportunities for these graduates (Seferoğlu, 2007).

It is possible to argue that the tasks expected from CEIT graduates in business environments diverged as the work areas of them began to diverge. As a result, the expected competences of graduates also changed. CEIT graduates who were trained to be teachers were found to be inadequate in certain subjects when they worked in different business sectors. For example, Durmaz (2012) concluded that the graduates of CEIT working in the firms operated in Technopolis were successful in communication and cooperation but not so good in programming and technical skills. In another research conducted by Berkant and Tuncer (2011), it was emphasized that students of the CEIT department were concerned about their lack of computer knowledge and technical knowledge after graduation. In a study conducted by Kızılcı and Kabakçı (2006), it was also concluded that IT teachers were inadequate in terms of technical knowledge and skills. The researchers emphasized that IT teachers who were CEIT graduates did not receive adequate training in technical subjects during their undergraduate education, and thus, they were found to be insufficient. Therefore, it has been suggested that the curriculum should be updated based on the new findings of the related literature.

In 2006, the CEIT curriculum was updated (YÖK, 2007). During this process, some new courses were added to the curriculum and some courses were merged and their names were changed. There has not been a research study to date conducted on a national scale for the evaluation of the CEIT curriculum, which is still in practice. Considering the changes in technology and changing human characteristics, it is important that teacher training programs are evaluated and updated in light of these developments. Seen from this perspective, it can be said that there is a need for a comprehensive evaluation of undergraduate programs. In this respect, this study aimed to evaluate the undergraduate program of the CEIT department according to the competence perceptions of the graduates.

1.2. Purpose and Significance of the Study

Curricula are very important in terms of organizing and conducting the education process in a planned way. Therefore, changing social, economic and political conditions necessitate the change of educational programs as well. Although it varies across the societies, education has a universal as well as a national quality. In this context, it can be argued that developments in science and technology in global and social contexts, wars, social changes, economic crises, and changing social perceptions result in a change in ideology and philosophy of education as well. These changes which take place in numerous areas are also reflected to ideology and philosophy as well as the education perceptions and perspectives of individuals in the society, and to the basic approaches and methods of educational programs (Gökmenoğlu, Eret & Kiraz, 2010).

The rapid increase in knowledge, which is accepted as one of the most important features of the 21st century, is considered as a driving force for the development of societies. According to Arslan and Erarslan (2003), societies wishing to become an information society should evaluate all aspects of educational systems, which play important roles in upbringing future generations, and should consider the developments in individual, national and universal contexts. High success and efficiency in education can be achieved through good regulation of the learning-teaching environment and effective implementation of the program by teachers with good content knowledge and pedagogical content knowledge (Duman, 2004). When the recent studies on new programs (Akbaş, 2006; Bukova-

Güzel & Alkan, 2005; Bulut, 2006; Ercan & Altun, 2005; Erdoğan, 2005; Gömleksiz, 2005; Gözütok, Akgün, & Karacaoğlu, 2005; Korkmaz, 2006; Özdemir, 2005; Şahin, Turan, & Apak, 2005; Yıldırım, 2006) are examined, it is seen that, in the majority of the studies, primary or secondary education programs have been evaluated. Furthermore, it is remarkable that there are only a few studies conducted on the evaluation of higher education programs to date.

As stated by Kumral and Saracaloğlu (2011), the process of evaluating the curriculum of higher education institutions that train teachers for primary and secondary education institutions has not been given the importance it deserves. It is considered significant for institutions training teachers to carry out research studies evaluating their curriculums, because universities should be the institutions that follow the developments and update themselves accordingly. On the other hand, universities have no obligations to appoint their graduates to any position, but they do have to clearly define what qualifications/competences their graduates are to acquire. In this respect, program evaluation studies in higher education are considered to be important.

When the program evaluation studies conducted so far are examined, it is observed that these studies have generally been conducted on the people who will implement the program. Furthermore, when the program changes made in Turkey are examined, it is also seen out that the changes are not made on the basis of program evaluation studies (YÖK, 1997; YÖK, 1998; YÖK, 2007). Since the changes are not based on scientific and theoretical studies, it can be said that they have been generally made depending on the political agenda in the country. From this point of view, it is possible to say that it is important to carry out program evaluation studies.

In the relevant literature, no study has been found making a general evaluation of the qualifications gained by the graduates of the CEIT departments. Existing studies are usually limited to certain courses (Başboğaoğlu, 2004; Şahinkayaşı & Şahinkayaşı, 2004) or conducted on students (Durdu & Yıldırım, 2005; Erkoç & Bayrak, 2008; Keser & Bayır, 2007). Therefore, it is thought that the evaluation of the perceptions of graduates concerning the competences gained through the undergraduate program of the CEIT departments will fill a gap in the literature.

It can be said that studies conducted on graduates are important in terms of program evaluation, because the value of the program can be best evaluated on the basis of its final products, which are the knowledge, skills and behaviors gained by the graduates. Product-based evaluation is an important type of evaluation that facilitates decision-making on the entire program. Product-based evaluation which is based on determining the product quality and which enables to evaluate the program on the basis of the soundness of the program, learning deficiencies as well as teaching efficiency makes sense only if it is conducted with systematic measurements and product-based approaches (Posner, 2004).

When studies on the frequent changes made in the programs in Turkey are examined, it is seen that the studies are not based on any program evaluation data (YÖK, 1997; YÖK, 2006). The undergraduate program of the CEIT departments is not an exception to this general trend. For example, the program developed in 1998, when the department was founded, underwent some changes in 2006 that were not based on comprehensive program evaluation data. In the current study, in order to partially meet the need for evaluation, the undergraduate programs of the department were evaluated in terms of the basic competences gained by the graduates on the basis of their competence perceptions. The results of this study are considered to be significant in that they can be used to make data-driven changes in the programs of the departments. It can be said that this study will contribute to the development of the undergraduate program according to the current requirements. It is thought that the study is significant since it may contribute to filling a gap in the field of program evaluation as well as guiding further research.

1.3. Research Problem

The problem of this study was determined as “Based on the competence perceptions of the graduates, what is the extent to which the undergraduate program of the Computer Education and Instructional Technology Department imparts basic competences to its students?”

1.3.1. Sub-Problems

1. Based on the competence perceptions of the graduates, what is the extent to which the CEIT undergraduate program imparts pedagogical competences to its students?
 - 1A. Based on the competence perceptions of the graduates;
 - 1.a1. What is the extent to which the CEIT undergraduate program imparts the competence of Educational Planning and Implementation to its students?
 - 1.a2. What is the extent to which the CEIT undergraduate program imparts the competence of Development of Educational Software and Materials to its students?

- 1.a3. What is the extent to which the CEIT undergraduate program imparts the competence of Educational Communication to its students?
- 1.a4. What is the extent to which the CEIT undergraduate program imparts the competence of Security and Ethics in the use of Information and Communication Technologies to its students?
- 1.a5. What is the extent to which the CEIT undergraduate program imparts the competence of Preparation and Implementation of Educational Projects to its students?
2. Based on the competence perceptions of the graduates, what is the extent to which the CEIT undergraduate program imparts technological competences to its students?
 - 2A. Based on the competence perceptions of the CEIT graduates;
 - 2.a1. What is the extent to which the CEIT undergraduate program imparts the competence of Problem Solving in Hardware and Software Installation to its students?
 - 2.a2. What is the extent to which the CEIT undergraduate program imparts the competence of Ability to use System Software to its students?
 - 2.a3. What is the extent to which the CEIT undergraduate program imparts the competence of Network and Information Security to its students?
 - 2.a4. What is the extent to which the CEIT undergraduate program imparts the competence of Ability to use Visual Software to its students?

2. METHOD

This section provides information about the research model, the study group, the development of the data collection tools, the implementation process, data collection, data analysis, internal validity, external validity and reliability of the study.

2.1. Research Model

This study was designed using the general survey model. In this study, qualitative data were collected, analyzed and interpreted. General survey models are used to review applications conducted on the entire population, or on a group or a sample from the population, in order to make a general judgment about the entire population consisting of many elements (Karasar, 2010). The survey method, in which surveys or scales are used as the data collection tools, allows the researcher to describe the existing situation (Cohen, Manion & Morrison 2000; Dörnyei, 2003; Lehtonen & Pakhinen, 2004). In the survey technique, a predetermined set of questions are asked to the participants in a sample from a population (Fogelman & Comber, 2007). According to Frankel, Wallen and Hyun (2012), survey models are used in studies in which the personality traits of a small group that is part of a large group are investigated. The survey models also investigate participants' opinions, competences, ideas, attitudes and beliefs.

2.2. Characteristics of the Study Group

The study group of this study was consisted of individuals who were graduated from the CEIT department. The convenience sampling method was used in the selection of the participants. The convenience sampling method (Teddlie & Yu, 2007) involves incorporating elements, which can be reached easily by the researcher, from the population into the study. This method is used in situations where it is difficult to reach participants as well as in situations where it is not possible to reach the entire population. Convenience sampling is a preferred method for practical and economical purposes.

In online environments, 461 CEIT graduates were reached in total, and the scales developed for the study were administered to these graduates. The data collection tools which were presented in an online platform were answered on a voluntary basis. Quantitative data obtained were analyzed and reported. Demographic information of the participants is presented in Table 1.

Table 1. Distribution of the Personal Information of the Study Group (N= 461)

<i>Variables</i>	<i>Groups</i>	<i>f</i>	<i>%</i>
Gender	Female	218	47
	Male	243	53
	Total	461	100
Age	20-24 years old	240	52
	25-29 years old	164	35
	30-34 years old	50	11
	34 and over	7	2

Graduation Year	2002-2006	57	13
	2007-2011	164	35
	2012 and later	240	52
Total		461	100

When the data in Table 1 are examined, it is seen that 47% of the CEIT graduates are female graduates and 53% are male graduates. When the graduation years of the participants are examined, it is seen that there is no balanced distribution by the years. For this reason, it was decided to divide them into groups such as the graduates of 2002-2006, 2007-2011 and 2012 and later. According to this grouping, the highest number of participants was reached from the graduates of 2012 and later (52%), while the lowest number of participants was reached from the graduates of 2002-2006 (13%).

2.3. Data Collection Tools

In the current study, three data collection tools were used to collect data. These tools are a “Personal Information Form”, the “Pedagogical Competence Perception Scale for the CEIT Graduates” and the “Technological Competence Perception Scale for the CEIT Graduates”. Data collection tools were administered through an online platform to the participants.

2.3.1. Personal Information Form

The “Personal Information Form” used in the study is comprised of four questions seeking to collect personal information about the graduation year, professional experience (length of service), and the institution in which s/he works. In the process of developing the personal information form, first of all, the variables to be studied in the study were determined and questions related to these variables were developed. The personal information form, consisting of a total of 4 questions, was administered to the participants before the competence perception scales.

2.3.2. Pedagogical Competence Perception Scale for the CEIT Graduates

During the development process of the “Pedagogical Competence Perception Scale for the CEIT Graduates”, initially, the literature was reviewed and no scale was encountered in the reviewed databases that can be related to this subject. As a result of this review, it was decided to develop a data collection tool that measures the pedagogical competence perceptions of the CEIT department graduates.

The “Pedagogical Competence Perception Scale for the CEIT Graduates” developed in this study is a 30-item scale that aims to determine the competence perceptions of graduates related to the competences that the CEIT department undergraduate program aims to impart to its students. It is a 5-point Likert scale (1- Insufficient... 5-Very sufficient).

As a result of the exploratory factor analysis, a scale was created consisting of 5 dimensions and 30 items. Cronbach Alpha reliability coefficient of the scale was determined as .954. According to this result, it can be said that this scale is reliable (Tabachnick & Fidell, 2001). In addition to the entire reliability analysis of the scale, the reliability of each of the 5 sub-dimensions on the scale was calculated separately. The reliability coefficients for the sub-dimensions of the scale were calculated as .915 for the sub-dimension of “Competence of Educational Planning and Implementation”, .912 for the sub-dimension of “Competence of Development of Educational Software and Materials”, .905, for the sub-dimension of “Competence of Educational Communication”, .876 for the sub-dimension of “Competence of Security and Ethics in the use of Information and Communication Technologies”, and .927 for the sub-dimension of “Competence of Preparation and Implementation of Educational Projects”.

2.3.4. Technological Competence Perception Scale for the CEIT Graduates

The “Technological Competence Perception Scale for the CEIT Graduates” is a 24-item scale developed to determine the perceptions of CEIT department graduates related to their technological competences gained in the CEIT department. It is a 5-point Likert scale (1- Insufficient... 5-Very sufficient).

This scale is comprised of 4 dimensions and 24 items. The Cronbach Alpha reliability coefficient of the scale was determined as .959. According to this result, it can be said that this scale is reliable. In addition to the entire reliability analysis of the scale, the reliability of each of the 4 sub-dimensions on the scale was calculated separately. The reliability coefficients for the sub-dimensions of the scale were calculated as .963 for the sub-dimension of “Competence of Problem Solving in Hardware and Software Installation”, .933 for the sub-dimension of “Competence of Ability to use System Software”, .861 for the sub-dimension of “Competence of Network and Information Security”, and .873 for the sub-dimension of “Competence of Ability to use Visual Software”.

2.4. Data Collection Process

In this study, the data were collected online. The final forms of the data collection tools were transferred to the online environment and distributed to the CEIT graduates. The URL address including questions was sent to individuals via email and/or shared in social media platforms. Private messages were written to each person while sending the URL address. In short, the URL addresses of the data collection tools were distributed to the participants individually. In this process, messages were sent to about 1000 CEIT graduates. At the end of the process, a total of 461 forms were returned.

2.5. Data Analysis Process

In this study, the quantitative data were collected online. The data were recorded on “Google.docs” system. First, the data stored online were saved through the MS Office Excel. A data set was created by editing the data in Excel program. The data were analyzed using the SPSS 17 package program. During the data check, the data considered to be incomplete were not included in the analyses. During the scale development process, factor analysis was performed using the SPSS program. In the analysis and interpretation of the data, frequency, percentage, standard deviation, one-way variance analysis (Anova) and Tukey test were used. Based on the assumption that the score intervals are equal in the responses to scale items, the score interval was calculated as 0.80 by subtracting the highest value from the lowest value and dividing it by the number of intervals. The intervals are given below.

- 1.00 --1.80 → insufficient
- 1.81---2.60 → almost insufficient
- 2.61---3.40 → less sufficient
- 3.41--- 4.20 → sufficient
- 4.20 and over → very sufficient

2.6. Internal and External Validity of the Research

While the controls applied in the study are all planned to increase internal validity, it should be noted that a highly controlled environment threatens external validity (Karasar, 2004). There were certain factors that increased the internal validity of the current study: the participants were not asked to give their identifications in order to encourage them to reveal their true views without any apprehension and their participation in the research was on a voluntary-basis..

External validity is the ability to generalize the findings obtained from the sample studied to the population and to daily life (Fraenkel & Wallen, 2006; Karasar, 2004). In the current study study, in the process of reaching the CEIT department graduates, individuals living in different cities, graduated from different universities and working in different business areas were reached to provide a diversity of participants.

The validity and reliability of the data collection tools used in the study were examined. During the implementation of the scales, due importance was shown to provide same conditions for the participants.

3. FINDINGS AND DISCUSSION

In this section, the research findings concerning the sub-problems and interpretations of these findings are discussed.

3.1. Findings Concerning the Extent to Which the CEIT Department Undergraduate Program Imparts Pedagogical Competences to Its Students

The first problem of the research was determined as “*Based on the competence perceptions of the graduates, what is the extent to which the CEIT undergraduate program imparts pedagogical competences to its students?*” In order to answer this research question, the data collected through the “Pedagogical Competence Perception Scale for the CEIT Graduates (PCPSCG)” were used. The Pedagogical Competence Perception Scale for the CEIT Graduates has five sub-dimensions. These sub-dimensions are, “Planning and Implementation of Education”, “Development of Educational Software and Materials”, “Educational Communication”, “Security and Ethics in the use of Information and Communication Technologies”, and “Preparation and Implementation of Educational Projects”. The responses given to the sub-problems of the first research question are presented below.

3.1.1. Findings Concerning the Extent to Which the CEIT Undergraduate Program Imparts the Competence of Development of Educational Planning and Implementation to Its Students

The responses of the CEIT graduates given to the items in the Planning and Implementation of Education sub-dimension of the Pedagogical Competence Perception Scale for the CEIT Graduates are given in Table 2. When the mean score calculated for the responses given to the competence items of this sub-dimension (3.78) was examined, it was determined that the graduates of the department were quite adequate in terms of their ability in

planning and implementing education. As a result, it was understood that the perceptions of the CEIT graduates were quite high regarding the acquisition of the Educational planning and implementation competence.

Table 2. Competence Perceptions of the CEIT Graduates about Educational Planning and Implementation (N=461)

<i>Items</i>	<i>Lowest</i>	<i>Highest</i>	<i>Mean</i>	<i>Standard Deviation</i>
<i>Ability to determine appropriate learning objectives for the target audience</i>	1	5	3.75	.873
<i>Ability to organize the learning environment appropriate to the target audience</i>	1	5	3.82	.881
<i>Ability to choose the strategy, method, and technique required for the teaching-learning process</i>	1	5	3.85	.891
<i>Ability to prepare content appropriate to the target audience</i>	1	5	3.84	.856
<i>Ability to choose assessment and evaluation methods appropriate to the target audience</i>	1	5	3.71	.937
<i>Ability to determine the learning needs of the target audience</i>	1	5	3.75	.918
<i>Ability to plan the teaching process considering the needs of the learner</i>	1	5	3.79	.896
<i>Ability to create course scenario appropriate to the content</i>	1	5	3.79	.942
<i>Educational planning and implementation Sub-Dimension Mean</i>	1	5	3.78	.712

Based on the data presented in Table 2, when the responses given to each item in the “Educational Planning and Implementation” sub-dimension were examined, it was observed that the CEIT graduates had high self-perceptions concerning the competences of ability to determine appropriate learning achievements for the target audience (3.75), ability to organize the learning environment appropriate to the target audience (3.82), ability to choose the strategy, method, and technique required for the teaching-learning process (3.85), ability to prepare content appropriate to the target audience (3.84), ability to choose assessment and evaluation methods appropriate to the target audience (3.71), ability to determine the learning needs of the target audience (3.75), ability to plan the teaching process considering the needs of the learner (3.79), and ability to create course scenario appropriate to the content (3.79).

Based on these data, it can be said that the CEIT undergraduate program was successful in terms of equipping its students with the “Competence of Educational Planning and Implementation”. The findings of the current study are parallel to those of previous studies (Duman, 2012; Numanoğlu & Bayir, 2009). Considering the facts that the main purpose of the CEIT department is to train teachers of information technologies and that the department graduates are expected to acquire these competences through the core courses, this finding can be interpreted as positive in terms of the undergraduate program.

3.1.2. Findings Concerning the Extent to Which the CEIT Undergraduate Program Imparts the Competence of Development of Educational Software and Materials to Its Students

The second sub-problem of the study is “Based on the competence perceptions of the graduates, what is the extent to which the CEIT undergraduate program imparts the competence of Development of Educational Software and Materials to its students?”. The responses given to the items in this sub-dimension by the CEIT graduates are given in Table 3. When the mean of the responses given to the competence items of this sub-dimension (3.60) is examined, it is seen that the graduates of the CEIT department are quite adequate in terms of their competence of Development of Educational Software and Materials.

In Table 3, when the means of the responses given to each item in the “Development of Educational Software and Materials” sub-dimension were examined, it was observed that the CEIT graduates had high self-perceptions concerning the ability to develop educational software appropriate to the learner characteristics (3.47), ability to develop educational software appropriate to the program and learning contents (3.63), ability to develop educational software appropriate to the development levels of the learner (3.62), ability to prepare web-supported teaching materials using different programming languages (3.35), ability to design technology-supported learning environments meeting the different needs of the learners (3.57), and ability to prepare teaching materials by using

information technologies (3.96). It is remarkable that the highest competence self-perception mean of the graduates is 3.96 for the ability to prepare teaching materials by using information technologies.

Table 3. Competence Perceptions of the CEIT Graduates about Development of Educational Software and Materials (N=461)

<i>Items</i>	<i>Lowest</i>	<i>Highest</i>	<i>Mean</i>	<i>Standard Deviation</i>
<i>Ability to develop educational software appropriate to the learner characteristics</i>	1	5	3.47	1.100
<i>Ability to develop educational software appropriate to the program and learning contents</i>	1	5	3.63	1.032
<i>Ability to develop educational software appropriate to the development levels of the learner</i>	1	5	3.62	1.038
<i>Ability to prepare web-supported teaching materials using different programming languages</i>	1	5	3.35	1.130
<i>Ability to design technology-supported learning environments meeting the different needs of the learners</i>	1	5	3.57	1.016
<i>Ability to prepare teaching materials by using information technologies</i>	1	5	3.96	.941
<i>Development of Educational software and Material Sub-Dimension</i>	1	5	3.60	.870

When the courses in the undergraduate program of the CEIT department were examined, it was observed that the students, who started their education in the department, received content knowledge courses on educational software development and material design from the first year onwards. Therefore, it can be said that the fact that graduates of the department find themselves competent in this regard is a result of the courses they attend in the department. For example, the courses provided in this department such as “Material Design and use in Education, Graphic and Animation in Education, Information Design” can be considered as the indicators of successful results. Therefore, it can be argued that the department imparts the necessary competences in developing educational software and materials to its students. It can be also said that the previous research studies carried out in the field reached conclusions supporting this finding. For example, Şahinkayaşı and Şahinkayaşı (2004) and Kılınç (2006) stated that the courses including content on software and material development were very useful for the students of the department.

3.1.3. Findings Concerning the Extent to Which the CEIT Undergraduate Program Imparts the Competence of Educational Communication to Its Students

The third sub-problem of the study is “Based on the competence perceptions of the graduates, what is the extent to which the CEIT undergraduate program imparts the competence of Educational Communication to its students?”. The responses given to the items in the Educational Communication sub-dimension by the CEIT graduates are given in detail in Table 4. When the means of the responses given to the competence items of this sub-dimension (4.15) was examined, it was determined that the perceptions of the graduates are high regarding the educational communication competence.

Table 4. Competence Perceptions of the CEIT Graduates about Educational Communication (N=461)

	<i>Lowest</i>	<i>Highest</i>	<i>Mean</i>	<i>Standard Deviation</i>
<i>Ability to work in harmony with the teammates</i>	1	5	4.15	.978
<i>Ability to take responsibility</i>	1	5	4.17	.954
<i>Ability to work in a disciplined manner</i>	1	5	3.92	1.035
<i>Helping teammates if needed</i>	1	5	4.35	.858
<i>Ability to express oneself</i>	1	5	4.01	1.001
<i>Ability to use the time effectively (ensuring time management)</i>	1	5	3.80	1.076
<i>Educational Communication Competence Sub-dimension</i>	1	5	4.15	.795

When the data in Table 4 were examined, it was observed that CEIT graduates perceived themselves competent in ability to work in harmony with their teammates (4.15), ability to take responsibility (4.17), ability to work in a disciplined manner (3.92), helping teammates if needed (4.35), ability to express oneself (4.01) and ability to use the time effectively (ensuring time management) (3.80). It is remarkable that the highest competence was perceived for “Helping teammates if needed” (4.35). This fact can be an indicator that the CEIT graduates have no problem in their communications with their teammates in their institutions and they are ready to help in any situation. In a study conducted by Durmaz (2012), it was determined that the CEIT graduates were quite competent in the implementation of collaborative works in their work environments, which supports this finding.

According to the data in Table 4, it is seen that the CEIT graduates perceive themselves highly competent in educational communication. Therefore, it can be stated that the courses and projects provided in the department are very successful for the students in gaining these competences. It is possible to say that this finding of the study is supported by the previous studies conducted in the literature (Berkant & Tuncer, 2011; Demirli, Türel, & Özmen, 2010; Karataş, 2010; Kurtoglu & Seferoglu, 2012). In short, it can be said that the undergraduate program of the department is successful in imparting educational communication skills to its students.

3.1.4. Findings Concerning the Extent to Which the CEIT Undergraduate Program Imparts the Competence of Security and Ethics in the use of Information and Communication Technologies

The third sub-problem of the study is “*Based on the competence perceptions of the graduates, what is the extent to which the CEIT undergraduate program imparts the competence of Security and Ethics in the Educational use of Information and Communication Technologies?*”. The responses of the CEIT graduates given to the items in the Security and Ethics in the Educational use of Information and Communication Technologies sub-dimension are given in Table 5. When the mean of the responses given to the competence items of this sub-dimension (3.71) was examined, it was determined that the graduates of the department perceived themselves adequate in terms of their competence in Security and Ethics in the Educational use of Information and Communication Technologies. As a result, it is observed that the CEIT graduates consider themselves competent in this sub-dimension.

Table 5. Competence Perceptions of the CEIT Graduates about Security and Ethics in the Educational Use of Information and Communication Technologies (N=461)

<i>Items</i>	<i>Lowest</i>	<i>Highest</i>	<i>Mean</i>	<i>Standard Deviation</i>
<i>Ability to lead the school and the environment about the security and responsible use of technology</i>	1	5	3.71	1.025
<i>Ability to ensure students to display positive social and ethical behaviors in using technology</i>	1	5	3.88	.989
<i>Ability to design activities that support the learners to acquire healthy and secure use of computers and other technological tools</i>	1	5	3.75	.987
<i>Informing the learners about the regulations concerning the use of information technologies</i>	1	5	3.55	1.142
<i>Ability to abide by the ethical rules in the use of information technologies</i>	1	5	3.90	1.030
<i>Ability to initiate efforts to meet the educational demands on information technologies that can emerge in the school</i>	1	5	3.53	1.074
<i>Sub-dimension of Security and Ethics in the Educational Use of Information Technology</i>	1	5	3.71	.819

As seen in Table 5, the CEIT graduates perceived themselves competent in ability to lead the school and the environment about the security and responsible use of technology (3.71), ability to ensure students to display positive social and ethical behaviors in using technology (3.88), ability to design activities that support the learners to acquire healthy and secure use of computers and other technological tools (3.75), informing the learners about the regulations concerning the use of information technologies (3.55), ability to abide by the ethical rules in the use of information technologies (3.90) and ability to initiate efforts to meet the educational demands on information technologies that can emerge in the school (3.53). It is remarkable that the lowest means were obtained in the competences of informing the learners about the use of information technologies and initiating efforts to meet the educational demands emerging in the school.

When the data in the Table 5 were examined, it was observed that the CEIT graduates perceived themselves quite competent in the teaching process concerning the security and ethics in the educational use of information and communication technologies. Based on this result, it is possible to argue that the courses on security and ethics in the use of information and communication technologies that are given to the students from the first year onwards in the department provided a basic knowledge to the students. Although there is no course directly related to the ethics in the undergraduate program of the department, it is possible to say that the high competence perceptions of the graduates in this subject is probably owing to the inclusion of these subjects in the other courses offered in the department. The courses such as *Use of Information Technologies in Education-1* and the *Use of Information Technologies in Education-2* can be given as examples for these courses. Similar results were reached in previous studies on this subject (Acat et al., 2004; Çuhadar & Dursun, 2010; Kılıçer & Odabaşı, 2006). As a result, it can be stated that, based on the competence perceptions of the participants, the CEIT undergraduate program provides the necessary basic knowledge on the competence about security and ethics in the use of information and communication technologies.

3.1.5. Findings Concerning the Extent to Which the CEIT Undergraduate Program Imparts the Competence of Preparation and Implementation of Educational Projects

The third sub-problem of the study is “*Based on the competence perceptions of the graduates, what is the extent to which the CEIT undergraduate program imparts the competence of Preparation and Implementation of Educational Projects?*”. The responses of the CEIT graduates given to the items in the Preparation and Implementation of Educational Projects sub-dimension are given in Table 6. When the mean of the responses given to the competence items of this sub-dimension (4.07) was examined, it was determined that the graduates of the department consider themselves quite adequate in terms of their ability in preparing and implementing educational projects. Based on this finding, it was determined that the perception levels of the graduates are high regarding their competence in preparing and implementing educational projects.

Table 6. Competence Perceptions of the CEIT Graduates about Preparation and Implementation of Educational Projects (N=461)

<i>Items</i>	<i>Lowest</i>	<i>Highest</i>	<i>Mean</i>	<i>Standard Deviation</i>
<i>Ability to conduct need analysis</i>	1	5	4.11	.917
<i>Ability to plan a project</i>	1	5	4.08	.944
<i>Project phasing and implementation</i>	1	5	4.11	.936
<i>Ability to implement the project effectively</i>	1	5	4.00	.984
<i>Sub-dimension of Preparation and Implementation of Educational Projects</i>	1	5	4.07	.856

When the data in Table 6 are examined in detail, it can be seen that the participants have high perceptions about ability to conduct need analysis (4.11), ability to plan a project (4.08), project phasing and implementation (4.11), and ability to implement the project effectively (4.00). Based on the findings obtained it is possible to say that the CEIT graduates were quite competent in preparing and implementing educational projects. It can be argued that the projects implemented during the courses given in the department and the Project Development courses achieved their goals. It was also observed in the previous studies conducted in the literature that graduates of CEIT department undergraduate program gained certain skills about preparing and implementing educational projects (Durdu, 2004; Seferoğlu & Akbıyık, 2009).

3.2. Findings Concerning the Extent to Which the CEIT Department Undergraduate Program Imparts Technological Competences to Its Students

The second research question is “*Based on the competence perceptions of the graduates, what is the extent to which the CEIT undergraduate program imparts technological competences to its students?*”. In order to answer this research question, the data were collected through the *Technological Competence Perception Scale for the CEIT Graduates*. The *Technological Competence Perception Scale for the CEIT Graduates* has four dimensions. These are the competences of “Problem Solving in Hardware and Software Installation, Ability to use System Software, Network and Information Security, and Ability to use Visual Software”..

3.2.1. Findings Concerning the Extent to Which the CEIT Undergraduate Program Imparts the Competence of Problem Solving and Software Installation to Its Students

The first sub problem of the second research question is “*Based on the competence perceptions of the graduates, what is the the extent to which the CEIT undergraduate program imparts the competence of Problem Solving in Hardware and Software Installation?*” The data concerning the *Problem Solving in Hardware and Software*

Installation sub-dimension of the *Technological Competence Perception Scale for the CEIT Graduates* are given in Table 7. When the mean of the responses (3.41) given to the questions in this sub-dimension was examined, it was observed that CEIT graduates perceived themselves *less competent* in this competence.

Table 7. Competence Perceptions of the CEIT Graduates about Problem Solving in Hardware and Software Installation (N= 461)

	<i>Lowest</i>	<i>Highest</i>	<i>Mean</i>	<i>Standard Deviation</i>
<i>Ability to solve hardware problems</i>	1	5	3.55	1.221
<i>Ability to solve technical problems</i>	1	5	3.42	1.255
<i>Ability to produce alternative solutions for technical problems</i>	1	5	3.43	1.243
<i>Ability to solve hardware and software problems emerging in the daily use</i>	1	5	3.56	1.151
<i>Ability to identify the hardware and software problems emerging in the daily use</i>	1	5	3.65	1.135
<i>Providing technical support for other units</i>	1	5	3.24	1.228
<i>Ability to develop and implement repairs and maintenance strategies for software, hardware and network elements</i>	1	5	3.16	1.221
<i>Ability to plan periodical repairs and maintenance for software, hardware and network elements</i>	1	5	3.22	1.256
<i>Ability to install a goal-oriented computer system</i>	1	5	3.33	1.367
<i>Ability to recognize software and peripheral components compatible with the installed system</i>	1	5	3.52	1.300
<i>Ability to install a goal-oriented network system</i>	1	5	3.31	1.273
<i>Ability to define and use the software and peripheral systems compatible with the computer and network systems</i>	1	5	3.41	1.235
<i>Ability to ensure communication among the computers</i>	1	5	3.52	1.192
<i>Ability to maintain the existing systems</i>	1	5	3.43	1.204
<i>Sub-dimension of Problem Solving in Hardware and Software Installation</i>	1	5	3.41	1.013

When the data in Table 7 are examined in detail, it is seen that the CEIT graduates perceived their competence *sufficient* in ability to solve hardware problems (3.55), ability to solve technical problems (3.42), ability to produce alternative solutions for technical problems (3.43), ability to solve hardware and software problems emerging in the daily use (3.56) and ability to identify the hardware and software problems emerging in the daily use (3.65). However, they perceived their competence as *less sufficient* in providing technical support for other units (3.24), ability to develop and implement repairs and maintenance strategies for software, hardware and network elements (3.16) and ability to plan periodical repairs and maintenance for software, hardware and network elements (3.22).

When the data in Table 7 are interpreted, it can be argued that the competence perceptions of the CEIT graduates were *insufficient* in *problem solving in hardware and software installation*. It is possible to say that the graduates of CEIT department consider themselves competent in identifying and eliminating a hardware problem. However, they consider themselves *less sufficient* in providing technical support, planning and developing repairs and maintenance strategies. It can be said that this result can be considered as normal, due to the fact that the number of the technical courses given in the department is very few, and the department, which is a teacher-training department, aims to develop educational skills of its graduates rather than technical skills.

Additionally, the fact that some competence perceptions are higher can be attributed to the courses provided in the department. It can be said that the department students acquire these competences through the hardware courses. The findings of a study conducted by Çoklar and Şahin (2008) also support this finding. In addition, CEIT graduates may perceive themselves competent in certain subjects since they feel more prone to technology owing to their fields. Seferoğlu and Akbiyik (2009) reported that the students of CEIT department and CEIT-graduate IT teachers were more successful in solving hardware problems.

3.2.2. Findings Concerning the Extent to Which the CEIT Undergraduate Program Imparts the Competence of Ability to use System Software to Its Students

Another sub-problem of the study is “Based on the competence perceptions of the graduates, what is the extent to which the CEIT undergraduate program imparts the competence of Ability to use System Software?” The findings concerning the *Ability to use System Software* sub-dimension of *Technological Competence Perception Scale for the CEIT Graduates* are given in Table 8. When the mean of the responses (2.81) given to the items in this sub-dimension were examined, it was observed that CEIT graduates perceived themselves *less sufficient* in *ability to use system software*.

Table 8. Competence Perceptions of the CEIT Graduates about Ability to use System Software (N=461)

<i>Items</i>	<i>Lowest</i>	<i>Highest</i>	<i>Mean</i>	<i>Standard Deviation</i>
<i>Ability to write SQL query</i>	1	5	3.04	1.352
<i>Ability to use the Oracle, SQL, and PL/SQL languages</i>	1	5	2.62	1.294
<i>Ability to use database programs effectively</i>	1	5	2.92	1.276
<i>Having a good level of SQL knowledge</i>	1	5	2.67	1.307
<i>Sub-dimension of Ability to use System Software</i>	1	5	2.81	1.192

When the data presented in Table 20 were examined, it was observed that the competence perception means of the CEIT graduates in ability to write SQL query (3.04) and ability to use database programs effectively (2.92) were lower compared to those of the ability to use the Oracle, SQL, and PL/SQL languages (2.62) and having a good level of SQL knowledge (2.67).

Based on these data, it is understood that the competence perceptions of the CEIT graduates concerning the ability to use system software are not so high. Considering the fact that there are basic courses of databases and programming languages in the department, it can be asserted that the lower competence perceptions of the participants may be due to the fewer number of courses. However, taking into account that the CEIT department is a teacher-training department, it can be thought to be normal that the department graduates perceived themselves *less sufficient* on system software competence. When the certain courses such as “*Computer Networks and Communication*” and “*Operating Systems*” offered in the department are examined, it can be argued that basic knowledge is given to the students in these subjects at undergraduate level. Therefore, it should not be perceived as a surprising result that the department graduates perceived themselves *less sufficient* on a subject that they have basic knowledge. At this point, it can be said that the graduates of CEIT department undergraduate program is *less sufficient* in gaining competence of *ability to use system software*.

3.2.3. Findings Concerning the Extent to Which the CEIT Undergraduate Program Imparts the Competence of Network and Information Security to Its Students

The findings concerning the sub-problem “Based on the competence perceptions of the graduates, what is the extent to which the CEIT undergraduate program imparts the competence of Network and Information Security?” were obtained through the *Network and Information Security* sub-dimension of the *Technological Competence Perception Scale for the CEIT Graduates*. Data concerning the competence perceptions of the participants about the *network and information security* are presented in Table 9. It is observed that the general mean of the participants concerning the network and information security sub-dimension was *almost insufficient* (2.53) and the graduates did not perceive themselves as competent in this subject.

Table 9. Competence Perceptions of the CEIT Graduates about Network and Information Security (N=461)

<i>Items</i>	<i>Lowest</i>	<i>Highest</i>	<i>Mean</i>	<i>Standard Deviation</i>
<i>Having knowledge about the standards of information security (ISO 27001, PCI DSS, CoBIT, etc.)</i>	1	5	2.18	1.215
<i>Having knowledge about security processes and technologies (penetration test, stress test, encryption, firewall, attack prevention systems, vulnerability of scanning systems etc.)</i>	1	5	2.71	1.259
<i>Having knowledge about network and system security</i>	1	5	2.71	1.167
<i>Sub-dimension of Network and Information Security</i>	1	5	2.53	1.074

When the data presented in Table 9 were examined in detail, it was observed that the CEIT graduates had the lowest competence perception (2.18) in *having knowledge about the standards of information security such as ISO 27001, PCI DSS, CoBIT, etc.* followed by *having knowledge about security processes and technologies such as*

penetration test, stress test, encryption, firewall, attack prevention systems, vulnerability scanning systems etc. (2.71) and having knowledge about network and system security (2.71).

According to the data in Table 9, it can be concluded that CEIT graduates do not perceive themselves competent enough in *network and information security*. When the courses provided in the CEIT department undergraduate program were examined, it was observed that the courses provided in this subject were very few and only at basic level, which can be a reason why the graduates perceived their competence as *insufficient*. Additionally, taking into consideration that the CEIT is a teacher-training-oriented department, it can be argued that the department cannot develop this competence in students. As a conclusion, based on the competence perceptions of the graduates, it is understood that the competence in *network and information security* cannot be developed at the department.

3.2.4. Findings Concerning the Extent to Which the CEIT Undergraduate Program Imparts the Competence of Ability to use Visual Software

In order to find answers to the sub-problem “*Based on the competence perceptions of the graduates, what is the extent to which the CEIT undergraduate program imparts the competence of Ability to use Visual Software?*”, the findings obtained from the responses given to the items in the *Ability to use the Visual Software* sub-dimension of the *Technological Competence Perception Scale for the CEIT Graduates* were used. Details of the findings are presented in Table 10. It is observed that the general mean of the participants concerning the *ability to use visual software* is *sufficient* (3.51). It is understood that the graduates perceive themselves as competent in *ability to use visual software*.

Table 10. Competence Perceptions of the CEIT Graduates about Ability to use Visual Software (N=461)

<i>Items</i>	<i>Lowest</i>	<i>Highest</i>	<i>Mean</i>	<i>Standard Deviation</i>
<i>Ability to use the software necessary for Graphics Software,</i>	1	5	3.49	1.162
<i>Ability to use animation preparation software</i>	1	5	3.51	1.197
<i>Ability to use the software necessary for the web design</i>	1	5	3.54	1.161
<i>Sub-dimension of Ability to use Visual Software</i>	1	5	3.51	1.048

When the data presented in Table 10 were examined, it was observed that CEIT graduates perceived their competence *sufficient* in ability to use the software necessary for Graphics Software (3.49), ability to use animation preparation software (3.51), and ability to use the software necessary for the web design (3.54). When the courses given in the department and their learning outcomes are examined, it can be said that the number of the courses given in the department on this subject is sufficient. Moreover, another reason that the graduates perceived themselves *sufficient* on this subject might be the fact that the graduates naturally have close ties with the technological devices and programs owing to their field of study. As the conclusion, it is observed that the the competence of the graduates about the *ability to use visual software* competence is *sufficient*.

5. CONCLUSIONS and SUGGESTIONS

In this section, the conclusions based on the findings of this study and the suggestions based on these conclusions are included.

5.1. Conclusions

This study was carried out for evaluating the CEIT department undergraduate program according to the competence perceptions of the graduates. For this purpose, the pedagogical and technological competence perceptions of the CEIT department graduates were examined and the program was evaluated according to the competence perceptions of the graduates. The competence perceptions of the CEIT department graduates were determined by the scales developed within the scope of the study. According to the findings obtained from the scales of pedagogical competence perception and technological competence perception, it was revealed that the perceptions of pedagogical competence of CEIT department graduates are higher than their perceptions of technological competence. The pedagogical competence perception scale consists of 5 competence sub-dimensions: “Educational Planning and Implementation”, “Development of Educational Software and Materials”, “Educational Communication”, “Security and Ethics in the Use of Information and Communication Technologies” and “Preparation and Implementation of Educational Projects”. The perceptions of CEIT graduates are quite high in all these sub-dimensions. The findings indicate that the CEIT undergraduate program is a powerful program in terms of developing pedagogical competences.

Another conclusion reached in the study is related to the participants' perceptions of technological competence. The technological competence perceptions of the CEIT Department graduates are generally low. The Technological Competency Perception Scale is consisted of four sub-dimensions: "Problem Solving in Hardware and Software Installation", "Ability to use System Software", "Network and Information Security", "Ability to use Visual Software". The perceptions of graduates are high in the "Problem Solving in Hardware and Software Installation" and "Ability to use Visual Software" sub-dimensions. In other sub-dimensions, they have low competence perceptions.

5.2. Suggestions

In this section, some suggestions are made in light of the findings of the current study:

- Within the scope of this study, by taking into account the competence perceptions of CEIT graduates, the product-oriented evaluation of CEIT department undergraduate program was made. A different evaluation can be employed concerning the program elements by using a different program evaluation model, such as including the academicians in this field.
- The program evaluation studies can be done separately for each course based on the courses given in the undergraduate program of the CEIT department.
- Within the scope of this study, the pedagogical and technological competence perceptions were asked to the participating CEIT graduates. A relational study can be conducted by going to the institutions, where graduates work, asking their employers and colleagues about the competence levels of CEIT graduates, and comparing their own competence perceptions and the competence perceptions of their colleagues towards them.
- Within the scope of the study, it was concluded that the undergraduate program of CEIT department was successful in helping its students to gain pedagogical qualifications, while it was less successful in helping its students to acquire technological qualifications. Thus, courses for the development of technological competences can be added to the department's undergraduate program, or the content of existing courses can be updated.
- The main purpose of the CEIT Department undergraduate program is to train teachers. However, by taking into account the developments in technology, developments in the education system across the country and technology-supported projects (such as Fatih Project), further studies can be conducted on the division of the department into different departments such as teacher training and instructional technologies experts training.

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Evaluation of Work-Life Balance of Teachers and School Managers

Osman VAİZ

Denetmen, KKTC Milli Eğitim Bakanı

Sarem ÖZDEMİR

Öğretim Üyesi, Uluslararası Kıbrıs Üniversitesi, Temel Eğitim Bölümü

Nedime KARASEL

Okul Müdürü, Değirmenlik İlkokulu

Ali EĞRİBOYUN

Öğrenci, Uluslararası Kıbrıs Üniversitesi, Eğitim Yönetimi

Abstract

The purpose of this study is to reveal the current status of the work-life balance of individuals working as classroom teachers, Turkish teachers and administrators in Turkey and Northern Cyprus and to examine them according to various demographic and professional characteristics. The study was carried out in relational screening model. The research population consists of people who work as primary school teachers, Turkish language teachers and administrators in Turkey and Northern Cyprus in the 2021-2022 academic year. The sample consisted of a total of 1059 people, 836 of whom were teachers and 223 of whom were administrators, selected using random sampling method. The data of the study were collected through an online questionnaire that included the Personal Information Form and the Work-Life Balance Scale. The data collected within the scope of the study were evaluated with quantitative analysis methods using the SPSS-26 software. In this context, frequency analysis, descriptive statistics methods, independent groups t-test, one-way analysis of variance (ANOVA) and Tukey HSD test were used. As a result of the study, it was observed that the participants were able to maintain work-life balance at a moderate level. In general, work-life balance does not differ significantly according to gender, marital status, having children and status ($p>0.05$), but the participants aged 51 and above have a significantly higher work-life balance than the participants aged 22-30 ($p<0.05$), and, results according to sub-dimensions are presented in the study.

1. INTRODUCTION

With the entry of women into the workforce in the early 1970s, the idea of work-life balance first became popular (Karaoğlu, 2019). Work-life balance, according to Akbarova (2019), is the reduction of tensions between the responsibilities that people play at work and in their personal lives. Work-life balance is described by Babayiğit (2016) as the harmony between a person's obligations to their family and their place of employment.

Work-life balance has been attempted to be described by a number of theories due to its importance, including spillover, compensation, partition, resource consumption, convenience, work-family conflict, role, instrumentality, and boundary. According to the spillover idea, even the smallest occurrence can have a beneficial or negative impact on both your professional and personal life. According to compensation theory, if there is a bad condition between job and personal life, the person will try to improve in one of the two domains. Spillover theory's opponent is partition theory. A personal or professional event has an impact on the other in the spillover hypothesis, but not the partition theory. According to the notion of resource consumption, the person spends more time working and less time with his or her family. According to convenience theory, each person should strike a healthy balance between their personal and professional lives. The theory of work-family conflict describes circumstances in which a person is unable to perform all of his or her responsibilities or to strike a balance between work and family. position Theory states that each person has a unique position in both work and family life. The problem, according to this theory, is not that there are many positions; rather, it is that people find it difficult to carry out the duties that the roles need. According to the Instrumentality Theory, the person understands that success in the workplace is a prerequisite for success in other areas of life. Work-life balance is expected to establish boundaries between work and home, which are extremely different from one another, according to the Boundary Theory (Girdap, 2019).

As a result of the studies conducted, it has been found out that work-life balance is affected by such factors as gender, education, career planning, marital status, child or elderly care, age, ambiguity of roles, role conflict,

organizational career ladders and career paths, excessive workload and job descriptions, management style, and employee participation in management (Teker, 2015; Yavuz, 2018; İzki, 2019).

When Batur and Saylk (2022) looked at the findings of work-life balance and degrees of commitment or burnout inside the organization, they discovered a negative correlation between the two. However, they discovered a positive correlation at the level of commitment. Ekinci (2021), who performed studies on the organization, found that the impact of work-life balance on organizational commitment is moderate in the context of the link between the two. On the other hand, Araslar (2021) found that those with great work-life balance also have high levels of professional motivation and engagement.

Work-life balance, motivation, and engagement studies have been conducted not only on employees but also on managers' work-life balances and the implications for organizations. Kerim (2021) asserts that the manager's team leadership style has a direct impact on employees' judgments of job satisfaction, commitment to work, and work-life balance. In a distinct manager-based study, Ergin (2022) tried to investigate the role of manager support in the relationship between work-life balance and job satisfaction and concluded that work-life balance favorably impacts managers' job satisfaction. Alkan (2019), examined the relationship between work-life balance and work engagement of school administrators and found that there is a relationship between work-life balance and work engagement. It also was concluded that there was a significant difference in favor of the study, and there were significant differences in the scores of the scale of work engagement according to the variables of marital status, spouse's employment, gender, having children, graduation, staff status, graduation.

Kiral (2020) investigated the relationship between high school administrators' empowerment of teachers and teachers' school engagement. The analyses conducted regarding teachers' levels of commitment revealed that there was no significant difference according to the subject variable, but it was found that male teachers possessed lower emotional commitment than female teachers. The researcher found that there was no significant difference in terms of work-life balance according to teachers' seniority, subject, and gender variables.

The work-life balance and job stress of employees who were required to work from home in their studies, on the other hand, were found to have a substantial impact on job satisfaction, according to Irawanto, Novianti, and Roz (2021). According to Akcebe (2022), there is a low correlation between attitudes toward teleworking and work-life balance. However, Ünal (2021) compared the work-life balance with the distance learning process during the pandemic process and discovered that teachers found it challenging to distinguish between work and non-work life when they had to work from home; they were unable to find time for professional development; they were unable to find time for their families or themselves; and the pandemic process had a negative psychological and physical impact on them.

According to research on work-life balance, psychological safety, and occupational health conducted by Gragnano, Simbula and Miglioretti (2020), job satisfaction is more strongly influenced by occupational health than by work-life balance. On the other hand, Demirbağ, Demir and Yozgat (2021) explored the connection between psychological safety and work-life balance and discovered that both psychological safety and the efficiency of remote working were regulated by work-life balance. It is also seen in the literature review that; Work-life balance, that is, establishing a balance between working life and private life, which are two separate sub-dimensions of individual life, is very important for both the individual and the society (Yalçınkaya, 2019). If this balance is not achieved, serious problems may arise in personal, organizational and familial areas such as the emergence of diseases, dissatisfaction with life, increase in family problems and divorce, increasing problems with parents, increase in juvenile delinquency and violence, and inefficiency of employees (Karaoğlu, 2019; Akın, 2019; Alkan, 2019).

When comparing the teaching profession to other occupations, it is clear that it has quite different qualities. Some parts consider it as an easy job due to the flexibility of working hours and summer vacations, while the experiences of instructors in the background go mostly unreported. Several issues are faced in the background. All social events and the production of working papers during the semester, which are chores unrelated to education, as well as class preparation, are various elements that enhance instructors' workload (Nakip, 2015). According to studies undertaken by educational groups, teachers are overworked and one-third of them suffer from stress and burnout. To overcome these challenges, a teacher must always be committed to self-improvement, a constant learner, and the most hardworking. He or she should stay current on innovations in his or her profession, be able to use those developments, update course tools and materials as appropriate, and seek methods to improve his or her teaching. A teacher or administrator, on the other hand, must make time for his or her family, friends, and self. As a result, when duties in life outside of school are added to responsibilities at school, teachers and administrators may struggle to fulfill these various responsibilities. A person's work-life balance might be thrown off after a stressful

procedure due to variables such as forgotten obligations, exhaustion, and stress. In both family and corporate life, problems and tension might arise (Akbarova, 2019). In this respect, it is believed that the concept of work-life balance of teachers and administrators should be examined in depth. For these reasons, it was seen necessary to conduct this study.

The purpose of this study is to display the work-life balance of individuals who work as classroom teachers, Turkish language teachers and administrators in Turkey and Northern Cyprus and its examination according to various demographic and professional characteristics. In line with purpose, answers to the following questions were sought:

1. Are teachers and administrators able to maintain work-life balance?
2. Are the levels of work-life balance of teachers and administrators affected by their gender, marital status, having children, their status and age?
3. Are the levels of work-life harmony, neglecting life, making time for oneself and life is work, which are the sub-dimensions of work-life balance of teachers and administrators, affected by their gender, marital status, having children, status, and age?

2. METHOD

2.1. Research Design

The study was conducted with relational screening model. Screening model ensures that the study conducted on the sample selected from identified population describes that sample quantitatively (Cresswell, 2012). In this approach, it is essential that the researcher does not affect the process except for the application of the tools necessary to collect the desired data (Büyüköztürk et al., 2018). In studies using relational screening model, it is aimed to determine the relationship between two or more variables (Kaya, Balay ve Göçen, 2012).

2.2. Population of the Study

The universe of the research consisted of people who worked as Classroom Teachers, Turkish Language Teachers and administrators in Turkey and Northern Cyprus in the 2021-2022 academic year. The sample included a total of 1059 people, 836 of whom were teachers and 223 of whom were administrators, who were selected using the random sampling method. The distribution of the participants by demographic and professional characteristics is given in Table 1.

Table 1. Demographic and Professional Characteristics of Participants

		N	%
Gender	Female	651	61,5
	Male	408	38,5
Age	22-30	203	19,2
	31-40	443	41,8
	41-50	294	27,8
	51 and above	119	11,2
Marital status	Single	281	26,5
	Married	778	73,5
Have children?	Yes	715	67,5
	No	344	32,5
With whom one lives	Family	902	85,2
	Alone	157	14,8
Status	Teacher	836	78,9
	Administrator	223	21,1
Which region do you work in?	Marmara	215	20,3
	Mediterranean	171	16,1
	Central Anatolia	163	15,4
	Aegean	139	13,1
	Southeast Anatolia	99	9,3
	TRNC	98	9,3

Black Sea	89	8,4
Eastern Anatolia	85	8,0

As seen in Table 1, 61.5% of the teachers and administrators participating in the study are female and 38.5% are male. In terms of age, 19.2% of the participants are 22-30 years old, 41.8% are 31-40 years old, 27.8% are 41-50 years old, and 11.2% are 51 years old and older. In terms of marital status, 73.5% of the participants are married and 67.5% have children. In addition, it was determined that 85.2% of the participants lived with their families and 78.9% were teachers. As for the region of duty, it was found out that 20.3% of the participants worked in Marmara, 16.1% in the Mediterranean, 15.4% in Central Anatolia, 9.3% in Southeast Anatolia, 8.0% in Eastern Anatolia, 13.1% in Aegean, 8.4% in Black Sea and 9.3% in TRNC.

2.3. Collection of Data and Data Collection Tools

The data of the research were collected through an online questionnaire including Personal Information Form and Work-Life Balance Scale. The Work-Life Balance Scale was developed by Apaydın (2011). The scale, which consists of a total of 20 5-point Likert-type items, includes four sub-dimensions called Work-Life Harmony, Neglecting Life, Making Time for Oneself, and Life is Work. An increase in the total score obtained from the scale and its sub-dimensions indicates an increase in the relevant level. The reliability of the scale was found as $\alpha=0.791$.

2.4. Analysis of Data

The data collected within the scope of the study were evaluated with quantitative analysis methods using the SPSS-26 program. In this context, frequency analysis, descriptive statistics methods, independent groups t-test, one-way analysis of variance (ANOVA) and Tukey HSD test were used. The reason for using parametric tests is that the data meet the normality condition. This was decided by examining the skewness and kurtosis values. Since these values were between ± 1.50 , it was decided that the data were normally distributed (Tabachnick & Fidell, 2013).

3. FINDINGS

3.1. Work-Life Balance Total Score

Whether total scores of work-life balance differed significantly according to gender, marital status, having children and status was examined by using independent groups t-test, and the findings are given in Table 2.

Table 2. Examination of Work-Life Balance Total Scores by Gender, Marital Status, Having Children and Status

		n	Mean	S	t	Sd	p
Gender	Female	651	66,65	11,82	-0,830	944,426	0,407
	Male	408	67,22	10,41			
Marital Status	Married	778	67,32	11,19	-2,136	403,848	0,330
	Single	281	65,62	11,50			
Having children	Yes	715	67,24	10,74	1,479	599,477	0,140
	No	344	66,09	12,36			
Status	Teacher	836	66,73	11,32	-0,748	351,633	0,455
	Manager	223	67,37	11,23			

According to Table-2, work-life balance total scores did not differ significantly according to gender, marital status, having children and status ($p>0.05$).

In addition, when the scores obtained are evaluated according to the lowest and highest scores that can be obtained from the scale, it has been determined that the scores are generally at a moderate level (about 58%). This showed that the participants were able to maintain a medium level of work-life balance.

A one-way analysis of variance (ANOVA) was performed to determine whether the work-life balance total scores showed significant difference by age, and the findings are given in Table 3.

Table 3. Analysis of Work-Life Balance Total Scores by Age

		Sum of Squares	Sd	Mean squares	F	p
Age	Inter-groups	1393,516	3	424,505	3,668	0,012
	Intra-groups	133600,7	1055	126,636		

Total 134994,2

* $p < 0,05$.

Accordingly, work-life balance total scores differed significantly according to age ($p > 0,05$). As a result of multiple comparisons (post-hoc), the work-life balance scores of those aged 51 and over were found to be significantly higher than the participants aged between 22 and 30.

3.2. Work-Life Harmony Sub-Dimension Score

Whether the scores of the work-life harmony sub-dimension differed significantly according to gender, marital status, having children, status and with whom one lived were examined by using independent groups t-test, and the findings are given in Table 4.

Table 4. Examination of Work-Life Harmony Sub-Dimension Scores by Gender, Marital Status, Having Children, Status, and Living with Whom

		n	Mean	s	T	Sd	p
Gender	Female	651	19,62	5,84	0,803	827,067	0,422
	Male	408	19,31	6,18			
Marital Status	Married	281	19,44	5,89	-0,202	504,509	0,840
	Single	778	19,52	6,01			
Having children	Yes	715	19,4	6,02	-0,789	693,194	0,430
	No	344	19,71	5,87			
Status	Teacher	836	19,31	5,97	-2,051	350,369	0,041
	Administrator	223	20,23	5,95			
Living with Whom	Family	902	19,58	5,98	0,957	214,541	0,340
	Alone	157	19,08	5,95			

* $p < 0,05$.

According to Table-4, the work-life harmony sub-dimension scores did not differ significantly according to gender, marital status, having children and with whom one lived ($p > 0,05$). However, significant difference was found according to status ($p < 0,05$). The work-life harmony scores of the administrators are significantly higher than the teachers. One-way analysis of variance (ANOVA) was performed to determine whether the work-life harmony sub-dimension scores differed significantly according to age and region of duty, and the findings are given in Table 5.

Table 5. Analysis of Work-Life Harmony Sub-Dimension Scores by Age and Region of Duty

		Sum of Squares	Sd	Mean squares	F	P
Age	Inter-groups	2,255	3	0,752	0,021	0,996
	Intra-groups	37732,49	1055	35,765		
	Total	37,734,74	1058			
Region of Duty	Inter-groups	806,409	7	115,21	3,279	0,002
	Intra-groups	36928,28	1051	35,136		
	Total	37734,74	1058			

* $p < 0,05$.

As seen in the table, the scores of the work-life harmony sub-dimension did not differ significantly according to age ($p > 0,05$), but differed significantly according to the region of duty ($p < 0,05$). Work-life harmony scores of the participants working in the TRNC were found to be significantly higher than those working in the Mediterranean, Central Anatolia, Eastern Anatolia, and Aegean regions.

3.3. Neglecting Life Sub-Dimension Score

Whether the scores of neglecting life sub-dimension differed significantly according to gender, marital status, having children, status and with whom one lived was examined by using independent groups t-test, and the findings are given in Table 6.

Table 6. Examination of Neglecting Life Sub-Dimension Scores by Gender, Marital Status, Having Children, Status and Living with Whom

		n	Mean	s	T	Sd	P
Gender	Female	651	19,76	4,40	-3,959	925,216	0,000
	Male	408	20,80	4,00			
Marital Status	Married	281	19,44	5,89	-0,202	504,509	0,840
	Single	778	19,52	6,01			
Having children	Yes	715	20,25	4,19	0,936	643,881	0,350
	No	344	19,98	4,44			
Status	Teacher	836	20,17	4,23	0,151	336,651	0,880
	Administrator	223	20,12	4,45			
Living with Whom	Family	902	20,11	4,28	-0,866	214,501	0,386
	Alone	157	20,43	4,26			

* p<0,05.

When Table-6 is examined, the scores of the neglecting life sub-dimension did not differ significantly according to marital status, having children, status and with whom one lived ($p>0.05$), but significant difference was found according to gender ($p<0, 05$). Neglecting life scores of males are significantly higher than the scores of females.

One-way analysis of variance (ANOVA) was performed to determine whether the scores of neglecting life sub-dimension differed significantly according to age and region of duty, and the findings are given in Table 7.

Table 7. Examination of Neglecting Life Sub-Dimension Scores by Age and Region of Duty

		Sum of Squares	Sd	Mean squares	F	P
Age	Inter-groups	419,38	3	139,793	7,796	0,000
	Intra-groups	18917,33	1055	17,931		
	Total	19336,71	1058			
Region of Duty	Inter-groups	126,697	7	18	0,99	0,437
	Intra-groups	19210,01	1051	18,278		
	Total	19336,71	1058			

* p<0,05.

According to Table-7, the scores of the neglecting life sub-dimension did not differ significantly according to the region of duty ($p>0.05$), but showed a significant difference according to age ($p<0.05$). Work-life harmony scores of participants aged 51 and over were found to be significantly higher than all other participants.

3.4. Making Time for Oneself Sub-Dimension Score

Whether the scores of the sub-dimension of making time for oneself differed significantly according to gender, marital status, having children, status and with whom one lived was examined by using the independent groups t-test, and the findings are given in Table 8.

Table 8. Examination of making Time for Oneself Sub-Dimension Scores According to Gender, Marital Status, Having Children, Status and Living with Whom

		n	Mean	s	t	Sd	P
Gender	Female	651	13,59	3,70	-0,017	868,123	0,987
	Male	408	13,59	3,68			
Marital Status	Married	281	13,07	3,76	-2,710	483,396	0,007
	Single	778	13,71	3,66			
Having children	Yes	715	13,74	3,62	1,906	643,127	0,570
	No	344	13,27	3,83			
Status	Teacher	836	13,55	3,66	-0,572	337,97	0,567

	Administrator	223	13,72	3,83			
Living with Whom	Family	902	13,69	3,66	2,110	207,821	0,036
	Alone	157	12,99	3,86			

* $p < 0,05$.

According to the table, the scores of making time for oneself sub-dimension did not differ significantly by gender, having children and status ($p > 0,05$). However, significant difference was found according to marital status and with whom one lived ($p < 0,05$). Singles and those living with their families obtained significantly higher scores for making time for themselves than the married and those living alone.

One-way analysis of variance (ANOVA) was conducted to examine whether the scores of the sub-dimension of taking time for oneself differed significantly according to age and region of duty. The obtained findings are given in Table 9.

Table 9. Examining the Scores of Making Time for Oneself Sub-Dimension by Age and Region of Duty

		Sum of Squares	Sd	Mean squares	F	P
Age	Inter-groups	228,213	3	76,071	5,648	0,001
	Intra-groups	14210,28	1055	13,469		
	Total	144338,49	1058			
Region of Duty	Inter-groups	136,646	7	19,521	1,435	0,188
	Intra-groups	14301,85	1051	13,608		
	Total	14438,49	1058			

* $p < 0,05$.

Accordingly, the scores of the sub-dimension of making time for oneself did not differ significantly according to the region of duty ($p > 0,05$), but showed a significant difference according to age ($p < 0,05$). The scores of the participants aged between 22-30 years of making time for themselves were found to be significantly lower than those between the ages of 31-40 and those aged 51 and over.

3.5. “Life is Work” Sub-dimension Scores

Whether the scores of the “life is work” sub-dimension differed significantly according to gender, marital status, having children, status and with whom they lived was examined by using independent groups t-test, and the findings are given in Table 10.

Table 10. Examination of “Life is Work” Sub-Dimension Scores by Gender, Marital Status, Having Children, Status and Living with Whom

		n	Mean	s	T	Sd	p
Gender	Female	651	13,68	2,73	0,984	925,064	0,326
	Male	408	13,52	2,48			
Marital Status	Married	281	13,02	2,78	-4,229	461,277	0,000
	Single	778	13,83	2,55			
Having children	Yes	715	13,85	2,51	4,011	610,018	0,000
	No	344	13,13	2,83			
Status	Teacher	836	13,70	2,65	2,044	357,090	0,042
	Administrator	223	13,30	2,58			
Living with Whom	Family	902	13,69	2,64	2,285	216,234	0,230
	Alone	157	13,18	2,59			

* $p < 0,05$.

As seen in the table, the scores of the “life is work” sub-dimension did not differ significantly according to gender and with whom one lived ($p > 0,05$). However, significant difference was found according to marital status, having children and status ($p < 0,05$). Singles, those with children, and teachers obtained higher scores on “life is work” than the married, the childless, and the administrators.

One-way analysis of variance (ANOVA) was conducted to examine whether the scores of the “life is work” sub-dimension differed significantly according to age and region of duty, and the findings are given in Table 11.

Table 11. Examination of the Scores of the “Life is Work” Sub-dimension According to Age and Region of Duty

		Sum Squares	of Sd	Mean squares	of F	p
Age	Inter-groups	56,616	3	18,872	2,727	0,043
	Intra-groups	7301,964	1055	6,921		
	Total	7358,58	1058			
Region of Duty	Inter-groups	51,741	7	7,392	1,063	0,385
	Intra-groups	7306,839	1051	6,952		
	Total	7358,58	1058			

* $p < 0,05$.

According to the table, the scores of “life is work” sub-dimension did not differ significantly according to the task region ($p > 0,05$), but showed a significant difference according to age ($p < 0,05$). The “life is work” scores of the participants aged between 22-30 years old were found to be significantly higher than those between the ages of 31-40 and those aged 51 and over.

4. DISCUSSION

1059 people participated in the study on the work-life balance of teachers and administrators. In this study, which included teachers and administrators, sub-dimensions of the work-life balance scale were interpreted in accordance with independent considerations. There was no significant difference between "life is work," "making time for oneself," "work-life harmony," and gender when the sub-dimensions of the work-life balance scale and the independent variable of gender were analyzed. However, there was a significant difference between gender and "neglecting life." In a related study, Paçal (2019) found that the "life is work" sub-dimension and gender showed a substantial difference, with the other sub-dimensions showing no difference at all.

When the link between the status variable and the sub-dimensions of the work-life balance scale was explored, the sub-dimension "life is work" did reveal a significant difference, but making time for oneself, neglecting life, and work-life harmony did not. The administrators' somewhat increased workload and their greater focus on work in order to succeed in their jobs are two factors contributing to this. Apaydn (2011) evaluated professors based more on their titles than on their rank. Their differences in the sub-dimension "life is work" were quite significant, according to the study. Both studies found the same results for making time for oneself, and no significant differences were found in this sub-dimension. They did not achieve the same outcomes with the disregarding life sub-dimension, though. It was found in Apaydn's study that professors and assistant professors neglected their personal lives. In Apaydn's study, the work-life harmony sub-dimension and status/title were significantly different for professors, associate professors, and assistant professors, but not for teachers and administrators (Apaydn, 2011).

The independent variable of married status and the sub-dimensions did not differ significantly. Similarly, the sub-dimension "life is work" showed a substantial difference, despite there being no statistically significant difference between the other sub-dimensions of "making time for oneself," "neglecting life," or "work-life harmony." Married people view life as more work than singles do. We can explain this by assuming that married people prioritize their careers in order to ensure that their families enjoy greater standards of living. There was not a significant difference between any of the sub-dimensions and marital status in Usta's (2020) study.

While there was no significant difference between the teachers and administrators having children and the sub-dimensions of making time for oneself, work-life harmony and neglecting life, a significant difference was found in terms of the sub-dimension of “life is work”. Those who do not have children tend to see life as work. In a similar study conducted by Usta (2020), the number of children was examined. According to the results of that analysis, no significant difference was found in terms of all sub-dimensions (Usta, 2020). There was no significant difference between the age independent variable and all sub-dimensions of work-life balance. According to Yalçın (2019), who conducted a comparable study, significant difference was found only in terms of work-life harmony sub-dimension. Work-life harmony scores of participants aged 50 and over were found significantly higher than those aged 40 and younger (Yalçın, 2019).

While there is no significant difference between who the teachers and administrators live with and the sub-dimensions of work-life harmony and neglecting life, there is a significant difference in terms of the sub-dimensions of making time for oneself and “life is work”. Compared to those living alone, those who live with their families can devote time to themselves and do not see life as just work. In Babacan’s (2020) study, however, no significant difference was found between who the participants lived with and all sub-dimensions.

5. CONCLUSION and RECOMMENDATIONS

As a result of the study, firstly, it was seen that participants ensure work-life balance at a moderate level. In addition, it was found out that the work-life balance of participants did not show difference according to gender, marital status, having children and status. When the work-life harmony levels of participants are examined, it has been concluded that there is no difference according to gender, marital status, having children and with whom one lived, whereas work-life harmony showed difference according to their status. In this respect, it has been determined that teachers have higher level of work-life harmony compared to administrators.

When the levels of disregarding life of the teachers and administrators participating in the study were evaluated, it was discovered that there was a substantial variation based on the participants' gender and age. Female participants were shown to be more neglectful of life than male participants. When the age variable was studied, it was discovered that those in the 51-60 age group neglected life less than those in the other age groups. It was established that the level of life neglect did not alter according on the participants' marital status, whether or not they had children, their status, or who they lived with. When the time allocation levels of the participants were studied within the scope of the research, it was discovered that there was no variation based on gender, marital status, whether or not they had children, status, age, or the region where they worked. Furthermore, it has been discovered that there is a difference based on who the participants live with, and that this difference is produced by the participants living with their family. It was discovered that persons who live with their family devote more time to themselves than those who live alone.

It was discovered that there is no difference in participants' "life is work" levels, which is another component of the study, based on their gender, age, and region of duty characteristics. The study found that the "life is work" sub-dimension differs by marital status, with married people seeing life as more labor than other participants. Furthermore, it was discovered that individuals who do not have children regard life as work more than participants who do.

When the "life is work" level of participants was examined according to their status, it emerged that teachers do not see life as simply work, whereas administrators do. It was also found that the "life is work" level fluctuated depending on who one lived with, with participants who live alone receiving higher scores than individuals who live with their family.

The results of the study can be reconstructed by considering different teaching fields. It can be done in 7 different regions of Turkey to compare work-life balances between regions. This study can be handled with a sociological approach and it can be investigated why people put their work at the center of life. With a similar approach, the problems of individuals who have problems in work-life adjustment can be investigated. It can increase the awareness of individuals on different issues with in-service trainings for teachers and administrators. By improving the working conditions of teachers and administrators, it can be helped to achieve a more comfortable work-life balance. By reducing the workload of managers who see life as work, improvements can be made in their work-life balance.

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Examination of Pre-Service Teachers' Experiences on Distance Education in the Covid-19 Pandemic Period: A Longitudinal Research

Assoc. Prof. Dr. Olga Pilli

Girne American University, Faculty of Education, Primary School Teaching Department
olgapilli@gau.edu.tr
0000-0002-4876-3977

Assist. Prof. Dr. Özgür Batur

Girne American University, Faculty of Education, Primary School Teaching Department
ozgurbatur@gau.edu.tr
0000-0002-5433-6162

ABSTRACT

This longitudinal research was conducted in Girne American University, Faculty of Education during the pandemic process by means of a qualitative multiple case study with semi-structured questions through online forms with a purposefully selected study group of 143 undergraduates between 2020-2022 academic years. The two phase research had 75 participants in the first phase and 68 in the second one. The interview questions were first applied to a randomly selected pilot group consisted of 13 participants that are exempted from the research. Content analysis was utilized in the data set in order to have a deep understanding of the findings. Findings revealed that most of the students did not have an online education experience before, but their competency levels were stated to be positive and they are quite satisfied from the distance education applications. Internet quality is found to be the major obstacle, Zoom to be the most used platform. Evaluation and communication problems are found to be at the center of negative attitudes. Even if there are both positive and negative attitudes towards the future preferences, a combination of face to face and online sessions seem to be accepted by the participants.

Keywords: *Distance education, online learning, pre-service teachers, qualitative research*

INTRODUCTION

After the Covid-19 outbreak, which deeply affected the lives of millions that started in Wuhan City of Hubei Province of China to the rest of the world, was declared a pandemic by the World Health Organization on March 11, 2020 (Kiok et al., 2021; Shingal, 2020; WHO, 2020) forcing us to leave our classrooms, offices and campuses. According to UNESCO, more than 1.6 billion students, as of 90% of the word student rates (Gençoğlu & Çiftçi, 2021, p. 1650) and young people around the world have been affected by the closure of educational institutions due to the pandemic (UNESCO, 2020a). The closure of educational institutions, although it is stated that the effect of school closure measures in coping with the epidemic is not yet known (Uscher-Pines et al., 2018; Viner et al., 2020), regional or countrywide school closure measures have been taken in 192 countries affecting not only students, teachers and families forcing them to stay at home (Grek & Landri, 2020), but also had far-reaching economic and social consequences (Setiawan & Iasha, 2020). The field of education also had its share due to the compulsory change from traditional classrooms to virtual ones, in terms of distance education, as an effect of the pandemic.

Distance education term stands for the teaching and learning activities that the suppliers and receivers of the educational objectives are physically far away from each other in which the process occurs in different settings which are backed up with technological tools and applications, time and space flexibility are provided, and interaction is established (Banar & Firat, 2015; Moore & Kearsley, 2012; Özüdoğru, 2021) Distance education's history dates back to 1700s by a teacher named Calep Phillips, who gave an advertisement in Boston Gazette about a correspondence course in which weekly learning programs will be sent to students living outside the region they live in underlining that there would be no change in the quality of the courses (Ceviz, Tektaş, Basmacı & Tektaş, 2021; Siemens, Gašević & Dawson, 2015). Unfortunately, correspondence study could not have an effect until the 19th century, due to the improvements in the postal system in the US. Later in 1840s, the process continued with letter teaching (Moore & Kearsley, 2005), followed by the British Broadcasting Corporation's (BBC) educational radio training and distance education for schools in 1920. The distance education phenomenon continued in the 1960s with the support of the BBC, higher education-level radio and TV broadcasts and lecturing sessions were on the run (Bates, 2015).

In our era, distance education turned out to be web-based educational activities with the help of developing internet technologies and computers (Newby, Stepich, Lehman & Russell, 2006). The increased usage of mobile devices in our lives, having the opportunity to access the internet from anywhere and the ability to do computerized operations has been effective more than ever (Chóliz et al., 2016). This status of improvement brought a new term as “Digital Literacy” (OECD, 2018, 2019; Zilka, 2021), which is also regarded as “21st century skills”, meaning to reach the desired information, evaluating, processing and integrating it by using various digital tools within the awareness of limitations, challenges and benefits of it. The limitations of technology integration is not a ‘hot topic’ that has been always under inspection and Ertmer (1999) identified these limitations (barriers) in two groups as internals, the ones related to equipment, education, access, time and technical support; and externals as pedagogy, belief and personal preferences of teachers. In the field of education, digital literacy phenomenon gains different requirements and competencies for both students, academics and the administrative staff. UNESCO’s (2011) diverse specifications of these academic competencies are; information and communication technology use in education, curriculum and assessment, pedagogy, organization and management, and individual development which are believed to have a positive effect when the required features are well conducted by expertise.

Blended and online courses were ingrained in the curriculum of educational institutions before the pandemic (Seaman et al., 2018; Soffer & Cohen, 2019; Zilka et al., 2019) but the new crisis initiated new approaches and applications of online learning and launched the process of total distance learning (Kwong et al., 2020). Once regarded as supplementary and ignored online instructional tools in the traditional education, are now on stage with their leading roles at all levels of educational institutions (primary, secondary, undergraduate & graduate) and schools world-wide (Batmang et al., 2021, p. 449). China with more than 270 million students shifted to online platforms supplying free of charge primary and secondary level learning opportunities, France activated home-class application nationwide, America’s first step from online shift in higher education level conducted by Washington university with 50 thousand students and British authorities predicted to be far from effect for its higher education system by internalizing social immunity approach during the pandemic (Saygı, 2021; Yamamoto & Altun, 2020; Yılmaz et al., 2020). Australia and Romaina (in addition to national tv broadcast), both used Google Drive/ Microsoft Teams of distance education, German teachers mailed homeworks and assignments to their students (Reimers & Schleicher, 2020), and Finland preferred to keep schools open by means of flexible learning environments and applications guided by the National Education Agency (Gençoğlu & Çiftçi, 2020). Meanwhile, Ministry of Turkish Education conducted on air (synchronized and non-synchronized) education via state television and higher education institutions also shifted to online instruction in all fields which already had some considerable technical competence, experience, software and hardware that were in use for variety purposes since the declaration of the Council of Higher Education (YOK), giving the opportunity to institutions to conduct online sessions for common/service courses in 2013 (Kuzu, 2020), which then come forth due to the pandemic. Following the announcement made by YOK in 2020 March out of 189 universities in Turkey, a fast shift to distance education on 23 March 2020 started with 121 (64%) universities, followed by 41 (21.6%) on 30 March 2020, and 25 (13.2%) on 6 April 2020 (Dikmen & Bahçeci, 2020). In the Turkish Republic of Northern Cyprus (TRNC), the first case of COVID-19 was identified on February 25th, 2020, after which the number of confirmed cases increased steadily forcing educational changes to be adapted rapidly at all levels of the education system.

It is believed that distance education is an effective model like the traditional one which also gives some educational the opportunities, new instructional techniques, creates contribution to adult education and additional set of challenges with feedback and curriculum implementation (GuriRosenblit, 2005; Hill, 2021; Simonson, Schlosser, & Orellana, 2011). Scholars state that distance education and online learning has the potential to be considered not only an alternative and supportive element of traditional education, but also as a major basis of educational operations and the “digitalization in education” must keep the pace and should be supported (Altunel, 2020; Ogbonnaya, Awoniyi & Matabane, 2020; Telli & Altun, 2020). Scholars approach to the requirements of distance education are examined from different viewpoints. Ormrod (2016) states four principles as; competence, excitement, self-determination and connectedness, where some researchers mention that distance education is consisted of four elements as institutional, communicative, audial and physical-stating the separation in distance education (Simonson, Smaldino, Albright & Zvacek, 2008). The mutual and instant interaction is highly crucial in order to supply and sustain learning in a virtual environment with student satisfaction, which reveals a higher level of engagement in learning activities (Cidral et al., 2018; Wu et al., 2010; Veletsianos, 2010) which have some unique specialties from the traditional classroom due to the motivation, satisfaction and interaction of the students (Bignoux & Sund, 2018).

Scholars state that no considerable difference was detected between the traditional and virtual class in terms of student satisfaction when designed and supplied properly (Adam et al., 2012; Clark, 2007), and there is some

proof that participation in distance education can also lead to higher academic success (Kurucay & Inan, 2017). At this point, student motivation and participation stand as the fundamental factor to have a positive effect on academic achievement. The motivation to take part in virtual activities highly connected with participation, which is believed to have three dimensions as; cognitive participation (the effort), emotional (to the peers and teachers) and behavioural participation (the attention to learn) (Jung & Jeongmin, 2018). These virtues are strictly connected with the teacher competence (technical and instructional), student readiness (academic and technical), and finally technical structure (the internet quality) which stands as the major concern as found in research conducted during and post covid period in many countries (Kulal & Nayak, 2020; Lau, Yang & Dasgupta, 2020; Özdoğan & Berkant, 2020; Sahu, 2020; Wang, 2020). Many research findings state that interaction in distance education activates student engagement, which positively affects satisfaction (Kim & Kim, 2021) and academic self-efficacy, as the most predictive factor of students' satisfaction (Shen et al., 2013; She et al., 2021).

Academic focus is affected by students' attitudes towards the shift from traditional classroom to virtual ones via distance education and a variety of approaches are measured by scholars that pre-service teachers generally have positive attitudes so that distance education is found to be advantageous, providing flexibility and convenience (Kiok, et al., 2021; Muthuprasad, Aiswarya, Aditya & Girish, 2021). Negative attitudes were due to the technical obstacles in synchronized course sessions, ineffective content and application for some specific domains like nursing, tourism, sport sciences which have more practical course content in their instructional agenda (Karatepe, Küçükgençay & Peker, 2020; Sarıtaş & Barutçu, 2020) that are problematic to conduct session via Zoom, which is found to be the most frequently used applications in distance education to replace conventional face-to-face classes (Ni et al., 2020; Harefa & Sihombing, 2022). These attitudes also differ regarding the gender of the students and males reported as the major group that finds distance education more practical and effective than females (Buluk & Eşitti, 2021; Greier et al. 2020; Yu, 2021) whereas there are some counter approaches on behalf of the females (Korlat et al., 2021). Measurement and assessment procedures also tend to have diverse approaches both stating positive sides of the assignments and homeworks (Görgülü Arı & Kanat Hayır, 2020) and negative sides of software used and the anxiety that rises because of the lack of the competence or technical suitability to use the Moodle for the exams (Reime, Harris, Aksnes, & Mikkelsen 2008). These sorts of obstacles found to have a negative effect on students' psychology as they create the feeling of isolation due to the access and lack of communication with their peers and teachers (Horspol & Lange, 2012; Özyürek, Begde, Yavuz & Özkan, 2016; Serçemeli & Kurnaz, 2020; Kuzu, 2020; Morcillo, 2020). Maybe due to the effect of this feeling of isolation, research findings also assert that students tend to see the traditional classroom more convenient for teaching and learning activities rather than the virtual ones due to the complex and diverse variables that can have an effect on the latter one (Richardson, Maeda, Lv & Caskurlu 2017; Ozaydın, Ozkara & Cakir, 2018; Batmang, et al., 2021).

PURPOSE OF THE RESEARCH

TRNC higher education institutions also activated their systems as of March 11, 2020, when the traditional education was suspended and schools were temporarily closed, in order to supply required specifications that the departments and the students will be in need during this unexpected occasion. It took a while to adapt to online education during the pandemic period and different online education applications were conducted on different platforms and a common ground was tried to be found, according to the needs of the students and the facilities of the educational institutions. This situation made us understand that there is a need for new applications and methods not only in course management, but also in course planning and evaluation procedures. Bringing the approaches and applications used in face-to-face education to virtual classrooms were questioned due to the competence of producing desired instructional outcomes. In order to keep the pulse in the field of education on this subject, many studies have been carried out on Covid after the pandemic revealing the reflections of this process within different dimensions. Now, three years passed since we learned to live with the pandemic with our new technical and educational experiences and outcomes throughout this process, that stands as the core objective of this longitudinal research which focuses on undergraduates' experiences of online education during the pandemic, who were enrolled in the Girne American University (GAU), the Faculty of Education between 2020-2023 academic years, located in TRNC. This research attempts to investigate how students' approaches and experiences have changed over the pandemic period with the following research questions;

1. What are the experiences of pre-service teachers' distance education before pandemic?
2. What are the experiences of pre-service teachers related to virtual class sessions before pandemic?
3. What are the devices that pre-service teachers prefer to follow the distance education during pandemic?
4. What kind of software tools do the pre-service teachers prefer on distance education?
5. What are the pre-service teachers' views on accessibility to the course content?
6. What are the pre-service teachers' views on announcements during distance education?
7. What are the experiences of pre-service teachers related to course materials uploaded to the system?

8. What are the pre-service teachers' views on attending live course sessions?
9. What are the pre-service teachers' views on recorded course sessions?
10. What do pre-service teachers think about online assessments?
11. What do pre-service teachers think about the effectiveness of distance education?
12. What are the pre-service teachers' experiences related to communication?
13. What are the pre-service teachers' experiences related to software systems during distance education?
14. What kind of technical issues pre-service teachers have been through?
15. What are the pre-service teachers' views on positive aspects of distance education?
16. What are the pre-service teachers' views on negative aspects of distance education?
17. What are the pre-service teachers' future preferences of educational model in the new academic year?
18. What opinion changes may occur in distance education during and post-COVID -19 pandemic?

METHODOLOGY

This section is devoted to the explanation of the research model, study group, data collection tool, data analysis and the reliability of the research.

Research Design

In this research, it is aimed to reveal the change in the thoughts of pre-service teachers about distance education carried out during the Covid-19 pandemic process over time by using the qualitative research method. It is a process based on the holistic examination of individuals' meanings towards a social problem or phenomenon through the analysis of a specific context of its reality (Yıldırım & Şimşek, 2013). Likewise, Strauss & Corbin (1998) describe qualitative research as a “type of research that produces findings not arrived at by statistical procedures or other means of quantification. A multiple case study approach was utilized in this research since it allows to understand the differences and the similarities between the cases (Baxter & Jack, 2008; Stake, 1995). Ethics Committee approval was taken on 22.11.2022 with the 5/22-128 file number and informed consent form was presented to the participants of the study.

Population and Study Group

The participants of the research consisted of two study groups. The population is between 700 to 800 undergraduates in both years of the research. The first study group was formed by the students studying at the GAU in the spring semester of the 2019-2020 academic year, and the second study group was formed by the students studying at the same university in the spring semester of the 2020-2021 academic year. The first group comprised of 75 pre-service students and the second group comprised of 68 students to make a total of 143 pre-service teachers. Amongst the purposeful sampling methods, typical case sampling was used in the research, which allows building up an outline about what is normal for a critical phenomenon (McCombes, 2019). All the pre-service teachers followed online education (synchronously and asynchronously) throughout the pandemic process; in this case the pre-service teachers in the two study groups are typical of their experiences. All participants were above 18 years old who consented to participate in the study and completed a semi-structured interview form. The demographic information about the pre-service teachers who participated in the research is given in the Table 1 below.

Table1: Participants of the research

Factor	Frequencies	
	Phase 1	Phase 2
Gender		
Male	25	20
Female	50	48
Department		
English Language Teaching (ELT)	35	32
Primary School Teaching (PST)	3	26
Pre-school Education (PRE)	30	-
Turkish Language Teaching (TLT)	4	8
Psychological Counselling and Guidance (PCG)	1	-
Computer and Instructional Techno. Education (CIT)	2	3
Total	75	68

Table 1 presents the participants of the research with total 143 students in two phases. Females found to be the majority participant group, as well as the ELT and PRE department students in the first phase of the research. In the second phase, the majority were ELT and PST and no PRE and CG students took part.

Pilot testing

A pilot test is believed to assist the researchers with the refinement of research questions in determining possible flaws, limitations, or other weaknesses within the research design and will allow the researchers to make necessary revisions prior to the implementation of the study (Kvale, 2007; Turner, 2010). Depending on this, this research data collection tool was applied to randomly select 13 participants, which are kept separate from the study group as a pilot test and the data obtained was analysed, and necessary adjustments were applied to the research questions.

Data Collection and Analysis

The researchers collected data through online Google forms in Spring 2020 and 2021 at the end of the semester. The content analysis technique was applied to the data sets which is a technique for replicable and valid inferences from texts in the contexts (Krippendorff, 2004) that systematically describes and specifies a phenomenon (Downe-wambolt, 1992). In order to conduct data analysis, the researchers used Creswell's (2005) six steps for qualitative data analysis and interpretation as; organizing the data, reading the data, coding, generating the categories and then themes, and finally interpreting the data obtained. In order to supply trustworthiness the researchers applied investigator triangulation (Denzin, 1978; Patton, 1980; Onwuegbuzie, 2002) by cross analyzing the data sets and peer reviewed the coding and categorizing process. For reliability analysis, Miles & Huberman's (1994) formula $[G=A \div (A+B) \times 100]$ as; "G: Reliability coefficient, A: Number of subjects/terms on which consensus is reached, B: shows the number of topics/terms on which there is no consensus" was applied to the data set and for all the results the reliability level is measured to be more than 0.97 which can be regarded as a high level of reliability (Patton, 2002).

RESULTS

The results are organized in tables and represented by the research questions that were leading the current research. In order to convey the experiences of the Faculty of Education students regarding distance education during the pandemic process. Although there are many similarities between the experiences of the students in the first year of the pandemic period and what they experienced in the following year, considerable differences were also encountered. The results of the research are presented in the following sections as; the experiences before the pandemic, the experiences during pandemic, and the future expectations.

The Experiences of Pre-Service Teachers' Distance Education before Pandemic

In order to explore the pre-service teachers' previous distance learning experiences the researchers asked if they had any experience before the pandemic. Most of the pre-service teachers, both in Phase 1 and Phase 2 stated that they had no experiences. Those who stated that they had experiences was limited by asynchronous lessons such as National History, Turkish Language and Computer Skills named as service courses. Table 2 states that, in Phase 1, the majority (n=61) of the pre-service teachers did not have online education experience before the pandemic and 11 of them mentioned their experiences and three of them stated that they only had asynchronous online sessions. In Phase 2, almost the same number of pre-service teachers indicated that they did not attend any online education process before the pandemic. The first question summarizes that online education stands to be a 'foreigner' to many students. The reliability level is measured as 1.00.

Table 2: Previous online experiences

Opinions	Frequencies	
	Phase 1	Phase 2
Yes	11	9
No	61	59
Partially (asynchronous courses during freshman period)	3	-
Total	75	68

A pre-service teacher from the ELT department from Phase 1 stated her opinion about service courses' as a summarization of others as; "Yes, I was only taking National History course online, however, it was not online education just lecture notes on the Moodle" [PST4-P1].

The research questioned the pre-service teachers' experiences about virtual classrooms. Table 3 indicated pre-service teachers' competences on online learning. Pre-service teachers were asked to state their competencies in

virtual classes, in Phase 1, 67 of them and in Phase 2 60 of them stated positive competencies related to the virtual classes and only 5 and 4 respectively mentioned that they have difficulties.

Table 3: Competencies of the virtual class

Opinions	Frequencies	
	Phase 1	Phase 2
Yes	67	60
No	5	4
Partially	3	4
Total	75	68

Regarding the results reflected in Table 3, it is possible to state that the majority of participants reflected a considerable competency level during distance education in both phases of the research. This could possibly interpreted as a positive virtue in terms of the readiness status of the participants to technological alterations caused by pandemic as an external stimuli to reflect their competencies which can be seen as a reflection of their digital literacy status.

The Experiences of Pre-Service Teachers' Distance Education during Pandemic

The aim of this research was to fold an evidence from pre-service teachers taking online courses at the pandemic to determine their perceptions on teaching-learning process, including devices preferences, types of virtual tools, access to Learning Management Systems (LMS), announcements, learning materials, attending live sessions, tracking recorded videos, online evaluation, effectiveness of online sessions, communication, software systems, technical problems, and pros and cons of online learning.

Opinions of pre-service teachers on the tools that they were chosen to follow the online lessons during the pandemic are given in Table 4.

Table 4: Device preference for online education

Opinions	Frequencies	
	Phase 1	Phase 2
Mobile phone	15	10
Personal Computer (PC)	11	15
Both mobile and PC	49	43
Total	75	68

The responses helped us to find out that many students (n=49) generally use mobiles and personal computers at the same time to engage in the online activities (courses and etc.) in Phase 1 and the great majority in Phase 2 (n = 43) also used both mobile phone and PCs to follow the online education and some prefer to get online via mobiles (n=15) and some with PCs (n=11) in Phase 1 and in Phase 2 only 15 student stated that used PC to follow the lessons. It is possible to state that this finding also backs up the status of the participants' competencies to use technological devices.

The students were also asked the type of virtual tool that were used to follow the lessons. It was found out that students were mostly able to use Zoom (n=45). They also get involved in moodle activities (n=13) and some use both (n=17). In Phase 1, the majority (n=45) indicated that they used Zoom to follow the lessons, but as stated in Table 5, in Phase 2 most of the students stated that both Zoom and moodle used to follow the content of the lessons.

Table 5: Types of the virtual tools

Opinions	Frequencies	
	Phase 1	Phase 2
Zoom	45	15
Moodle	13	19
Both Zoom and Moodle	17	34
Total	75	68

Even if it is widely used (worldwide) some students found Zoom more problematic to use rather than their institutions' moodle and a male participant from the CIT department stated their experiences of these two

different applications through the two phases by saying; *“For example, it is difficult in Zoom, but it is easier than what we do on Moodle, at least we can listen to the lesson again and again”* [PST4-P2].

This research helped us to understand how the pre-service teachers access to LMS was actually happened. As shown in Table 6, in Phase 1 generally take steps to reach the online course content (n= 69) whereas some (n= 14) do not even try to reach or fall behind due to some unexpected obstacles (n= 2). The same results were also obtained from Phase 2, during the online education, pre-service teachers generally (n=64) did not have difficulties reaching the course content, whereas some of them (n=6) mentioned that they do not have access, and the situation depends on the net connection as stated by some (n=4) pre-service teachers.

Table 6: Access to LMS

Opinions	Frequencies	
	Phase 1	Phase 2
Easy access	69	64
No access	14	6
Partially (due to connection problems)	2	4
Total	75	68

Two participants from different departments and phases said; *“The course content is easily accessible”* [PST25-P2], and *“If the Internet connection is good, yes I can reach it”* [PST12-P1] underlining that the major obstacle in distance education and application of its features are strictly connected with internet quality which allows access to the course content. This issue stands as a fundamental obstacle that has a negative effect on implementation of distance education features at all levels of national education systems.

Pre-service teachers were asked if they receive enough announcements related to courses or other academic or administrative issues. As presented in Table 7, in Phase 1 it was seen that the majority (n= 43) of the participants mentioned that they do, a considerable amount (n=24) of them stated that they do not, and some (n=8) mentioned that these announcement issues depend on instructors' attitudes. In Phase 2, the majority (n = 48) indicated that they quite satisfied about the announcements related to courses and regulations. However, six students stated that some obstacles, such as technical issues, prevent them to follow the announcements on time.

Table 7: The Announcements during distance education

Opinions	Frequencies	
	Phase 1	Phase 2
Quite Satisfied	43	48
Not Satisfied	24	14
Partially (depends on net connection, technical issues, instructor)	8	6
Total	75	68

It is possible to mention that participants' opinions about the announcements during the pandemic in the two phases had a little amount, but positive change in the three degrees of satisfaction. A participant from Phase 1 said; *“Yes, communication groups that students establish among themselves are especially helpful”* [PST23-P1] whereas the other criticized by saying; *“I believe it could be done more clearly”* [PST12-P1]. We can see that in Phase 2 there are more positive responses as; *“I think it's enough.”* [PST3-P2] and recommendation mentioned by a male ELT student as; *“I think it will be very good if the latest updates are sent from mobile phones”* [PST47-P2].

As Table 8 shows under the theme course materials in distance education the results are gathered in 3 categories, namely *“answers students' needs, not answers students' need and partially answer students' needs.”* In Phase 1, even if the majority of the pre-service teachers mentioned that they can find materials for the courses a close number of them stated that do not have materials for their courses, and some mentioned that this case depends on the course content or the instructors' approaches. On the contrary, in Phase 2, most of the students stated that the materials did not answer the students need since they are not effective and efficient. The rest, also stated the lack of exercise questions and course books and unavailability to do practice made them to not get the real benefits from the online lessons. However, the third category was decreased in Phase 2 which in the second year of pandemic less students stated that course materials partially answer students' needs.

Table 8: Materials in online lessons

Theme	Category	Codes	Frequencies	
			Phase 1	Phase 2
Course materials in online lesson	Answer students' needs	Lecture notes	32	23
		Presentations	5	10
	Do not answer students' needs	Not effective	21	34
		Not efficient	5	10
		Lack of blackboard	3	-
		No practice	2	5
		Lack of attention to the lesson/ distraction	2	8
		Get bored	2	8
		Limited access to hardcopy resources	2	5
		Lack of exercise questions	3	7
		Lack of materials	2	4
		Lack of lecture notes	1	5
		Lack of course book	2	3
	Partially answer students' needs		16	4
Total			75	68

Table 8 is the first table prepared with the codes, categories and themes, due to the content analysis, which involves 13 different codes (in Phase 1) taken from participant responses stating the satisfaction levels of the participants related to the course materials. There are some counter-ideas about this topic, but the major opinion is found to be satisfactory in Phase 1 but in Phase 2 the situation has changed. Participants said; *"No. It is not as effective as face-to-face education. Participation is low. We can't do any hands-on stuff"* [PST8-P1]. And this approach is backed up with a pre-school education department female student, in which materials are of vital importance due to the age groups that they deal with. She said;

"Not available for some courses. Because in some lessons, the teachers only talk about the subject, and no material or lecture notes are used during or after the lesson. Since we have difficulty in taking the necessary notes during the lesson, it takes a serious amount of time to listen to the lesson recordings again later" [PST32-P1].

A pre-service teacher from ELT department expressed her opinions by saying; *"Mostly yes, sometimes I feel inadequate, sometimes it is difficult to access resources due to the pandemic. It is not possible to access all resources in an electronic environment"* [PST51-P2]. The responses of the participants help us to understand that students do not find the course notes effective (specially for some departments) even if they are the major source of information for the courses they are registered.

This research is also trying to find out the attendance status of the students to the live course sessions. As shown in Table 9, in Phase 1 even if some of the pre-service teachers do not (n=28) or occasionally (n=12) attend the online courses, it was found that the majority (n=51) regularly attends the courses. In Phase 2, the availability of recorded lessons, personal issues and technical issues many students did not attend the live sessions, but the majority of students stated that they were able to attend the live sessions.

Table 9: Attending to the live course sessions

Theme	Category	Codes	Frequencies	
			Phase 1	Phase 2
Attending live sessions	Not able to attend	Recorded lessons	2	13
		Working	3	6
	Attending live sessions	Internet issues	7	4
		cell phone capacity	8	2
		Inconvenient home environment	5	5
		Personal issues	3	2

Able to attend	51	42
Occasionally	12	10
Total	75	68

In both phases, the participants mentioned positive attitudes towards participation issues in distance education courses. The rest of the responses seemed to be personal obstacles rather than general problems faced mentioned in previous result tables.

The perceptions of the pre-service teachers' on following the recorded lessons were also explored in this research. As reflected in Table 10, in Phase 1 the majority (n=32) of the pre-service teachers stated that they can reach the recorded lessons when they missed the live sessions; some stated that they only watch recorded lessons to repeat the course content particularly during exam weeks. In Phase 2 majority (n=40) have access to the recorded lessons when they missed the live lessons; and only 10 stated that they watch the recorded lessons if they need to repeat the content. However, both in Phase 1 and Phase 2 pre-service teachers mentioned that they cannot watch the recorded lessons since not all the instructors loaded the videos on Moodle, and the rest stated that they watch the recorded lessons if they have no internet problems. Two pre-service teachers mentioned that they gather information from their friends, whereas in Phase 2, three of them mentioned that they have no time to watch the recorded lessons. Twelve pre-service teachers mentioned that they do not need to watch the recorded lessons so that they regularly attend the classes. A considerable number of (n=43) pre-service teachers in both Phase1 and Phase 2 mentioned that not all of the instructors upload recorded lessons for them in order to follow the course content. One of the male students from pre-school education department mentioned his opinion about recorded courses as;

"I can say that I am only satisfied with online education because of recorded lessons. I am a student who actively participates in my classes, but sometimes I listen to what I do not understand and what we have studied during the semester before the exam week" [PST29-P1].

The same positive attitude towards the recorded course sessions with a different approach came from a female ELT department student who works and studies at the same time as; *"No. Since my workplace is a little far from my house, the lesson starts until I get home, so I listen later" [PST16-P2]*, possibly underlining that the course recording sessions could be regarded as a 'handy' feature to be benefited according to the needs of an individual.

Table 10: Tracking recorded video lessons

Theme	Category	Codes	Frequencies	
			Phase 1	Phase 2
Tracking recorded video lessons	Yes	Missed lessons	32	40
		Repeating	20	10
		Useful in the exam week	10	1
	No	Limited number of loaded the videos	23	20
		I attended the classes	8	4
		Internet problems	7	3
		I get information from my friends	2	-
		No time to watch	-	3
	Total		75	68

And some more benefits of recorded course sessions, maybe to be considered as a future 'beneficial' goal to be internalized by institutions, so that it supplies academic back-up for the students that are in diverse needs and situations as exemplified by a male primary school teaching department as; *"I'm trying to follow as I can. I'm working to support the home economy due to the pandemic" [PST7-P2]*.

This research also questioned the experiences of the pre-service teachers about online evaluation. Thus, the question *"how do you feel about the online assessments?"* was asked. As shown in Table 11, two categories emerged, namely *"positive and negative"*. In Phase 1, the majority of pre-service teachers indicated that negative feelings towards online evaluation owing to no required information given on exams, not productive and various system and internet-based faults. However, in Phase 2 although the majority of pre-service teachers stated that

they have positive feelings on online evaluation, but the time issue still continues to be the most mentioned difficulties during exams.

Table 11: Online evaluation

Theme	Category	Codes	Frequencies	
			Phase 1	Phase 2
Online Evaluation	Positive	Not bad	3	12
		Economic	2	4
		Practical	3	2
		Easy to do	3	1
		Individual test taking	2	1
		Self-controlling	1	-
	Negative	Not enough information	15	2
		Not productive	10	2
		Not effective	4	2
		Cheating	2	2
		Freezing	5	2
		System error	13	7
		System collapse	7	3
		Time issues: surfing the pages, time to think, not managing time, not enough time	12	16
		Internet connection	12	11
		Quality of exam questions	5	4
		Slow system processing	4	2
		Not able to go previous question	7	2
		Lack of information on system	2	-
		Lack of electricity	3	3
Total			75	68

As reflected in Table 11, 20 different codes were generated that are gathered in two categories under one theme. The shortage of time stands for the major difficulty the pre-service teachers faced during distance education period's online evaluation process. A female student from ELT department both stated positive and negative aspects of the online evaluation process as;

Since the exams are online, it is a problem for me that the duration of the exam is very short in order to minimize cheating. As a student who has a hard time keeping my attention, taking the exam online and being given a very limited time can sometimes lead to negative results. What I can say positively is that I can work comfortably in my own home and attend exams when the time comes. Not going to school from one place to another in order to take the exam saves time for me and at the same time allows me to take the exam more energetically" [PST42-P2].

It is possible to state that, the efforts to prevent cheating or other undesired occasions during exams are also found to be effective elements of student satisfaction from online evaluation. The compulsory sequential exam questions mentioned to be one of these applications by a female pre-school education department student by saying; *"I can log in as long as there is no system and internet connection problem. However, there is one annoying situation which the system doesn't allow you to return to the previous questions in exams" [PST52-P2]*, which can possibly create anxiety and possible academic failure as underlined by a student as; *"On the negative side, I'm having a time problem, time is very limited and I can make wrong while answering quickly" [PST35-P2]*. Counter ideas about this issue was also pronounced as it was found to be practical; *"While I don't think it is as effective as face-to-face education, but it's not a bad way of follow lessons under these circumstances. More economical and practical than physical exams" [PST5-P1]*. Moreover, the internet quality again comes up to stage when the word comes to evaluation, and one student clarified the issue as; *"... the loading of the exam questions depends on the internet speed, sometimes the time is not enough" [PST10-P1]*.

One other focus of this research is the pre-service teachers' experiences on the effectiveness of distance education. As Table 12 indicated, both in Phase 1 and Phase 2 the majority of the students believe the online

lessons are not effective due to the reliability issues in exams, the lack of interaction between teachers and students, and poor internet quality.

Table 12: Effectiveness of the online lessons

Theme	Category	Codes	Frequencies		
			Phase 1	Phase 2	
Effectiveness of online lessons	Effective	Recorded lessons	10	5	
		Repeating lessons	8	3	
		Cozy learning environment	7	3	
		Economic	5	6	
		Practically	4	3	
		Productive	5	2	
		Time	7	5	
	Not effective	Difficult to follow	10	2	
		Lots of homework	8	3	
		Cheating on exams	9	7	
		No one-to-one communication	7	3	
		No active participation	5	3	
		Internet connection issues	5	4	
		No eye contact with the instructor	6	1	
		Not able to do practice	4	2	
		Not able to concentrate	4	2	
		Total		75	68

As Table 12 specified unfortunately, the majority (n=33) of the pre-service teachers mentioned that they certainly do not find online education effective, whereas some (n=15) find it rather fully or partially (n=6) effective. Some find it not effective as face to face (n=8) and some compared it with having nothing (n=3). The rest of the pre-service teachers stated their negative opinions as online education is not effective due to the technical problems (n=5) and their negative effects on attention (n= 3) and it is not sufficient for every course (n=1). Participants' approached to the effectiveness of online lessons vary according to the personal beliefs. A female student from Turkish Language department in Phase 1 underlined the engagement and satisfaction status, which is found to be an important aspect or the distance education world-wide, by saying;

If the student does not try to learn, I cannot say that it is very effective. Because we can experience disconnection due to internet problems, disconnection or internet problems caused by the teacher. In this case, the topic is divided; it takes time to repeat, etc. We cannot make eye contact with the teacher; we have difficulties in doing the practicum lessons. These inevitably reduce the impact and understanding of the lesson [PST14-P1].

Another female student from ELT department underlining the benefit of the recorded sessions as;

Yes, I find it effective. Especially sharing content is very useful and recording the lessons is very useful for us to listen and understand the lesson over and over again. In face-to-face education, we unfortunately do not have the chance to listen to the lesson again" [PST23-P2].

On the contrary, a female student from pre-school education department mentions that nothing compared to the traditional classroom environment by saying; "No, I do not think. No classroom atmosphere, low attendance. Our ability to attend classes depends on whether we have internet or not" [PST19-P2].

Pre-service teachers were asked to reflect their opinions related to communication issues with the instructors during the online education. In Phase 1, the majority stated that they do not (n=31) have problems, whereas a similar number of pre-service teachers stated that they had communication problems (n=22) during this period. Table 13 shows two categories under theme communication problems, namely *healthy communication* and *insufficient communication* involving nine codes. The codes of insufficient communication are generated as; no

question-answer sessions (n=5), system issues (n=5), late email returns and no assistance on exams. In Phase 2, the codes quick response (n=20), e-mail (n=8), and e-learning (n=6) are the ones under the *healthy communication* category, whereas the codes of the *insufficient communication* category are no reply or late reply to e-mails (n=5), system issues (n=7) and no assistance on exams (n=3).

Table 13: Communication problems with the instructors

Theme	Category	Codes	Frequencies	
			Phase 1	Phase 2
Communication Problems	Healthy Communication	Quick response	15	20
		WhatsApp	6	4
		E-mail	5	8
		E-learning	4	6
	Insufficient Communication	No email returns	8	3
		Late email returns	2	2
		No QA sessions	5	2
		System issues	5	7
		No assistance on exams	2	3
	Total		75	68

Table 13 represents the satisfaction status of the participants regarding the mutual communicative issues of both the lecturers and the students. They seem quite satisfied when both phases are examined. A female Turkish Language teaching department mentioned her satisfaction as; *“No, I did not have any problem in terms of communication. We can reach our teachers via email and we get feedback from all of them as soon as possible”* [PST2-P1], and backed up by a female Primary-school Teaching department student by saying; *“Generally, I don't. But some of our teachers do not use their e-mail addresses actively”* [PST47-P1] and by a male Pre-school Education student whose response could possibly regarded as a proof that the communication issue depends on the lecturers' attitudes as formerly mentioned by other participants as; *“I have never experienced it. I always had the chance to reach him from the group he founded via WhatsApp”* [PST9-P2].

During the distance education period, the first semester Zoom application was used at the university, where the research was conducted, for online synchronized courses and e-learning Moodle was the basis for the file sharing and the exam application platform for the students. Depending on this, the pre-service teachers were asked to reflect their experiences about these systems and the majority in Phase 1 mentioned positive (n=39) opinions about Zoom and Moodle when it is compared to negative (n=28) opinions about Zoom and Moodle. As seen in Table 14, in Phase 2, under the positive aspects the codes practical and easy access, clear and understandable, resources and recorded videos are emerging from the pre-service teachers' response. Besides, *needs to be developed*, *exam issues*, *system collapse* and *system issues* are emerging codes under the negative aspects category.

Table 14: Software systems during online education

Theme	Category	Codes	Frequencies	
			Phase 1	Phase 2
Experiences on the Moodle	Positive aspects	Recorded lesson videos	-	3
		Resources	1	2
		Clear and understandable	5	3
		Blackboard better than Zoom	13	1
		Practical and easy to access	20	6
		Instructors	-	2
	Negative aspects	The lesser evil	3	2
		Needs to be more effective	5	5
		Needs to be developed	2	3
		Exam issues	3	2
		System collapse	2	2

	System issues	5	2
	Zoom	5	2
	Distraction for the course content/activities	3	-
Total		75	68

Table 14 indicates 14 codes that are generated in two categories under one theme. One pre-service teacher mentioned her satisfaction as; *“All systems work very well. Students who really want to follow the lessons can get a good education as long as they don't have internet problems”* [PST11-P2] who is backed up by her peer as; *Although the system currently used by our school (GAU) is a good system in terms of processing the lessons and listening to the recordings again, it was bad to experience problems in the exams and the system is down sometimes. But I think Moodle is more useful than the Zoom which was used in the first pandemic period. Because it is a better system for accessing both the lecture notes and the recorded live lessons that I could not attend”* [PST32-P2].

Even if Zoom is found to be the most used digital platform during the pandemic, the participants of the research stated their preferences of the shift from Zoom to the other platform in Phase 2. One pre-service teacher in the English Language Teaching department summarized the issue as; *“I used the e-learning system and Zoom. E-Learning is easier and faster to follow and access from the Zoom application. For Zoom, there is a constant code login, which is annoying”* [PST27-P1].

To answer the research question *‘What kind of technical issues pre-service teachers have been through?’*, the researchers questioned the sort of technical problems that pre-service teachers faced up online education during pandemic. Under the theme of *technical problems*, three categories were emerged, namely *the internet*, *LMS* and *hardware*. As shown in Table 15, in Phase 1, most of the pre-service teachers stated that they had various technical problems mostly related with internet connection. The codes are; no internet connection, slow internet connection and the quality of connection. Even more, some of them stated that they did not have a computer to follow the live lessons and to reach the course content. Those who have no problems with an internet or hardware they stated some technical problems with LMS such as systems update and collapse made them frustrated when they spent time on the site Moodle. Considerable high number of pre-service teachers mentioned that there are insufficient timing procedures in online exams. In Phase 2, almost the same codes emerged from the study, but some codes are mentioned less in the second year of a pandemic, such as the timing issues of the exams and systems failures and updates that out the students into a difficult situation.

Table 15: Technical problems during online education

Theme	Category	Codes	Frequencies	
			Phase 1	Phase 2
Technical Problems	Internet	Slow internet connection	15	8
		No internet connection	18	10
		Freezing screen	10	2
		Quality of connection	5	5
	LMS	Time limitation of exams	10	5
		System Collapse	5	2
		System updates	5	1
	Hardware	Lack of computer	11	8
		Microphone issues	8	5
		Electricity cut off	9	8
Total			75	68

The technical problems stated by the participants are gathered in three categories with 10 different codes under one theme in Table 15 stating that the technical problems of the participants are generally internet quality in the first line, followed by hardware problems and the ones related to the LMS applications. This issue is summarized by a male participant from the Primary School Department as; *“There are minor problems related to the net connection. Generally speaking, if there is no Internet problem, there will be no problem”* [PST47-P2], backed up by his peer from the same department as; *“Yes, I do, sometimes the teachers and students may have technical internet problems”* [PST52-P1].

This research also tried to put forth the positive aspects of online education during pandemic. Under this theme, as shown in Table 16, four categories were emerged, namely “*economical, timely, practical and none.*” In Phase 1, the pre-service teachers were positive about the continuity of the courses (n=23) without going to school (n=10) and spend more time with the family (n=7) and reducing the life costs (n=9). Moreover, assignments were preferred by some (n=9) pre-service teachers, likewise the online exams so that they were believed to lower the distraction (n= 5) by the external stimuli. Some (n=7) were positive enough to have online education rather than having nothing but some stated no (n=7) positive opinions at all. In Phase 2, some of the codes were diminished even not mentioned such as continuity of the course and assignment rather than exams. The codes such as reduced travel and rent costs are the ones still mentioned by the pre-service teachers. Besides, the codes recorded lessons-able to repeat and comfortable learning environment are mostly mentioned under the category of practical. Since in the second year of pandemic the LMS system allows students to watch the recorded lesson videos.

Table 16: Positive aspects of online education

Theme	Category	Codes	Frequencies	
			Phase 1	Phase 2
Positive experiences	Economical	Continuity of the courses	23	-
		Travel costs, rent expenses reduced	9	10
		Better than nothing	7	-
	Time	Non-stop education	-	2
		Spend more time with the family	7	8
	Practical	Assignments rather than exams	9	-
		No distraction during online exams	5	-
		Recorded lessons-able to repeating	-	7
		Comfortable learning environment	-	14
		No need to go to school	10	-
		Easy access	-	7
	None		7	3
	Total		75	68

Apart from the economic benefits mostly stated by the participants in both phases of the research, recorded course sessions were found to be the most beneficial aspect of the distance education process and a female pre-service teachers from ELT department clarified the situation as; “*In my opinion, the only and perhaps the most positive aspect is that we have access to the recorded video lessons when we miss classes or want to repeat them*” [PST57-P2], who is supported by her peer as;

It makes me very happy that we have the chance to listen the recorded lectures over and over again at any time. It is very good to be able to reach the lessons, especially when taking notes and stop it at the point I do not understand. These are quite positive aspects when we are away from face-to-face education [PST27-P2].

Participant 15 from Phase I, made us understand that a motivated student will be happy to take part in activities, conduct research, and update her skills by means of the applications of distance education and said; “*It allowed us to do more research and examination in the lessons. It has been beneficial for me in writing essays, examining them, reaching the content, and the literature review. I realized how valuable and important face-to-face lessons are*” [PST15-P1].

When the word comes to negative aspects of online education this research also tried to put forth the negative aspects of online education during pandemic. Under this theme, four categories were emerged, namely *assessment, health issues, teaching and learning* and *technical issues*. As Table 17 indicated, in Phase 1 lots of homework and system failure during exams were the codes mostly mentioned. The majority stated that internet connection problems (n=16), the increase in homework assignments (n= 13), the lack of efficiency in general (n=16) and system failure in exams (n=11). The distraction (n=9) for the course content and electricity cut offs (n= 8) was regarded as the negative sides of online education as well as the lack of communication with the lecturers (n=3) and falling behind the normal schedule of the course (n=3). However, in Phase 2 lots of homework only mentioned by one pre-service teacher, but the system failure in exams was found to be the most mentioned code. For the category teaching and learning pre-service teachers believe that the online education is

insufficient and ineffective. In Phase 2, in technical obstacles category internet connection problems and system collapse are mentioned by a majority of the pre-service teachers similar to Phase 1.

Table 17: Negative aspects of online education

Theme	Category	Codes	Frequencies		
			Phase 1	Phase 2	
Disadvantages of Online Education / Negative experiences	Assessment	Lack of online assistance during exam	-	3	
		Exam duration	1	2	
		Difficult questions	-	3	
		Lots of homework	13	1	
		System failure in exams	11	6	
	Health issues	Posture	-	2	
		Eyestrain	-	2	
		No interaction	2	2	
	Teaching-learning	Not real classroom environment	-	2	
		Not effective	-	10	
		Not efficiency	12	6	
		Unfair learning environment	-	2	
		Lack of concentration	-	2	
		Lack of practicum	-	2	
		Lack of communication with the lecturers and the administrators	3	-	
		Fall back of normal schedule/content of the courses	3	-	
		Distraction for the course content/activities	9	-	
		Technical obstacles	Lack of accessibility	-	2
			Lack of connection tools	-	2
			Internet connection	16	10
	System Collapse		-	6	
	Electricity cut offs		8	4	
	Total			75	68

Unfortunately, negative aspects of distance education were more pronounced by the participants of this research according to the Table 17 which reflects 22 codes in four categories under one theme. One participant from ELT department clarified this situation as;

I think that the retention, impact and understanding of the courses given are less than face-to-face education. The number of effective and productive courses was very little. It is a pity that there are people who do not have an internet connection, the opportunity to participate in online education and the problems in this regard cannot be overcome. The difference between the opportunities that the students have has been understood more and it is a sad that these opportunities are not provided to those students" [PST24-P2].

This participant was supported by her peer as; *"Courses are completed without anyone knowing or learning anything. While receiving face-to-face training, applied lessons were rare, and now even theoretical lessons are not efficient" [PST37-P1]* making understand that face to face interaction tend to be regarded as vital for educational success and sustaining equality of opportunities.

The Future Expectations

In order to answer the following question, *'What are the pre-service teachers' future preferences of educational model in the new academic year?'* researcher asked to pre-service teachers' preferences of educational model for the upcoming academic semester. As shown in Table 18 majority of the students in both Phases are preferred face-to-face education. In Phase 1, most of the pre-service teachers (n=31) prefer face to face education for the upcoming academic year or a combined model of education (n=21) that their foresight came true that the hosting university announced to be hybridized during 2021-2022 academic year. Some believe that current situation must continue to depend on the health (n=14) or economic (n=9) issues. However, when compared between two

Phases, the second year of the pandemic pre-service teachers` preferences towards face-to-face was slightly decreased. For face-to face instruction the most mentioned codes were more effective, quality of education, applied lessons, effective communication and fair evaluation. On the other hand, the pre-service teachers who preferred online instruction were mentioned economic issues, working by studying, able to be multi-task, interestingly a few pre-service teachers mentioned health issues.

Table 18: Preference of education model in the upcoming semester

Theme	Category	Codes	Frequencies	
			Phase 1	Phase 2
Preferred Education Model	Online	Health issues	4	1
		Economical	8	10
		Recorded lesson	3	5
		Working	12	10
		Time effective	5	2
		Self-success	5	3
		Comfortable	8	1
		Able to multi-task	6	4
	Face-to-Face	Self-confident in classroom		
			2	1
		More effective	8	8
		Applied lessons	10	5
		More fun	2	2
		Effective communication	6	2
		Motivation	5	2

Table 18: Preference of education model in the upcoming semester (Continued)

Theme	Category	Codes	Frequencies	
			Phase 1	Phase 2
	Mixed	Quality education	3	8
		Fair evaluation	8	2
		Self-responsibility	2	2
		Interaction	2	2
		Classroom atmosphere	2	2
			18	12
Total			75	68

The future preferences of the participants of this research are gathered in three categories with 19 codes under one theme. Participants generally mentioned that, depending on the number of the codes calculated, face to face education stands in the core beliefs for applications. A male pre-service teacher from Primary School teaching department who questions the effectiveness of distance education as;

I prefer face to face. Although three semesters have passed with online education, an efficient and correct system has not been established yet. I don't think it is right to continue like this. I would like education to be a priority in our country. I do not want to be a graduate as a teacher who is not equipped and does not even take teaching practicum courses. I can never study my department with pleasure" [PST10-P1].

On the other hand, there are participants in both phases of the research who wants to continue with online learning activities by saying; *"I prefer it to continue with online education. Instead of the energy, time and cost lost in transportation to school, getting the same information in the comfort of home makes education more efficient" [PST42-P2],* as well as the ones with ideas that education in the future must be hybridized according to their experiences that they have been through.

The Changing Views on Online Education during and post Pandemic

In this part, how the views of teacher candidates regarding online education between the first and second years of the pandemic have changed has been examined. It has been determined that pre-service teachers have almost no experience with online learning both in the first year of the pandemic and the second year. As in Phase 1, a large majority of pre-service teachers in Phase 2 were following online education from their mobile phones. However, the vast majority reported that they use both mobile phones and PCs. In Phase 1, the online-learning platform that the pre-service teachers used to follow the online lessons was mostly Zoom. Although, in the first year of the pandemic, Moodle was actively ready to be used by students and instructors as a lesson management system, in the second year of the pandemic, pre-service teachers have gained the facility to use Moodle, which was a primary lesson management system of the GAU. When compared to Phase 1, the technical problems caused by Zoom were slightly less mentioned in the second year of the pandemic. Similarly, in Phase 2, the pre-service teachers who participated in the second part of the study stated that it is considerably easier and more satisfying to receive the lesson content and the announcement.

Pre-service teachers also expressed their dissatisfaction with the course materials used in the online lessons in Phase 1. Similarly, in Phase 2, there were many pre-service teachers who specified that the materials used in online education were not more effective, inadequate and insufficient when compared to regular face-to-face education. In the first year of the pandemic, the attending and participating in live lesson sessions was mentioned by the majority of the pre-service teachers, but then again in Phase 2, recorded lesson videos were more favoured by pre-service teachers. However, the problems related to the poor Internet connection, which do not change in each phase of the study, are stated as the biggest obstacle to attend the online lessons. Results also indicated that, many of the negative views regarding online assessment mentioned by the majority of the pre-service teachers in Phase 1 were vanished in Phase 2, such as high numbers of given assignments. Nonetheless the codes such as insufficient exam duration and internet and system problems were highly mentioned by pre-service teachers. Although the pre-service teachers in Phase 2 did not express positive opinions about the effectiveness of online education, reductions were observed in many negative codes. The difficulties experienced in communicating with the instructor have changed from Phase 1 to Phase 2 in a noticeably positive way. Many pre-service teachers revealed that there is a healthier communication in Phase 2. The existence of live lesson recorded videos in the LMS is more evident in Phase 2. However, the negative views on the online lesson platforms were mentioned almost equally in both phases of the study. Many of the technical problems that the pre-service teachers mentioned in Phase 1 related to the LMS appeared slightly decreased in Phase 2. However, Internet and lesson delivery platform related problems were not changed over a year. In Phase 1 and Phase 2, it is equally stated by the pre-service teachers that online education is flexible in terms of economical and practical. In fact, in Phase 2, pre-service teachers embraced the benefits of online education more. The codes that stand out about the negative opinions of teacher candidates about Phase 1 online education are that they are not effective and there are problems with the Internet and the LMS. Giving a lot of homework in Phase 1 disappeared in Phase 2, and even the only time problem in the evaluation was the problem mentioned in both Phases.

Finally, in Phase 1, majority of the pre-service teachers favoured face-to-face education in the next academic year. However, in Phase 2, some of the pre-service teachers mentioned about the possibility of online education and even more of a hybrid education model as a combination of online learning and face-to-face learning.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This research aimed to present the pre-service teachers' experiences and views on online education during and post pandemic period. There are some limitations of this research. First of all, it is limited due to the sample size, which is comprised of total 143 undergraduates for both phases. The data collection tool which is developed by the researchers and the findings related to the tool also stands as another limitation of the research due to the generalization of the findings. The findings of the research showed similar findings of the related studies with both distance education and Covid based studies (Wang, Hsieh, & Kung, 2023; Yılmaz, Sakarya, Gayretli, & Zahal, 2021). The current research shows that pre-service teachers' previous experiences on distance education and the virtual classrooms were only limited by asynchronous online courses. This result has been demonstrated in many studies conducted during the pandemic period (Ogbonnaya, Awoniyi, Matabane, 2020). In many universities located in Turkey and TRNC after 2013, asynchronous (or video recorded lessons) online sessions were held only for common/service courses (Kuzu, 2020). Although the online courses were ingrained in the curriculum of educational institutions before the pandemic (Seaman et al., 2018; Soffer & Cohen, 2019; Zilka et al., 2019) in most of the universities online education did not carry out in an appropriate way (UNESCO, 2020b). Pre-service teachers with a background in online education have a chance to affect their experience positively during the pandemic period (Li, Odhiambo, & Ocansey, 2023). This possibly means that the more the experience and involvement, the more the success and satisfaction will be for the students in the distance education process.

Perhaps the most important focus of this research is to compare the educational experiences of pre-service teachers regarding online education both in the pandemic period and the post-covid period. First of all, as it has been exposed in many studies in which the pre-service teachers indicated that they mostly prefer mobile phones to access the contents of the courses (Amaoh & Naah, 2020). In Phase 1, pre-service teachers mostly used Zoom to follow online lessons for compulsory reasons, but the problems with this platform were pronounced by them more often. For instance, after a certain period of time the online lesson was interrupted due to the limited Zoom free of charge sessions which lasts in 40 minutes. In fact, there are many studies that already support this finding (de Oliveira Dias, Lopes, & Teles, 2020) that it can be sometimes problematic to conduct session via Zoom, even if it is found to be the most frequently used applications in distance education to replace conventional face-to-face classes (Harefa & Sihombing, 2022; Ni et al., 2020). However, in the second year of the pandemic, it can be said that there has been a serious decrease on the negative opinions expressed regarding distance education with more effective use of LMS. This finding is in line with scholars' research stating that distance education has no difference from the traditional one when it is conducted properly that can also lead to higher academic success (Adam et al., 2012; Clark, 2007; Kurucay & Inan, 2017).

The results obtained from pre-service teachers about teaching and learning in online education revealed that there were a variety of problems. Especially in the first period of the pandemic, many pre-service teachers who think that the announcements are sufficient have reported that this was not through the LMS, but the WhatsApp groups established by instructors (Batmang et al., 2021). In fact, the result of the research supports the use of smart phones, which is one of the advantages of online education during the pandemic period, as a source to reach the relevant information required. However, it is still discussed in the literature how effective and healthy it is to follow the lessons, communicate and even take the exams on smart phones (Wang, Hsieh, & Kung, 2023). Unlike the other studies (Barrot, Llenares, & del Rosario, 2021; Gumantan, Nugroho, & Yuliandra, 2021) this research showed that many pre-service teachers stated that the course materials in the pandemic period were not as effective and accessible as the course materials used in face-to-face education. Especially in the first year of the pandemic, there was a consensus on the insufficient course notes and contents. The majority of the pre-service teachers stated that they attended online lessons. However, in the second year of the pandemic, instead of attending online lessons they preferred to follow the recorded lesson sessions by claiming the reasons such as the lack of having comfortable home atmosphere, the inadequacy of the systems used for online lessons, and the poor quality and technical problems of the internet, and finally for some personal reasons. In fact, many pre-service teachers stated that recorded course videos are the most important benefit of online education. As Islam, Kim and Kwon (2020) showed in their study, recorded video lectures are favored to live Zoom lessons by reason of their flexibility, handiness, and instructive efficiency. In the first year of the pandemic, online assessment, which is one of the most controversial issues in online education, was carried out through assignments since the instructors were not equipped and ready for conducting online exams via software that the institutions used. Thus, the pre-service teachers reported negative opinions on the heavy workload and pile of assignments. Measurement and assessment procedures tend to have diverse approaches both stating positive sides of the assignments and homeworks (Görgülü Arı & Kanat Hayır, 2020), and negative sides of software used and the anxiety that rises because of the lack of the competence or technical suitability to use the moodle for the exams (Reime, Harris, Aksnes, & Mikkelsen 2008). This finding of the research is consistent with Batmang, Sultan, Azis, & Gunawan (2021). Furthermore, in the second year of the pandemic, the pre-service teachers expressed their views that online evaluation could actually be more attractive and useful if the duration of the exams is extended. However, as many studies (Dendir & Maxwell, 2020; Erguvan, 2021) questioned the validity and reliability of the online exams, and some pre-service teachers mentioned that it may be objectionable since online education can provide suitable environments for cheating.

In spite of the existence of studies that show online education has effective outcomes during Covid-19 pandemic (Asgharzadehbonab, Akkeleş & Özder, 2022; Lampropoulos & Admiraal, 2023), in this research most of the pre-service teachers stated that online education is not beneficial for them. As an example, contrary to the findings of the research, which was conducted by Asgharzadehbonab, Akkeleş and Özder (2022) in TRNC, the majority of the pre-service teachers expressed positive views on the effectiveness of online education. However, just as the previous studies which conducted by Kiok et al. (2021) and Muthuprasad, Aiswarya, Aditya and Girish (2021), a considerable number of pre-service teachers stated that the online education provides a comfortable learning environment by saving time and money and actually this can be considered as a positive aspect compared to face-to-face education. Likewise the previous research, male participants' of this research stated more positive opinions regarding the distance education applications (Buluk & Eşitti, 2021; Greier et al. 2020; Yu, 2021).

Unfortunately, there are also negative attitudes of pre-service teachers regarding distance education and one of them is the technical problems that they experienced (Buluk & Eşitti, 2020). Pre-service teachers who

participated in this research also reported negative opinions about online education, due to the low internet quality, inadequacy of course management system, and some hardware problems. This result is in line with previous research in which the technical structure (the internet quality), which stands as the major concern that was found in research conducted during and post Covid period in many countries (Kulal & Nayak, 2020; Lau, Yang & Dasgupta, 2020; Sahu, 2020; Özdoğan & Berkant, 2020; Wang, 2020). In addition, as Jin (2023) stated in her study, some pre-service teachers confronted different struggles while conducting teaching practicum courses in online education. This finding is in line with the studies conducted during the pandemic period (Karatepe, Küçükgençay & Peker, 2020; Sarıtaş & Barutçu, 2020).

Finally, unlike the other studies (Altunel, 2020; Ogbonnaya, Awoniyi & Matabane, 2020; Telli & Altun, 2020) this research revealed that the majority of the pre-service teachers are not willing to continue to use the online education as a main course delivery system in the future. However, many pre-service teachers agreed on the possibility of using distance education as a hybrid mode to support the face-to-face learning.

The overall findings of this research clarify that undergraduates of our era have a conspicuously competent digital literacy level so that they have adapted themselves to the fast shift of the traditional classroom to the virtual one due to the pandemic considerably well. Even if this could be interpreted as a positive aspect, the technical obstacles seem to decrease their motivation and satisfaction levels, which also have a negative effect on the psychology of the students as stated in previous research findings. This means that individuals' well-being, psychologically, academically and technologically, related to educational change cannot be enough when the technological infrastructure of the institution or even the city they live in have a negative effect on students' both attitudes to distance education and their academic success. Depending on this, it is possible to state that institutions must take sensitive precautions in order to supply a qualified and effective distance education harmonized with qualified educational software and instructional approaches that must fit the departmental requirements and necessities to build up skilled generations that our era needs. In order to examine these requirements, obtain opinions and to make comparisons the research on these subjects must be examined specifically by conducting qualitative document analysis to gather research findings and create a deep understanding of the needs.

Lecturing a specific subject meets the desired outcomes when the participation of the students is supplied, which has direct connections with the satisfaction level of the students, that is affected by the course materials uploaded and the mutual communication supplied by the lecturers. In order to sustain motivation of the students, not only the lecturers, but also the administrators of the institutions must focus on this issue by remembering that it has strict bounds with attitudes towards the distant courses that can help to reach the desired educational outcomes to be assessed properly by decreasing the undesired assessment failures. Assessment and evaluation issues were mentioned to be fundamental problems that the students faced during the pandemic and many researches were conducted focusing on this topic. Limited time during exams to prevent cheating and compulsory sequential exam questions were mentioned to decrease the academic success while it increases the anxiety and motivation levels of the students. More research must be conducted in quantitative manner to gather the previous research findings on this topic in meta-analysis model to understand the effects of assessment failures effect on students which must be also explained by qualitative focus group interviews designed as grounded theory to create a tick description of the assessment failures in distance education process to prevent undesirable effects on students future lives both academically and psychologically.

Even if there are diverse responses related to future considerations of distance education, by means of this research it is possible to understand that not only technical procedures but also approaches of lecturers' to distance education in terms of communicative and instructional skills, material preparation and presentation, time management and awareness of the effects of these issues on students' psychological status and state of mind must be a priority for educational departments at all levels of the national educational system so that all of them were affected because of the pandemic. The only way to reach an enriched date to examine these cases, explanatory mixed methodologies must be conducted at different levels of education.

UNESCO (2020b) clarified the major risks of the pandemic, which must be put under examination as childcare of working parents, drop out levels and lack of nutrition provided in schools for lower income layers in the society, the academic gap that is created due to technical infrastructure and personal stand backs because of low level of technical (software, hardware and ability to use) competencies. This research brings insight to educational requirement for implementing distance education with a variety of variables to be examined and considered so that the case of the pandemic affected all layers of the society with a wide range of effects as mentioned by many scholars. In order to get over this diverse scale of 'needs' and 'musts', so that all layers of the societies worldwide were affected because of the consequences of the pandemic, it is possible to state that all

layers of the society must be prepared to involve in practices and applications of educational operations as well as educational institutions and the related personnel. It must be kept in mind that the Director-General of the World Health Organization mentioned in Geneva that countries must still strengthen response to the disease and prepare for future pandemics and other threats.

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Is Youtube an Adequate and Reliable Source for Calcaneal Spur?

Zeynep KILIÇ, MD

Ankara City Hospital, Department of Physical Medicine and Rehabilitation, Üniversiteler Mahallesi 1604. Cadde No: 9 Çankaya/ANKARA
drzeynepk@yahoo.com
ORCID ID: 0000-0002-5537-0266

Sinem BOZKURT

Ankara City Hospital, Department of Physical Medicine and Rehabilitation, Üniversiteler Mahallesi 1604. Cadde No: 9 Çankaya/ANKARA
sinembozkurt06@gmail.com
ORCID ID: 0000-0002-4518-0186

ABSTRACT

YouTube contains videos that provide information about many health conditions. Patients and healthcare professionals frequently use YouTube to obtain information. The calcaneal spur (heel spur) is a bony outgrowth of the calcaneal tuberosity in the form of osteophytes. In this study, we aimed to determine the quality and reliability of YouTube videos about the calcaneal spur, whose prevalence increases with age and is more common in those with osteoarthritis.

Search was made with the keywords 'Calcaneal spur' and 'heel spur'. Of the 300 videos reviewed, 104 were included in the study. The number of days since the videos were uploaded, the number of views, likes, dislikes, comments and the duration of the videos were recorded. The DISCERN tool and the Global Quality Scale (GQS) were used to evaluate the reliability and quality of the videos.

Most of the video presenters were healthcare professionals (79.80%). In 65.4%, the target audience was patients. 61.4% of the videos were low quality, 32.69% medium quality, 5.77% high quality. There was no difference between health professionals and non-health professionals in terms of quality and reliability.

This study showed that most of the information provided by YouTube videos about the calcaneal spur is not reliable and inconsistent. YouTube should consider collaborating with database platforms, which is constantly updated and equipped with evidence-based information, to provide reliable health information on many health issues, including the calcaneal spur.

Keywords: Calcaneal spur, Heel spur, YouTube, Quality, Reliability

INTRODUCTION

The calcaneal spur (heel spur) is a bony outgrowth of the calcaneal tuberosity in the form of osteophytes. The prevalence of calcaneal spurs in the young and middle-aged is 11-21%. This rate increases with age. It increases to 55% over the age of 62, to 59-78% in those with current or pre-existing heel pain, and up to 81% in those with osteoarthritis (Kirkpatrick et al., 2017). Studies predict that calcaneal spur will become an increasing problem in the future with the aging population (Beytemür et al., 2018).

The calcaneal spur mostly occurs in association with plantar fasciitis (Kirkpatrick et al., 2017). Usually, there is pain in the calcaneal region on the first press in the morning or after a long rest and when standing for a long time. It causes difficulties in walking and other physical activities due to pain and quality of life is impaired. Obesity, wearing unsuitable shoes or high heels, hereditary factors, long standing, aging, endocrine and rheumatological diseases are the most important etiologic causes ((Kirkpatrick et al., 2017; Moroney et al., 2014).

In treatment; rest, cold pack application, foot and ankle stretching exercises, NSAIDs, steroid injection, ESWT, electrotherapy, radiotherapy, using soft insoles, wearing shoes with appropriate soles, massage and weight loss (Rosenbaum et al., 2014; Kociuga et al., 2016; Agyekum et al., 2015; Prokein et al., 2017). In cases where treatments fail, plantar fasciotomy or endoscopic heel spur surgery may be required (Johannsen et al., 2020).

Communication technology has been used for decades to increase access to health care and improve medical care (Grigsby et al., 1995; Bashshur et al., 1976; Charles, 2000). In this context, the interest in Telemedicine service, which has been applied for a long time, is increasing. The main reason for the development of telemedicine services is to provide healthcare services to people whose access to healthcare services is restricted

for any reason (Weisgrau, 1995). Especially in the period of Covid-19 restrictions, its importance has increased even more. The fact that it provides accessible information at all hours of the day ensures that the internet is used intensively not only for accessing health services, but also as a source of information in the field of health. YouTube is the most commonly used website for this purpose. It is known that 80% of Internet users access health information online (Madathil et al., 2015), making YouTube the second most popular website worldwide after Google Search (Wikipedia, 2020). YouTube contains videos that provide information on the pathogenesis, diagnosis, treatment and prevention of various diseases. Although patients frequently use YouTube to obtain information about their disease, 86% of searchers are concerned about the reliability of the information, and 44% state that they can only believe some of the information found on the internet (Koller et al., 2016). Similar to studies in other health-related fields, in the evaluation studies of YouTube videos on the musculoskeletal system, the majority of the videos were found to be of poor or very poor quality (Sari et al., 2021; Basch et al., 2018; MacLeod et al., 2015; Jildeh et al., 2021; Tejada-Llaca et al., 2020; Onder et al., 2022). In this study, it was aimed to determine the quality and reliability of YouTube videos about calcaneal spur, which is a common musculoskeletal problem and impairs people's quality of life.

MATERIALS AND METHOD

Study design and ethics

On January 22, 2022, a search was made on <https://www.youtube.com/> with the keywords “calcaneal spur/ heel spur”. The call history was deleted before the call. Since the frequency of repetitions increased after the 300th video, the first 300 videos were evaluated. Videos containing only product advertisements, duplicate videos, videos in languages other than English, patient experience videos, surgery-related videos, video-only or audio-only videos, and irrelevant videos were excluded from the study. Of the 300 videos reviewed, 104 met the inclusion criteria. All selected videos have been added to the YouTube library database for detailed analysis.

Video features, quality, reliability, and usability analysis

Views, view rate (views/g), total video duration, total comments, total “likes” and “dislikes”, comments/days, time since upload date, and upload source were recorded.

Download resources; They were categorized as physician, non-physician healthcare professional (physiotherapist, podiatrist, acupuncturist, mesotherapist, yoga instructor, personal trainer), academic institutions, health-related websites, company websites, and independent users.

Video power index was not calculated because there was no dislike for any of the videos. The popularity of the videos was determined by the rate of likes (the number of views during the broadcast period / the time since the upload date).

Variables; The duration after the video was published (days), video duration (seconds), views, daily views, likes, dislikes, and comments were determined.

Video content; were classified as cause/pathophysiology, diagnosis, treatment, recommendation and balanced content. Since a video can have multiple themes, the duration of each theme in the video was taken into account; if a theme is more than 50% of the entire video duration, the content was defined through a single theme; however, if no theme reached this percentage, it was defined as “balanced content”. The videos that did not reach an agreement on the video content among the reviewers were re-examined. Video contents were evaluated by two independent physiatrists. Consensus was reached among raters for items that differed.

Target group; They were identified as patients, healthcare professionals, and unclear. DISCERN and the Global Quality Scale (GQS) were used to determine the reliability and quality of the videos.

In DISCERN, each question is scored on a 5-point (1-5) scale. It is scored as 5 if it fully meets the criterion, and as 1 if it does not. If it meets the criteria to some extent, a score between 2-4 is given according to the judgment of the evaluators. The DISCERN guide includes detailed information for each question, including instructions and examples. The total DISCERN score is calculated by adding the first 15 questions. It is classified as excellent (63-75), good (51-62), moderate (39-50), poor (27-38) and very poor (<27).

This is a descriptive study performed by searching through a website. This study does not require ethical committee approval since it was conducted by examining videos that are free for common use on the internet. No human participants or animals were included in this study.

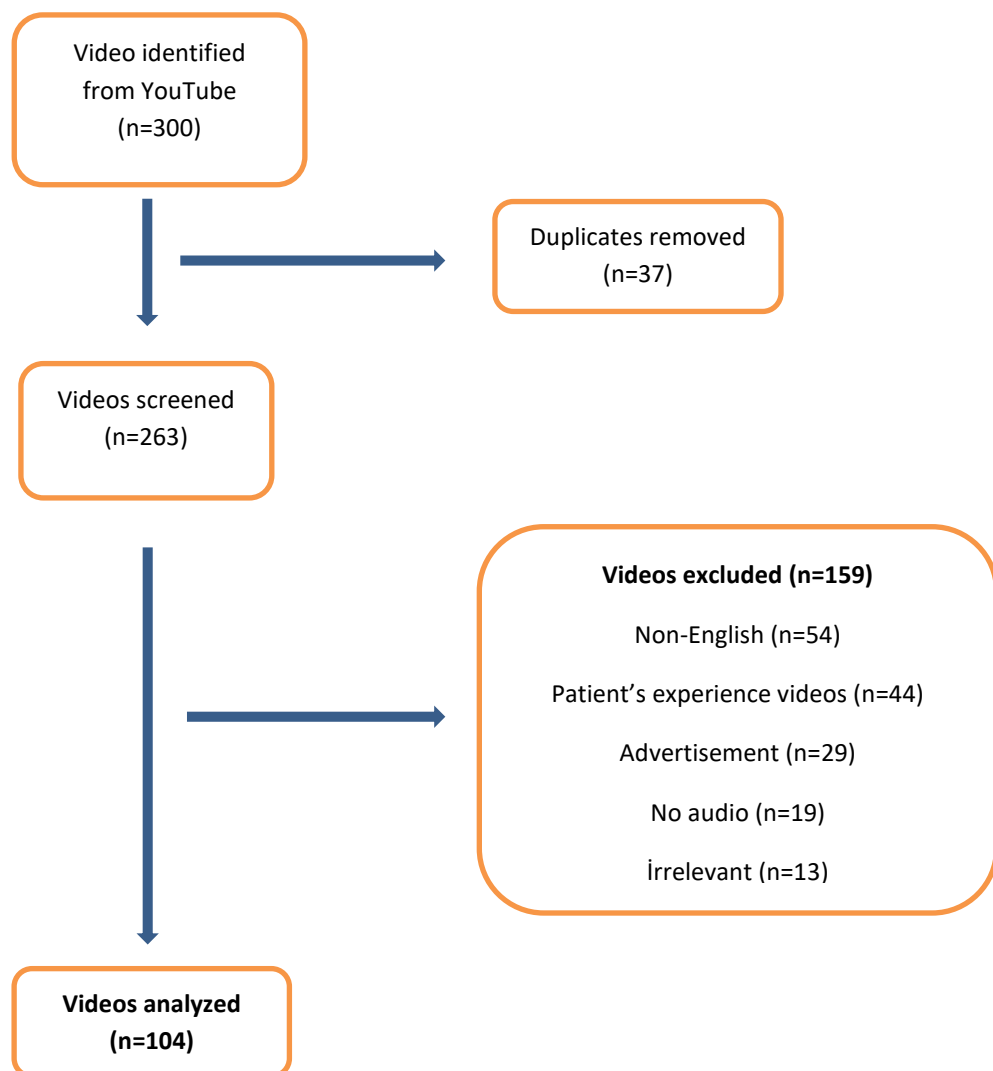
Statistical analysis

Statistical tests were performed using SPSS v. 23.0 for Windows (IBM SPSS Statistics for Windows; Armonk, NY: IBM Corp). The Shapiro–Wilk test was applied to evaluate the normality of data. The inter-observer agreement was specified with Cohen’s kappa coefficient. Non-normally distributed continuous variables were expressed as median (minimum–maximum) values and categorical variables were showed as number or percentages. The Mann–Whitney *U* test were used to compare two independent groups and the Kruskal–Wallis test were used to compare more than two groups. Significant difference in the Kruskal–Wallis test were evaluated using the Mann–Whitney *U* test with Bonferroni correction that automatically adjusted. A *p* value of less than 0.05 was considered as statistically significant.

RESULTS

A total of 300 videos were scanned for the research. 54 videos in languages other than English, 119 videos that contain only images, 37 videos that are repeated, 44 videos with patient experience, 29 videos with advertising content, 13 videos that are not related to the subject were excluded from the study. A total of 104 videos were included in the study for detailed analysis (Fig 1).

Fig.1 Flowchart of YouTube video screening process



The kappa statistics for inter observer agreement were 0.746 for GQS, 0.708 for DISCERN. The median value of the online duration of the videos was 1478.50 days, the number of dislikes was "0", and the median value of GQS AND DISCERN quality was 2. The basic features of the videos are shown in Table 1.

TABLO 1. Baseline features of the analyzed videos

variables	Videos (n=104) median (min-max)
days online	1478.50 (95-6158)
Duration (sec)	212.50 (29-1131)
Number of views	13417.00 (6- 2721863)
Number of likes	48,50 (0- 16000)
Number of comments	8,00 (0-1021)
View ratio	7.42 (0.01- 1070.36)
GQS	2 (1-4)
DISCERN reliability	18 (8-24)
DISCERN treatment	9 (7-23)
DISCERN quality	2 (1-4)
DISCERN total	28 (15-46)

GQS, Global Quality Score

Video content includes pathophysiology (n:22, 21.2%), diagnosis (n:3, 2.9%), treatment (n:65, 62.5%), recommendation (n:2, 1.9%), and balanced (n:12,%) 11.5).

Video servers distribution; physician 29.8%, non-physician healthcare provider 29.8%, academic institutions 1.0%, independent health-related websites 20.2%, company website 14.4%, independent users 4.8%.

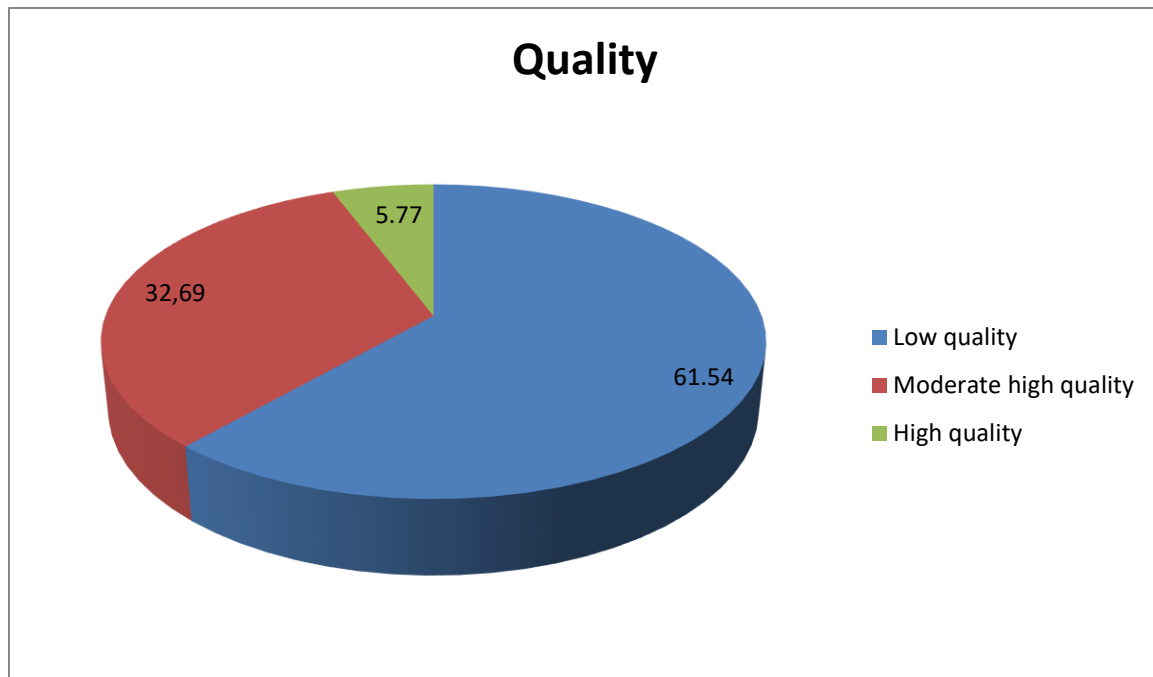
65.4% (n:68) of the videos were for patients and 22.1% (n:23) were for healthcare professionals. The target group of 12.5% (n:13) was unclear.

The number of high-quality videos in doctors and non-physician healthcare providers was quite low. None of the videos from other sources were of high quality. The quality evaluation of the videos according to the sources is shown in Table 2.

TABLO 2. Categorization of the videos according to sources

Source	Low quality n	Moderate quality n	High quality n	Total n(%)
Physician	16	12	3	31(29,8)
Non- physician healthcare professionals	20	8	3	31(29,8)
Academic institutions	1	0	0	1(1)
Health related websites	10	11	0	21(20,2)
Society/ non-profit organization	14	1	0	15(14,4)
Independent users	3	2	0	5(4,8)

The quality of all videos is evaluated; It was determined that 65 videos were of low quality, 34 of them were of medium quality, and 6 of them were of high quality (Fig 2).



A significant moderate correlation was found between the GQS score and the video duration ($p < 0.001$ $r = 0.438$), and a significant but weak correlation between the GQS score and the number of likes and comments ($p = 0.021$ $r = 0.225$; $p = 0.007$ $r = 0.263$), respectively.

Significant moderate correlation between Discern total score and video duration ($p < 0.001$ $r = 0.400$), a significant but weak correlation between Discern total score and number of likes and comments ($p = 0.036$ $r = 0.206$; $p = 0.011$ $r = 0.249$) It was determined that there was a significant and strong correlation between Discern total and GQS ($p < 0.001$ $r = 0.866$). Comparison of video parameters with quality scores is shown in Table 3.

TABLE 3. Comparison of the video parameters between the quality groups.

	Low quality (n=64)	Moderate quality (n=34)	High quality (n=6)	p*
days online	2280,50 (95-6158)	1574 (202-4649)	609 (435- 1406)	0,502
Duration (sec)	207 (39- 750)	279 (127-1131)	540 (280- 940)	<0,001**
Number of views	34843 (602-	79916 (161-	49911 (7294- 170895)	0,127
Number of likes	78 (2-4200)	607,50 (14-16000)	871 (189- 4000)	0,054
Number of comments	13,50 (0- 177)	68 (0-1021)	60 (11- 157)	0,227
View ratio	13,24 (0,29-563,27)	69,18 (0,79-804,30)	81,96 (5,19-392,86)	0,416
DISCERN reliability	15 (8-20)	21 (14-24)	22 (21-23)	<0,001**
DISCERN treatment	8 (7-12)	15 (7-23)	20 (19-20)	<0,001***
DISCERN quality	2 (1-4)	3 (1-4)	2 (2-3)	0,405
DISCERN total	23 (15-30)	33,50 (25-46)	40 (40-43)	<0,001**

Values are median (minimum-maximum).

*Significance level for the comparison between the groups based on quality (Kruskal–Wallis)

**post-hoc bonferonni test Adjusted p-value for pairwise comparison of the low quality and moderate quality, low quality and high quality groups ($p < 0,05$)

*** post hoc bonferonni test, Adjusted p-value for pairwise comparison of low quality and moderate quality, low quality and high quality groups, moderate quality and high quality groups ($p < 0,05$)

There was no difference between health professionals ($n = 63$) and non-health professionals ($n = 41$) in terms of quality and reliability. Comparison of reliability and quality scores with video source groups is shown in Table 4.

TABLE 4. Comparison of the reliability and quality scores to video source groups.

	Health professionals* median (min-max)	Non-health professionals* median (min-max)	P value**
GQS	2 (1-4)	2(1-3)	0,197
DISCERN reliability	20 (8-24)	17 (8-24)	0,074

DISCERN treatment	9 (7-20)	9,5 (7-23)	0,662
DISCERN quality	2 (1-4)	2 (1-4)	0,916
DISCERN total	28,5 (15-43)	27,5 (15-46)	0,304

*type of video source

**Mann-Whitney U Test

DISCUSSION

Calcaneal spur is one of the musculoskeletal system problems that increase in prevalence with the aging population and negatively affect the daily life quality of individuals (Irving et al., 2008).

This study is the first to evaluate the content of English calcaneal spur videos on YouTube. In this study, we analyzed 104 videos with a viewing rate of 7.42/day. Most of the videos (65.4%) targeted patients. The majority of the videos focused on treatment (62.5%) and pathophysiology (21.2%).

Although the videos included the pathophysiology, diagnosis, treatment and recommendations of the calcaneal spur, it was seen that the quality of the information presented in most of the videos was not sufficient. It has been determined that the videos with longer duration are of better quality. As expected, when the time is increased, the subject can be explained more clearly and in more detail. Similar to the findings in our study, some researchers have found that high-quality videos have a longer duration than those of poor quality (Gaş et al., 2019; Crutchfield et al., 2021). However, there is a risk that patients may lose their interest and attention while watching a longer video (Lena et al., 2018). Therefore, video sources should provide high-quality information on the topic within a reasonable time.

In our study, approximately 60% of the videos were presented by health professionals. We could not find a significant difference in videometric parameters (number of views, number of likes, number of comments, view ratio) between healthcare professionals and non-health professionals. Other studies reporting that there is no significant difference in videometrics (views, daily views, likes and dislikes) between the videos presented by both groups on YouTube support our findings (Onder et al., 2022; Irving et al., 2008; Gaş et al., 2019; Crutchfield et al., 2021; Lena et al., 2018; Elangovan et al., 2021; Kocyigit et al., 2020).

In our research, the videos presented by health professionals were of higher quality and reliability. Despite this, the quality of the videos provided by the healthcare professionals was not satisfactory. Similar to our study, Dincel et al. (Dincel et al., 2021), when they examined the videos about Achilles tendon rupture, determined that although the quality scores of the videos uploaded by the doctors were higher than the other groups, even these videos did not contain sufficient quality information Dincel (Dincel et al., 2021). In the study of Onder et al. (Onder et al., 2022), in terms of reliability and quality, videos presented by healthcare professionals had higher GQS and DISCERN scores compared to non-health professionals.

In our study, the rate of high quality videos was very low (5.76%). The longer the video duration, the higher the quality was significantly. The determinants of the improvement in quality were the significant increase in Discern reliability and treatment section. In the YouTube study on osteoporosis, the number of high-quality videos was predominantly high, unlike our data ((Onder et al., 2022). The hosts of 60.9% of these videos were healthcare professionals. Kocyigit et al. They found a higher rate of high-quality video in the videos they analyzed. They did not find a significant difference between the groups in terms of daily views, likes, dislikes and comments (Kocyigit et al., 2019). In another study, all videos created by academic institutions/professional organizations were found useful. There was no significant difference between helpful and misleading videos in terms of average number of likes and comments and video length. Average views and daily views were significantly higher for misleading videos than helpful videos (Onder et al., 2021). Similarly, a study on CTS found that 78% of videos contained at least one statement that could reinforce common misconceptions about CTS (Goyal et al., 2021). Desai et al. found that although instructional videos had accurate and reliable information, they were viewed less frequently than low-quality videos (Desai et al., 2013).

Videos with low quality scores run the risk of reinforcing false information. Considering that the vast majority of videos about the calcaneal spur (62.5%) focus on treatment and most of the content is unreliable, it will be seen how high the health risks are. A study by Rice (Rice 2006) showed that 25% of people seeking health information always check the video source, 25% check occasionally and 50% never check. Studies have shown that the attractiveness or intelligibility of videos is just as effective on view rates as the content itself (O'Neill et al., 2014). In order to educate and inform patients, it is necessary to improve the information sources and increase their attractiveness and understandability. The tendency of patients to search for information online and the lack of reliability of online information may lead to misdirection of patients and deterioration of the

clinician-patient relationship. Accurate and reliable information will enable the patient to take an active role in decision-making processes and reduce anxiety levels (Longtin et al., 2010; Ketelaars et al., 2017).

Increasing the reliability of information sources will play an active role in patients' decision-making about their own health and ultimately reduce the cost. For this purpose, studies should be carried out to prepare quality videos with internationally accepted guidelines (Karagoz et al., 2022). Healthcare providers and professional communities should also provide more educational material using this powerful Internet tool to avoid misleading information (Mukewar et al., 2013).

As part of its 2021 policies, YouTube has decided to take down videos containing COVID-19 and vaccination information that contradicts the consensus of health authorities (Letter from Susan, YouTube Official, 2021). He stated that their aim was to remove content that experts determined to be harmful, to increase reliable content, and to reduce viewing of low-quality content (Letter from Susan, YouTube Official, 2021). It also partnered with professional organizations such as the Cleveland Clinic and Mayo Clinic to make health-related information more accessible and understandable in early 2021, and announced that they would like to establish more partnerships with different reputable healthcare organizations (YouTube, 2021). YouTube's presentation of videos created with verified sources on the first page of search results and filtering those uploaded by independent users in cooperation with experts can also contribute positively to accessing accurate information. In addition, universities and professional organizations should increase the number of videos they produce.

One of the strengths of our research is that it is the first study on YouTube to analyze videos about the calcaneal spur. The other; as a result of determining that the content related to the subject is not sufficient and reliable, it contributes to the literature by creating awareness about the improvement of the content.

This study has several limitations. Only English videos were analyzed and searched with only 2 keywords. YouTube is a dynamic platform and search results change as new videos are added over time. As it is a cross-sectional study, the findings of this study are only the results of the analysis of the videos in a certain time period. Therefore, the data obtained in this study may differ from the data obtained by another researcher searching for the same terms. Geographical location and searching in different languages also affect the results. In our research, our evaluation methods did not analyze how long users watched a particular video and the extent to which the viewer understood it. The opinions of the users on this subject were obtained by interpreting the metrics such as viewing, liking and disliking.

CONCLUSION

In our research, we determined that the quality and reliability of the information provided by most of the YouTube videos about the calcaneal spur is not sufficient. The data obtained showed that the available YouTube videos cannot guide patients to understand the causes that may facilitate the occurrence of calcaneal spur, the treatment options, and the possible risks they may face in the absence of treatment.

YouTube should consider collaborating with database platforms such as UpToDate, which is constantly updated, equipped with evidence-based information, and easy to use, to provide reliable health information on many health issues, including the calcaneal spur.

Providing health professionals with proven and sourced videos will enable YouTube users to access accurate, reliable and satisfactory information.

Ethics approval

Ethical approval was not required as public YouTube videos were reviewed and no human/animal participants were included in the study.

The authors declare that there is no conflict of interest.

Conception or design of the work: ZK, SB. Data collection: ZK, SB. Data analysis and interpretation: ZK, SB. Drafting the article: ZK.

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Professional Career Development of University Students: Current Approaches

Asst.Prof. Dönay Nisa KARA

Girne American University, Faculty of Education, Computer and Instructional Technology Education. Kyrenia/TRNC.

E-mail: donaykara@gau.edu.tr

Orcid: 0000-0002-6069-2833.

Afiyet Gül ÖZKINACI

Department of Guidance and Psychological Counseling

E-mail: afiyetgul@gmail.com

Orcid: 0009-0008-0240-8399

Abstract

Many factors are effective in the process of choosing the department that students study. Today, digital technologies are used effectively in the field of education, and the importance of digital technologies in the career choices of students is very high, because many professions for human needs have emerged with digital technologies. Some of these professions can be counted as artificial intelligence specialist, digital literacy, technology designer, digital game development, social media specialist. Digital technologies have affected the career choice and career development of university students. The aim of this research is to contribute to the field regarding the professional career development of university students. Qualitative research methods provide flexibility to the researcher in the conduct and design of their research. In the research, the data were analyzed with the content analysis technique. The participants of the research were students studying at a private university in the 2022-2023 academic year. In order to determine the professional career development of university students, a total of 40 participants, 25 female and 15 male, were included. These participants are people who benefit from digital technologies in their career development processes. When the reasons for choosing the departments of the participants are examined, it is seen that it is important whether it is suitable for them in the process of choosing a profession. In addition, the students participating in the study stated that their future careers are important in their career choices and that they are studying in the department they dream of. The majority of the participants stated that they were satisfied with the department they read and that they did not experience any anxiety about their departments. In addition, it was concluded that the participants had problems in their educational goals due to financial inadequacy. The participants who are not satisfied with the quality of the education and who oppose the view that the education provided is sufficient are worried that they will experience problems as regards their goals.

Keywords: Education, Digital technologies, career choice, career development.

Introduction

In our country, the choice of job and profession and the choice of vocational education institutions cannot be made depending on a systematic orientation, which brings along problems such as unwilling work of individuals, inability to follow professional innovations and low productivity.

Being a student, being an employee, being a parent and a child etc. There are many roles acquired throughout our lives, such as These roles can change throughout life. It is seen that when people adapt themselves to the acquired roles, they affect their career choices in their lives. Each individual is guided throughout their career choices, for the professions that suit them, and in line with their needs in their professional life and career preparation processes. Forcing the student to choose a profession by applying pressure brings with it a life full of failure in the future life of the child. Guidance can be made in line with the individual characteristics and abilities of the student in the professional development processes (Özkazanç, Sayılan, & Akşit, 2018).

The student should not be pressured to choose a profession or a profession. Stress factors and anxiety in career choices and education, which cause anxiety and stress in individuals, can cause failure in students (Klassen, Usher, & Bong, 2010). Vocational guidance is all of the assistance provided in order to provide individuals with the opportunity to choose suitable professions by getting to know different professions, and to prepare them for professions and to develop professionally. One of the factors that affect an individual's happy and successful development in life after a certain age is the choice of profession (Demir, 2010; Chason, Bullock-Yowell, Sampson, Lenz, & Reardon, 2013).

There are studies on career decision making and career indecision based on both information processing theory and other career development theories (Akkoç, 2012; Creed, Patton, & Prideaux, 2006; Germeijs, & Verschueren, 2009; Ginevra, Nota, Soresi, et al. Gati, 2012; Lounsbury, Hutchens, & Loveland, 2005; Kırdök, 2015).

Individuals need to choose their professional development processes not at an early age, but after they reach the age when they have the awareness of professional decision making (Şeker and Kaya, 2019). The personality traits, interests, abilities and competencies of the individual should be taken into account by directing students to professions that make the individual happy financially and spiritually in the future (Demirel, 2016).

It is one of the biggest mistakes made to direct individuals to various professions by considering the gender factor in their career choices. On the other hand, it is the right decision to choose a profession that will bring professional satisfaction in line with the interests and abilities of the individual. Students' parents' guidance, ignoring the wishes of the individual, and directing them to that profession only with the decision of other people may cause the individual to work in a job that will be unhappy throughout his life (Sürücü, & Yavuz, 2013). Objective professional support should be provided to the individual in reaching realistic information about the professions at the stage of professional decision. It is necessary to help him realize that his profession and job is valuable, to appreciate it, and to have a positive attitude towards working (Bacanlı, Hamamcı, & Doğan, 2013). When it comes to different types of profession, work and activities are to provide information from relevant sources (Özteke, 2020; Alkan, 2014; Eagle, 2012).

Many stages determine the career choice of students. To mention a few of these phases;

Temporary stage (11-18 years old): This period is the stage of self-recognition. First, decisions are made in accordance with the profession he likes. Then the individual's abilities are taken into account. Finally, the choice of profession is made taking into account the professional difficulty and the material income angle.

Realistic stage (18-23): During this period, individuals discover professions. They minimize the occupations in their thoughts by making choices and finally make their decisions (Ansari and Alay, 2017).

Career choice culturally; ethnic background, the culture of the living environment, the extended family along with the local population also have an influence on the choice of profession. Culture often shapes values and expectations. As a result, your expectations are effective in most of life, including your career (Yeşilyaprak and Eskisu, 2013; Ünsal, 2014). Another name for this is multicultural career counseling, which is a special field of expertise. The dominant characteristics of a culture are not attributed to one of the individuals, but being aware of the values and expectations of your culture helps you understand how you make your professional choices. How you see yourself as an individual is much more important when choosing a profession (Peker, 2014). At the stage of choosing the department that students study, many factors affect the student in choosing a profession. For example, although the financial benefits of an individual are a priority in choosing a profession, their interest in the profession is also considered important (Wienclaw, 2011; Peker and Ay, 2019). There are also some applications that have been put into service by field academics (Korkut-Owen et al., 2017). These applications are self-guidance (self-service) services in the form of assistance services based on evaluating the user's own characteristics and matching them with appropriate educational /professional fields (Yeşilyaprak, 2012). However, it is not yet possible to say that these programs are widely and functionally used. There is a need for a roadmap suitable for new paradigms in the use of information and communication technologies in this field (Çanga and Soyaliç, 2015; Demir, 2015). At the same time, the benefit of digital technologies is inevitable at the career selection stage.

Technology (digital), the dictionary meaning is expressed as 'application knowledge, application science covering construction methods, tools, tools and tools used, their ways of use'; it is explained as all the information related to them with the tools developed by man in order to control and change his material environment" (TDK, 2023). Today, digital technologies are also being used effectively in the field of education.

Vocational guidance and career psychological counseling programs supported by digital technology are still at the design stage. In this regard, the YÖK, MONE and İŞKUR's websites, especially for students (örn.mbs.meb.gov.tr; <https://yokatlas.yok.gov.tr>, <http://kariyerrehberligi.net> /, <http://career.center.org/>, iskur.gov.tr) provides e-services related to professional guidance (Yeşilyaprak, 2019).

The importance of digital technologies in students' career choices is quite high. Because with digital technologies, many professions have emerged that are aimed at human needs. Some of these professions are artificial intelligence, digital literacy, technology design, digital games, social media specialist, etc. professions such as have emerged. When the literature was examined, a limited number of studies were found about the situations that

students experience in the professional development processes. From this point of view, it has affected the career development of students with the influence of digital technologies in career choice. The aim of this research is to contribute to the field of professional career development related to the department studied by university students.

Method

Qualitative research in accordance with the purpose of the research; Phenomenology was also preferred as a pattern. Phenomenology is a research model that is aware of in daily life and helps to investigate the phenomena in detail and to better understand these phenomena. The cases to be investigated are encountered in various ways throughout life. Qualitative research; It can be expressed as studies in which the qualities of materials, situations, activities or relationships are investigated (Yıldız, 2017). Qualitative research focuses on how people interpret some events and situations they have encountered in their lives (Merriam & Tisdell, 2015; Creswell, 2015). Qualitative research method provides flexibility to the researcher in the realization and design of the research, and it gives the opportunity to develop new approaches and methods, and make changes in the research setup, according to the situation at every stage of the research. Another important contribution of qualitative research is that, due to its exploratory nature, researchers make great use of this type of research in examining and illuminating the subjects that have not been studied in depth enough (Karataş, 2015).

Working Group

In the research, criterion sampling, one of the purposeful sampling methods, was used to determine the study group. Criterion sampling is the study of all situations that meet a set of predetermined criteria (Yıldırım & Şimşek, 2016). The participants of the research consisted of students studying at a private university in the 2022-2023 academic year. It consists of 40 participants in order to determine the professional career development of university students. Participants consist of 25 female and 15 male participants. More than half of the participants, 30 participants are between the ages of 18-23; 6 participants are between the ages of 24-29 and 4 participants are between the ages of 30 and over. The chapters that the participants read, in order; 15 participants are Guidance and Psychological Counseling, 10 participants are Classroom Teachers, 8 participants are Turkish Language Teaching and 7 participants are Preschool Education students. Considering the education level of the families of the participants, while the parents of 20 participants were primary school graduates; Parents of 10 participants are high school graduates and parents of 9 participants are university graduates. There is 1 participant whose parent has never read. In addition, the participants of the research were those who benefited from digital technologies in their career development processes.

Preparation of Data Collection Tool

In the study, a structured interview form prepared by the researcher was used as a data collection tool. The structured interview consisted of a series of predetermined questions and answers; unstructured interview questions include open-ended questions (Yıldırım & Şimşek, 2013). At the initial stage, a draft interview form consisting of four questions was prepared in line with the purpose of the research. In the draft interview form, adjustments were made in line with the opinions of three field experts working in the field of educational sciences. Immediately after the expert opinions, pilot interviews were conducted with three teachers and care was taken to ensure that the questions were understandable. After expert opinions and pilot interviews, interview questions were arranged and the interview form consisted of four questions and the questions took their final form. The researcher was active at every stage of the research, in order to collect in-depth data, the study group was formed from participants with different characteristics, and processes for peer review were used in the development of the data collection tool. The content and face validity of a measurement tool can be evaluated with expert opinions (Büyüköztürk, 2017). The prepared interview form consists of two parts. In the first part, demographic information such as gender, age, parental education status of the participants, and in the second part, interview questions took place. Interview questions are given below.

1. What are your views on the reason for choosing the department you are studying?
2. What are your views on your satisfaction with the department you have read?
3. What are your views on realizing your educational goals in your department?
4. What are your views on digital technologies in the professional career process?

Analysis of Data

In the research, the data were analyzed with the content analysis technique. The main purpose of content analysis is to reach the concepts and relationships that can explain the collected data, and to determine the themes that explain these relationships (Yıldırım & Şimşek, 2013). The interview questions created by the researcher through Google forms were collected via e-survey. In the research, the data obtained in line with the opinions of the participants were analyzed by making content analysis, and themes and sub-themes were created. The findings obtained in the study were evaluated comprehensively.

Findings and Discussion

In this section, four themes, sub-themes of each theme and related opinions, which were formed as a result of interviews with 40 university students who participated in the research, are given in order.

Table 1: Students' Reasons for Choosing the Department they are studying.

Theme	Categori	N
Choice of profession	Suitability	19
	Realizing dreams	10
	Relief financially	7
	Don't be amazed	4

When the table is examined, 19 people constitute the suitability category in the theme of choosing a profession. There are 5 students who prefer the department they are studying in order to follow their dreams. Some of the participants, 10 people, chose the department they studied in order to realize their dreams during the career selection stage. Another part, 7 participants stated that they chose the department they studied in order to be comfortable financially. In addition, 4 students stated that they admire their profession.

K2: 'I thought it was suitable for my personal characteristics.'

K10: 'I thought that it would be beneficial for both me and the society to practice a profession that I love and can be happy in the future.'

K4: 'I think I will be financially comfortable after graduating from the department.'

K33: 'It is not a department that I have chosen especially, but teaching is a good profession.'

Table 2: Satisfaction of the participants in terms of the department they studied.

Theme	Categori	N
Glad	My area of interest	12
	Compliance with the target	10
Not satisfied	Difficulties experienced in education	10
	Fear of failing	8

According to Table 2, 12 people are satisfied with their department and are not worried about their departments. Ten of the participants stated that the department they read was suitable for their goals. On the other hand, the dissatisfaction of the participants stated the difficulties experienced in education by 10 people and the fear of failure by 8 people.

K2: 'Yes, I like reading books and my department.'

K8: 'No, I am not. I am dissatisfied with the difficulties that my school imposes on us.'

K24: 'Yes, I am satisfied because having science-based courses is more in my area of interest.'

K10: 'I am partially satisfied, I have great difficulty in reading, which causes me to be dissatisfied with this section. The fact that it is an area that is deeply involved in life makes me love it more and read this chapter with pleasure.'

Table 3: Educational objectives at your university.

Theme	Categori	N
Opinion on educational goals	Satisfaction at the target	17
	Insufficiency	12
	Fear of not reaching the goal	11

When Table 3 is examined, there are 17 students who are satisfied with the educational goal of the participants and progress towards their goals. There are 12 people who have problems in their educational goals due to financial and moral inadequacy. There are 11 participants who are not satisfied with the education level and who do not think that the education provided is sufficient and are afraid of not reaching the goal in this regard.

K33: 'I aim to improve myself in the field of science and to be successful in my field. I want to do my best to give my students a good education in the future.'

K3: 'I consider our university insufficient due to the fact that the courses are online and there are not enough activities.'

K12: 'I am a senior student, when I look back, I face the fact that I could not achieve my educational goals. Unfortunately, I feel inadequate in this regard.'

Table 4: Opinions of the participants on digital technologies in their professional career process.

Theme	Category	N
Positive aspects of digital technologies	Research oriented	8
	Effective use of time	6
Negative aspects of digital technologies	Ease of access to information	12
	Information confusion	6
	Digital addiction	8

According to Table 4, the positive and negative aspects of digital technologies are grouped under 2 themes in terms of the participants' use of digital technologies in their professional career processes.

The theme of the positive aspects of digital technologies of the participants was divided into 3 categories in terms of research-oriented (8 people), effective time use (6 people) and ease of access to information (12 people). When the negative aspects of digital technologies are evaluated, they are divided into 2 categories as information confusion (6 people) and digital addiction (8 people).

K2: 'I learn more quickly what I can do about my career at school by searching the internet.'

K3: 'I can be instantly informed about current developments in my career development thanks to digital technologies.'

K39: 'Thanks to technology, I can easily access all kinds of information. I do my homework by having access to the internet.'

K1: 'Sometimes, wrong information on the internet can cause me to learn the subject wrong.'

K23: 'I get all the information about my department from the internet. I learn almost everything about my profession by inquiring on the internet.'

Conclusion and recommendations

In the research, career developments of university students in their professions were evaluated. When the reasons for choosing the departments of the participants are examined, it is seen that it is important whether they are suitable for the profession selection process. In addition, in the study, students stated that their future careers are important in their career choices and that they studied the department they dreamed of. Another result of the study is that the financial dimension is important in the career choices of the students and they wanted to guarantee their income in their career processes. It is also another result of the research that the participants chose because they admire their career development and the profession.

According to the participants' satisfaction with the department they read, the majority of the participants stated that they were satisfied with the department they read. They do not have any concerns about their departments. In line with the opinions of the participants, it was determined that they were satisfied with the departments they studied, and this shows that this situation will bring them to a better position in their careers in their career development processes. Because when individuals love what they do, it does not appear as work to them, and in this process, the success steps of individuals will come one after the other. On the other hand, another result of the research is that the participants are hopeless about the future with the fear that if they are not successful in the profession, they will be negatively affected in their career development and cause anxiety and anxiety. It was determined that the majority of the participants were satisfied with their educational goals. In addition, it was concluded that the participants had problems in their educational goals due to financial inadequacy. The participants, who are not satisfied with the quality of the education and who oppose the view that the education provided is sufficient, are worried that there will be problems towards their goals. As stated in the study, it is unacceptable for students to experience anxiety due to financial inadequacy in education and training and necessary steps should be taken. Another issue that needs to be emphasized is that students' taking an active role in projects and activities that will support their career development towards their goals will contribute to their career development after graduating from school.

It has been stated that digital technologies have positive and negative aspects in terms of the participants' use of digital technologies in their professional career processes. The participants' views were evaluated in terms

of the positive aspects of digital technologies, research-oriented, effective use of time and ease of access to information. When the negative aspects of digital technologies are evaluated, they are divided into 2 categories as information confusion and digital addiction. It is seen that there will be many benefits when students use digital technologies correctly and effectively in their professional career development. In addition, the problematic use of technology is another result of the research that will cause digital addictions.

There are participants who prefer the department they are studying now with the feeling of future anxiety, escape and realization of dreams, but the general harmony has been reflected positively and positively on the table. Although the number of people who are satisfied with the department they read is higher, the number of people who regret it is not to be underestimated, which tells us that young people are suspicious and hesitant about the department they read. Most of the students have difficulties due to education and inadequacy, and the satisfaction of the majority of them in their goal has a positive effect on the result. The vast majority are satisfied with their goal. One of the results with the most negative data, which we see the most negativity, is that a large number of students experience educational difficulties. The problem of dialogue between the student and the teacher stands out as the main theme, this situation should be investigated and addressed. It is necessary to examine the relationship between school-teacher-student. Most students are confident in the department they are studying now and are confidently moving towards their future. These results reveal how important the attitude of the school and the teacher is in adapting to the department.

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Role of Augmented Reality in Architecture and Urbanism Education: Systematic Literature Review

Danielle Skubs

State University of Campinas (UNICAMP)

orcid: 0000-0003-3615-897X

d002902@dac.unicamp.br

Ana Regina Mizrahy Cuperschmid

State University of Campinas (UNICAMP)

orcid: 0000-0002-6792-174X

cuper@unicamp.br

ABSTRACT

The use of technology in education has experienced a remarkable upswing in recent years, largely due to the integration of computer hardware into classrooms and the use of mobile devices such as smartphones. One aspect of this development is the proliferation of augmented reality (AR) in education, which has been shown to support teaching and learning processes in several areas by promoting engagement and motivation. This article, therefore, presents a systematic literature review of how AR-based experiences are created and implemented in didactic activities in undergraduate architecture and urbanism (AU) courses, highlighting the benefits of the learning process and the associated challenges. To achieve this, a bibliometric analysis, a quality assessment, and a literature review of articles were conducted. The results show that there are several approaches to developing and applying AR-based experiences in teaching AU that have numerous benefits.

KEYWORDS: Augmented Reality; Extended Reality; Teaching; Learning; Undergraduate Programs in Architecture and Urbanism.

INTRODUCTION

Augmented Reality (AR) systems enable the visualization of virtual objects superimposed on the physical world so that they can seamlessly coexist and interact in real time in three-dimensional environments (Azuma, 1997; Kipper & Rampolla, 2013; Milgram & Colquhoun, 1999; Schmalstieg & Höllerer, 2016). Thus, AR is not just a technology, but a system composed of a variety of technologies that work together to enhance our perception and interaction with digital information (Kipper & Rampolla, 2013).

Technology utilization in classrooms has witnessed a marked increase in recent times, primarily owing to the surge in computer equipment in schools and the employment of mobile devices such as smartphones and tablets. The proliferation of AR experiences in education is part of this evolution, which has proved advantageous for teaching-learning processes across diverse domains, including medicine (Cabero-Almenara, Barroso-Osuna, & Obrador, 2017; Kandasamy, Bettany-Saltikov, Cordry, & McSherry, 2021), product design (Tang, Au, & Leung, 2018), and pedagogy (Cabero-Almenara, Fernández-Batanero, & Barroso-Osuna, 2019).

Despite some research specifically addressing the adoption of AR-based didactic activities for undergraduate courses in Architecture and Urbanism (AU) and highlighting various benefits for teaching and learning (Chu, Chen, Hwang, & Chen, 2019; Domínguez, Escudero, Riera, & Delgado, 2017; Domínguez, RIERA, ESCUDERO, & Delgado, 2014; Fonseca, Redondo, & Villagrasa, 2015; Zhao, Pan, Gao, & Cheng, 2022), the investigation of this area remains limited. Furthermore, reports of difficulties associated with the use of AR systems have also emerged (Elmqaddem, 2019; Khan, Johnston, & Ophoff, 2019).

To explore and examine research employing AR systems to facilitate teaching and learning processes in undergraduate courses in AU, this article presents a systematic literature review (SLR) that addresses the development and application of these systems in didactic activities and elucidates the benefits and challenges encountered.

AUGMENTED REALITY IN EDUCATION

The idea of augmenting routine activities with artificial interactions with the physical world was first discussed in the 1930s (Schnabel, 2009). In the 1960s, Ivan Sutherland introduced equipment that served as an interface for AR (Azuma et al., 2001; Billinghurst & Kato, 2002). Since then, there have been several discussions on the

classification of reality spectra, leading to the emergence of different terms (Milgram & Kishino, 1994; Schnabel, Wang, Seichter, & Kvan, 2007).

Realities classified as Mixed Reality (MR) involve varying degrees of merging or replacing parts of the physical world (Schnabel, 2009). Virtual Reality (VR), on the other hand, is excluded from the MR spectrum, as it refers to an experience where the user is completely immersed in and interacts with a totally virtual and synthetic environment (Milgram & Kishino, 1994; Schmalstieg & Höllerer, 2016; Sherman & Craig, 2019; Stals & Caldas, 2020).

More recently, the term Extended Reality (XR) has been widely used (Al-Adhami, Wu, & Ma, 2019). XR is utilized to describe the spectrum that bridges the gap between MR and VR, covering all of these terms as an umbrella concept and encompassing the previously existing one hundred percent virtual environment of VR (Al-Adhami et al., 2019; Lee & Yoo, 2021; Stals & Caldas, 2020), as depicted in Figure 1.

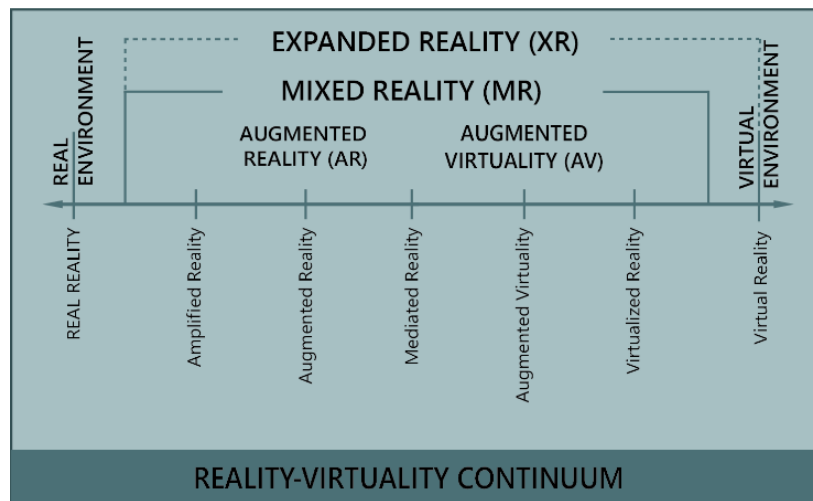


Fig. 1 – Junction of the main classifications of the spectrum of realities

Source: Adapted from (Al-Adhami et al., 2019; Milgram & Kishino, 1994; Schnabel et al., 2007)

AR environments were initially developed for Scientific Visualization and Games and later expanded to include Educational, Architecture, Engineering, and Construction (AEC), and Collaborative Design areas (Schnabel, 2009). AR experiences offer several benefits, such as improved collaboration, greater interactivity, integration of digital information, and computational mobility, according to the author.

The most commonly used devices for AR are smartphones, which require a camera and/or other optical sensors, as well as accelerometers, gyroscopes, compasses, or GPS systems for optimal performance (Kipper & Rampolla, 2013). Head Mounted Devices (HMDs), particularly smart glasses, are also relevant, but not as widely accessible as smartphones. The use of AR experiences in education is beneficial for teaching and learning processes in multiple areas (Akçayır & Akçayır, 2017; Arvanitis et al., 2009; Billinghurst & Dunser, 2012; Cabero-Almenara, Barroso-Osuna, & Martinez-Roig, 2021; Dunleavy, Dede, & Mitchell, 2009).

Several principles have been established to facilitate the effective planning of AR use in teaching-learning processes, such as the flexibility of AR systems to adapt to student's needs and the constraints of the institutional context in which they are employed (Kerawalla, Luckin, Seljeflot, & Woolard, 2006).

It is worth noting that within the classroom environment, AR enables students to collaborate in visualizing the same object in real space, thus enhancing collaborative capacity and face-to-face interaction (Billinghurst, 2002). This is unlike computer-based activities where students sit side by side, albeit working independently (Kiyokawa et al., 2002). The possibility of collective visualization combined with the debate is crucial for the development of design exercises in the AU course.

Smartphones offer an opportunity to extend the learning process beyond the classroom walls, utilizing AR apps that enable students to apply the knowledge acquired in class and solve problems in real-world situations (Cabero-Almenara & Barroso-Osuna, 2016).

AR facilitates the visualization of complex objects from multiple angles and scales, allowing for the continuity of the learning process outside the classroom. This type of visualization facilitates the understanding of AU students, who commonly face challenges in conceiving spatial relationships in their initial design exercises. Moreover, this enables the creation of virtual environments that are essential for higher education, such as laboratories and simulators, which encourage students to pursue their learning through engaging and dynamic experiences (Akçayır & Akçayır, 2017; Davila Delgado, Oyedele, Beach, & Demian, 2020; H. K. Wu, Lee, Chang, & Liang, 2013). The use of AR-based teaching and learning activities helps to develop technology-oriented skills and fosters an investigative, constructivist, and ubiquitous perspective creatively and dynamically. This, in turn, assists teachers in creating innovative and engaging didactics, which is an important demand in the university environment (Vázquez-Cano, Marín-Díaz, Oyarvide, & López-Meneses, 2020).

University students are currently drawn to new technologies such as AR because they demand stimuli for motivation and enthusiasm in the learning environment. They value the interactivity and opportunities for experimentation and simulation that the system offers (Bucea-Manea-Țoniș et al., 2020). Hence, institutions need to promote technological innovation, which facilitates real-time communication and continuous interaction between students, universities, and the labor market. Additionally, institutions must support the development of AR-based activities by providing support centers for the production of innovative didactic activities (Cabero-Almenara et al., 2019).

METHOD

The implementation of a SLR constitutes a valuable contribution to scientific research, as it provides researchers with a comprehensive tool for mapping, evaluating, consolidating, and integrating relevant research findings on a specific research subject (Morandi & Camargo, 2015). As posited by these authors, the SLR methodology enables researchers to identify potential knowledge gaps and, ultimately, leads to the synthesis of relevant information.

The objective of this SLR is to survey and analyze research studies that have utilized AR systems to assist in teaching and learning processes related to undergraduate courses in the field of AU. Through this review, we aim to address questions regarding the development and application of AR systems in didactic activities, as well as to highlight the benefits of such systems for the learning process and the difficulties encountered in their implementation. To achieve this goal, the present study followed the methodology proposed by (Morandi & Camargo, 2015), which involves several steps, such as defining the central theme and research question (as stated above), establishing methodological procedures including the development of search strategies and criteria for inclusion and exclusion, conducting bibliometric analysis, assessing the quality of the studies, and performing a thorough analysis of the literature.

Methodological Procedures

A search was conducted on the Scopus and Web of Science (WOS) databases. The research utilized these databases due to their extensive collection of research articles and the capability to utilize unlimited Boolean operators, allowing for a more precise search. The search terms used were ("Augmented Reality") AND (educat* OR learn* OR teach* OR training OR student) AND (architect* OR urban*) AND (course OR undergraduate OR "higher educat*" OR postgrad* OR college OR school OR curric* OR syllabus OR degree)), just considering the abstract, title, and/or keywords of the articles, as shown in Figure 2. A total of 242 articles were found in Scopus, and 165 in WOS.

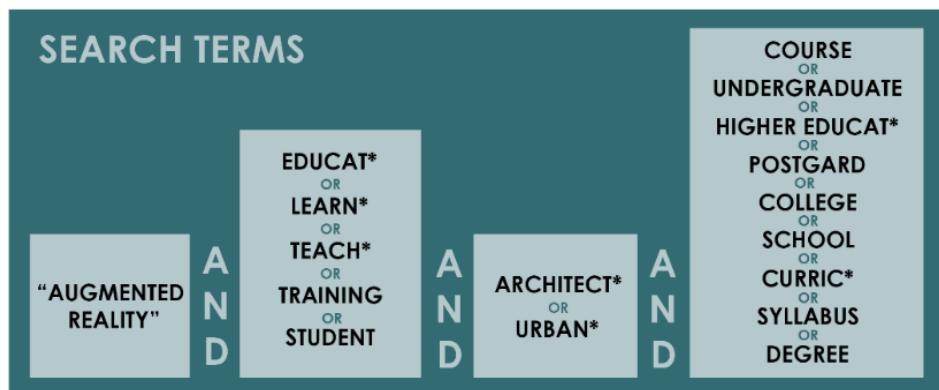


Fig. 2 – SLR search terms

The search in the databases utilized truncated words, indicated by an asterisk next to a part of the term. This method returns all variant words of the term. For example, when searching for the term teach*, the databases also searched for the terms teacher and teaching.

These filters included selecting only journal articles (excluding literature review articles), limiting the language to English, Portuguese, or Spanish, and setting the year of publication between January 01, 2013, and April 12, 2022. A total of 49 articles were found in Scopus, and 57 in Web of Science, resulting in 106 articles in total. To organize the articles, the researchers applied two exclusion criteria, which were to remove duplicate articles and articles that did not focus on the application of AR systems in teaching and learning activities in the field of AU.

The software Mendeley was used to remove duplicate articles, resulting in a total of 72 unique documents. After that, the researchers manually applied the exclusion criterion of articles that did not focus on the application of AR systems in teaching and learning activities in the field of AU. As a result, 18 articles remained, as shown in Figure 3.

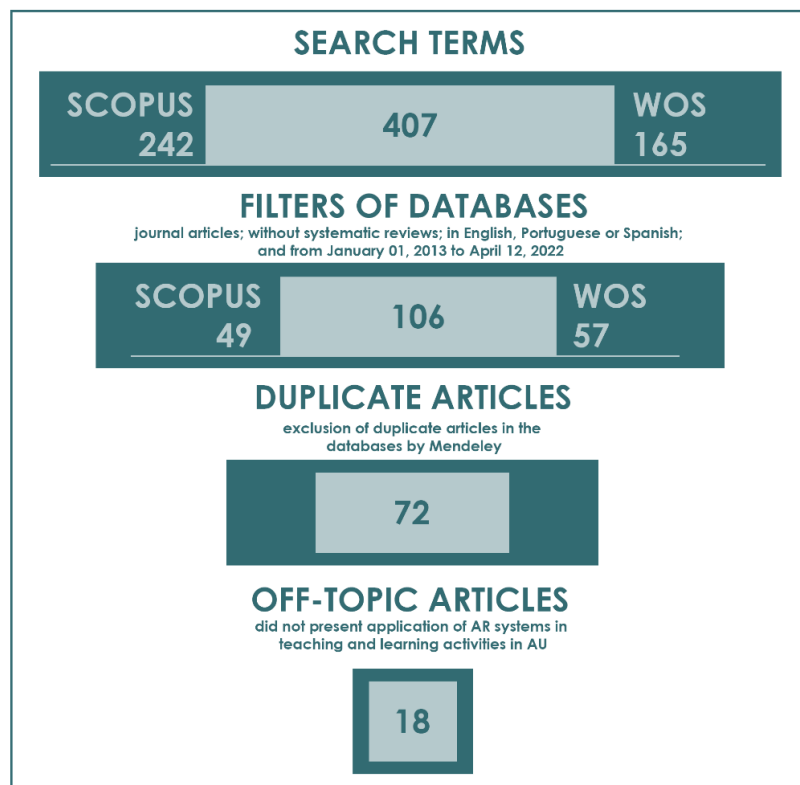


Fig. 3 – Number of articles found before and after exclusion criteria

To conduct bibliometric analysis, quality assessment, and literature analysis, the 18 selected articles were classified according to the following categories: database; year of the article; journal; country of the first author; level of education of the students involved; relevance of AR in teaching activities; main activities (modeling/visualization); topics of study involved in AR activity; development mode of experience in AR; platform/tool used for development; tracking mode; devices used; and benefits and difficulties pointed out.

Bibliometric Analysis

To conduct a quantitative synthesis of the selected studies, a bibliometric analysis was performed. It was found that eleven articles were common to both the Scopus and WOS databases, as depicted in Figure 4.

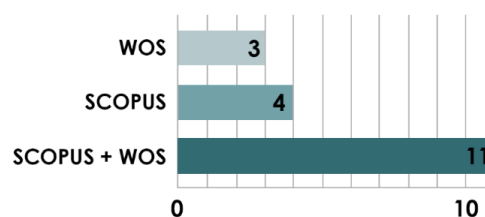


Fig. 4 – Number of articles found in each search database

Concerning to the years of publication, it was observed that there was a gradual increase in the number of articles on the topic over time, as depicted in Figure 5. Notably, no publications were found in 2013, but in subsequent years, between 1 and 3 publications were identified annually, indicating a nascent field that is ripe for further exploration.

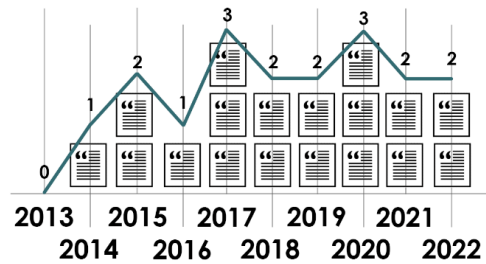


Fig. 5 – Number of articles published per year

Regarding the journals, the articles were found to be distributed across 15 different publications, as shown in Figure 6. The results suggest that the topic of AR is of significant interest to a diverse range of journals in fields such as Technology, Education, Architecture and Urbanism, Engineering, Construction, and others. Although only one journal (Architecture, City and Environment) focuses specifically on Architecture, five of the publications relate to related areas such as Engineering and Construction. Nonetheless, a common goal that is shared among all of these journals is a focus on the study of technology and innovation.

JOURNAL	ARTICLES
Applied Sciences Research In Learning Technology Universal Access In The Information Society	2
Advanced Engineering Informatics Advances In Engineering Education Architecture, City and Environment Computers In Human Behavior Construction Innovation Education And Information Technologies Intelligent Automation And Soft Computing International Journal Of Interactive Design And Manufacturing International Journal Of Simulation And Process Modelling Journal Of Construction Engineering And Management Journal Of Visualization Revista Iberoamericana De Educacion A Distancia	
	1

Fig. 6 – Number of articles published per journal

To conduct a geographical analysis of the articles, the country of the first author was taken into consideration. The results indicate that Spain stands out with a total of 6 articles (33%), demonstrating a strong commitment to the application of AR for teaching AU, as depicted in Figure 7.

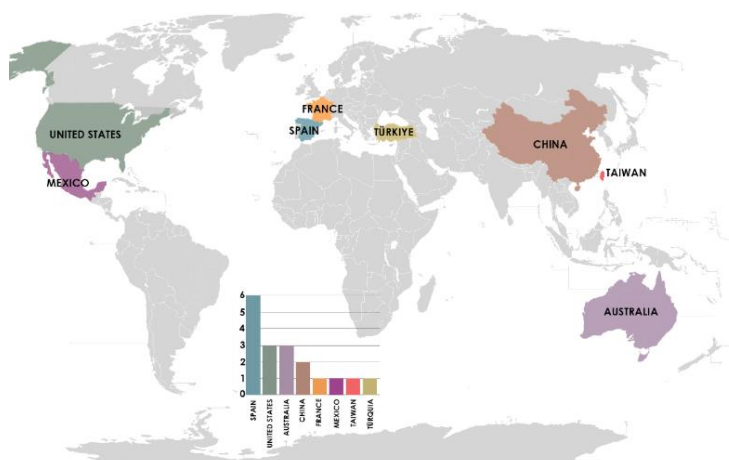


Fig. 7 – Number of articles by country of the first author

Regarding the level of education of the students involved in the studies, it was found that the majority of research (66.5%) was applied to undergraduate students, as shown in Figure 8. This finding suggests that activities using AR can be developed for students with little or no specific knowledge of AU.

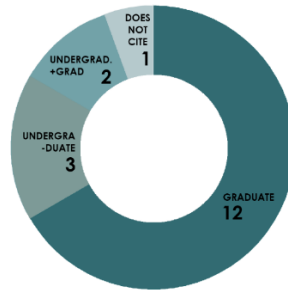


Fig. 8 – Number of research applied by the level of education

Quality Analysis

To assess the relevance of the selected studies to the review issue, which is one of the dimensions used to evaluate the quality of primary studies (Morandi & Camargo, 2015), a classification was conducted based on the applicability of AR in teaching activities, as shown in Figure 9. To achieve this, three classifications were created: intense for studies where AR was the primary visualization system in didactic activities, moderate when AR shared equal importance with another system such as VR, for instance, and subtle when AR was not the main focus. Although AR was not the only system or technology applied in some of the studies, it was the main focus in eight studies, which were classified as intense, representing the dominance of the research.

As an example of moderate relevance, a study by (Guray et al., 2021) aimed to promote teaching activities related to building design and construction through the use of projects and the modeling of building information for visualization of its elements in AR. In this study, Building Information Modeling (BIM) was found to be equally important as visualization in AR and was thus classified as having moderate relevance.

Another study (Birt & Cowling, 2018) investigated different ways of understanding the lighting comfort of a building. The activity included visualization of the design using: (i) 2D documentation; (ii) virtual reality (VR) with a HMD; (iii) VR with a smartphone and Google Cardboard (GOOGLE, 2022); (iv) AR using the HoloLens HMD (MICROSOFT, 2021); and (v) visiting the building for on-site analysis. In this study, AR was only a small part of the systems and technologies studied and was thus classified as having subtle relevance.

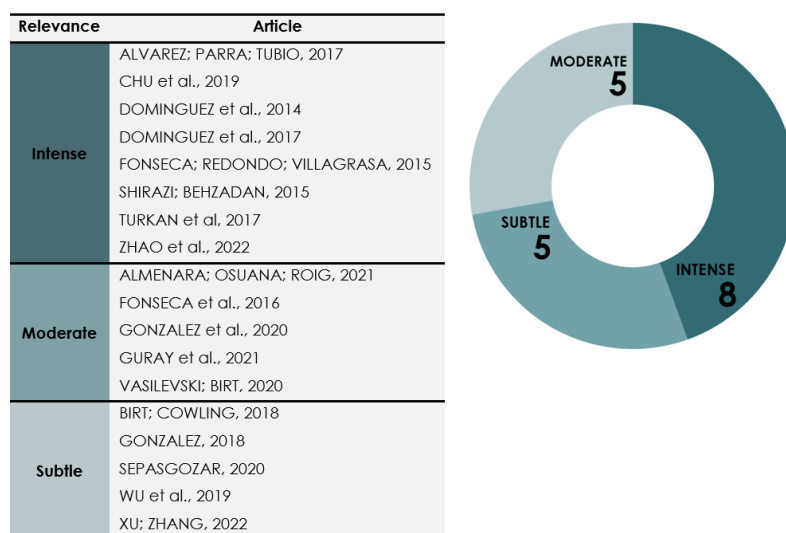


Fig. 9 – Number of articles and the relevance of AR in studies

Literature Analysis

This section endeavors to establish correlations among the texts to address the initial question, while identifying lacunae and potential areas for future research within the domain of study (Morandi & Camargo, 2015).

The main activities applied in the classroom in the research were examined, and two primary activities were identified: (i) visualization, which was present in all studies, and (ii) modeling of a three-dimensional element followed by its visualization, which was observed in half of the studies (Figure 10). While the visualization activity is inherent to AR, it is noteworthy that the modeling activity was incorporated into a significant number of studies.

In the studies analyzed, the modeling activity for visualization in AR was proposed to the students for various elements, such as the building in the urban context (Domínguez et al., 2014), new proposals for urban furniture to reorganize a local market (Fonseca, Valls, Redondo, & Villagrasa, 2016), sculptures to be inserted in urban space (Domínguez et al., 2017), land for the study of topography (Alvarez, Parra, & Tubio, 2017), parts and volumes of buildings for the development of spatial skills (González, 2018), urban sculptures and a building that dialogues with the surroundings (González, Suarez-Warden, Milian, & Hosseini, 2020), building elements (Guray et al., 2021), and steel structures (Xu & Zhang, 2022).

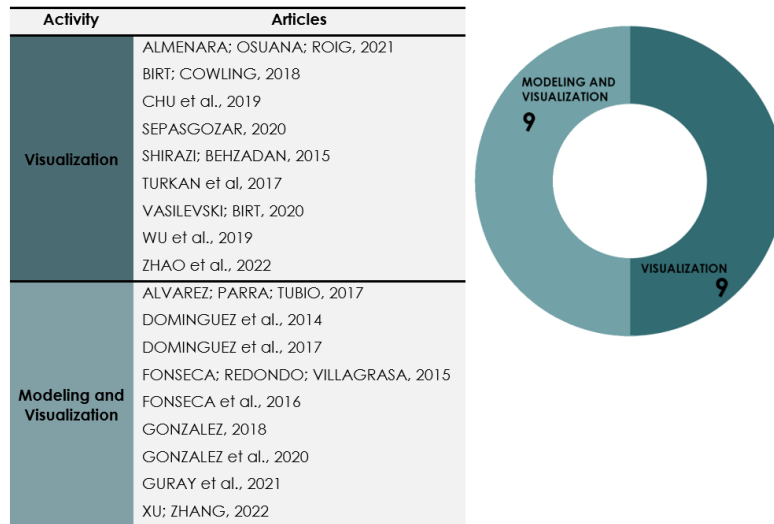


Fig. 10 – Number of articles per main activity

To conduct a qualitative analysis of the themes of study involved in the AR activity, they were distributed among the various curricular components of the AU courses as defined by the National Curricular Guidelines (DCNs) of the AU courses, Resolution No. 2 of June 17, 2010 (BRASIL, 2010). The main themes identified in each research were then associated with these curricular components (Figure 11).

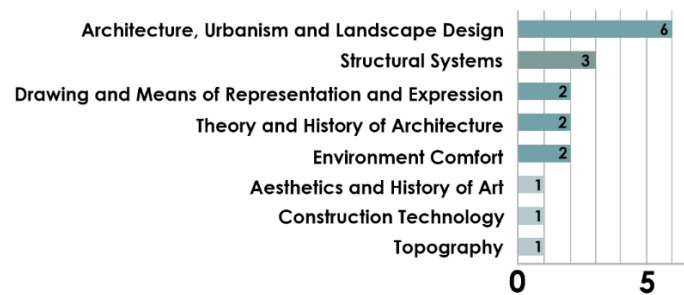


Fig. 11 – Number of articles with main activity related to the themes of the curricular components of the Brazilian DCNs.

AR-based activities have been widely applied to the study of Architecture, Urbanism, and Landscape Design, as evidenced by the recurrent proposals found in the surveyed articles. These proposals include modeling of building designs for visualization in AR in the real urban context (Domínguez et al., 2014); design and modeling of new proposals for urban furniture aimed at reorganizing local markets (Fonseca et al., 2016); design and modeling of sculptures for urban intervention proposals (Domínguez et al., 2017); AR visualization of house designs with a small useful area, used to experiment and study accessibility issues (W. Wu et al., 2019); project design of urban sculptures and religious buildings aimed at studying the local context and creating a dialogue with the surroundings (González et al., 2020); and design and modeling of residential building designs using BIM, with a focus on the organization of documentation (Guray et al., 2021).

The topic of Structural Systems is prevalent in AU courses, as well as in three studies in courses focused on Engineering and Construction. These studies propose activities such as the visualization and interaction with structural elements to comprehend their behavior under the application of various forces (Turkan, Radkowski, Karabulut-Ilgu, Behzadan, & Chen, 2017), visualization of diverse building construction processes with emphasis on foundations (Sepasgozar, 2020), and the study of steel frames for building structures (Xu & Zhang, 2022).

The use of AR as a tool for aiding Drawings and Means of Representation and Expression highlights the significance of spatial visualization in comprehending design concepts. One study utilized AR visualization to read assembly guides of physical models for the understanding of design representation (Shirazi & Behzadan, 2015). Additionally, the visualization of 3D parts and built volumes through AR was employed for the development of spatial skills (González et al., 2020; Xu & Zhang, 2022).

Two studies focused on the Theory and History of Architecture, one of which modeled and presented an existing design through AR (Fonseca et al., 2015), while the other involved the study of design elements of a cathedral by reading markers on a physical model of the building located in a museum (Chu et al., 2019). Environmental comfort was the subject of two studies that used AR visualization to analyze the lighting performance of buildings (Birt & Cowling, 2018; Zhao et al., 2022).

Moreover, Aesthetics and Art History were incorporated into AR activities in the form of visualizing art pieces in AR complemented with audio information for the study of Indigenous works of art in Australia (Vasilevski & Birt, 2020), as well as the geometric and mathematical information of a religious building for the study of Construction Technology (Almenara, Osuana, & Roig, 2021). Finally, Topography was studied through the modeling and visualization of the terrain under analysis (Alvarez et al., 2017).

As for the development of the AR experience, half of the studies created customized AR apps using applications or software that required programming knowledge. Another eight articles developed customized experiences using no-code programming platforms (NCPP), which do not require users to create or edit codes. Only one study did not specify the form of development and was classified as "does not cite/demonstrate" (Figure 12).

The AR apps created for these experiences include the U-AR (Urban Augmented Reality) for Android, designed for urban study (Domínguez et al., 2017); the Corrigan Walking Tour, for the study of Indigenous Art History in Australia (Vasilevski & Birt, 2020); and the FBE Piling AR (PAR), for the study of foundation structures (Sepasgozar, 2020).

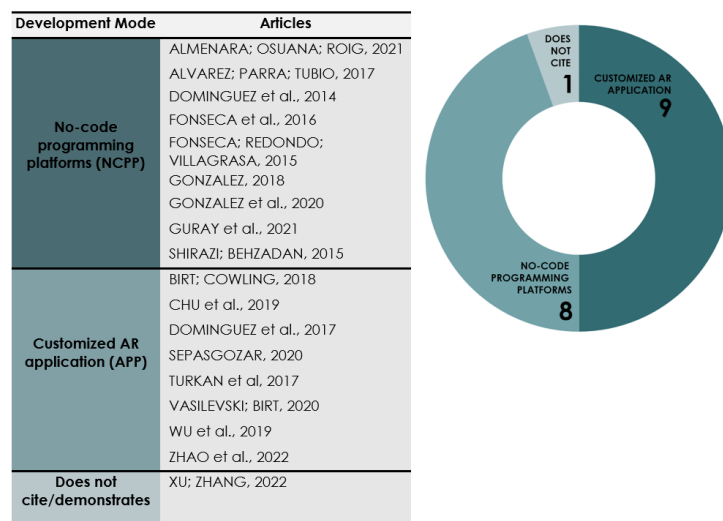


Fig. 12 – Number of articles with different development modes for AR use

In terms of the platforms or tools utilized for the development of the experiments, various options were mentioned (as shown in Figure 13). Among these, Unity 3D was cited in four articles (Birt & Cowling, 2018; Vasilevski & Birt, 2020; W. Wu et al., 2019; Zhao et al., 2022), while the ARmedia plugin was utilized in two studies (Domínguez et al., 2017; Fonseca et al., 2016). The remaining platforms or tools were only mentioned once each. However, four articles did not provide any details regarding the tools utilized (Chu et al., 2019; González, 2018; Sepasgozar, 2020; Xu & Zhang, 2022).



Fig. 13 – Tools cited in development research

In addition to Unity 3D, other software tools were used for the development of AR applications. The Apple Cocoa Touch SDK, which is a Software Development Kit for IOS platforms, was utilized in one study. ArToolkit Library, a software library for AR development, was used in another study to define the tracking of objects (Turkan et al., 2017). Android Studio, an integrated development environment for applications, was mentioned in one study, but its specific usage was not clearly explained (Almenara et al., 2021). It is noteworthy that Unity 3D, initially developed for game production, has become a popular engine for creating AR experiences.

In addition to Unity 3D, other tools have been mentioned for AR development. Microsoft's Mixed Reality Toolkit was used by (Sepasgozar, 2020), which is a collection of packages that support development on platforms such as Unity 3D or Unreal (MICROSOFT, 2022). Some studies utilized no-code programming platforms such as Augment (González et al., 2020), Zappar (Almenara et al., 2021), Layar (Domínguez et al., 2014), and Aumentaty (Alvarez et al., 2017), for AR development and hosting, using them for viewing applications such as Aumentaty Viewer. Other softwares like Metaio Creator (Fonseca et al., 2015) and SimLab Composer (Guray et al., 2021) were also used for this purpose, with the latter employing the SimLab Viewer app for AR visualization. One study cited the use of the ARmedia plugin tool for Sketchup and the ARplayer viewer app for visualizing three-dimensional AR models created by students (Fonseca et al., 2016). Another study used the Junaio application to visualize informative content for the assembly of a physical building model, although it was deactivated in 2014 (Shirazi & Behzadan, 2015).

Regarding the tracking methods for visualizing AR experiences, eight studies have reported using markers, while others eight have not. However, one study reported using solely GPS tracking, while another noted employing both marker and GPS tracking methods (Figure 14). The authors of one study suggest that incorporating multi-markers, which refers to the utilization of more than one marker with the same function printed on the student's activity reading page, can help minimize instability in AR visualization. This is because such an approach ensures that at least one of the markers will always be within the line of sight of the device's camera (Turkan et al., 2017). Additionally, the authors of another study commented that GPS tracking of a three-dimensional model was challenging at distances of less than 25m from the insertion site (Domínguez et al., 2014).

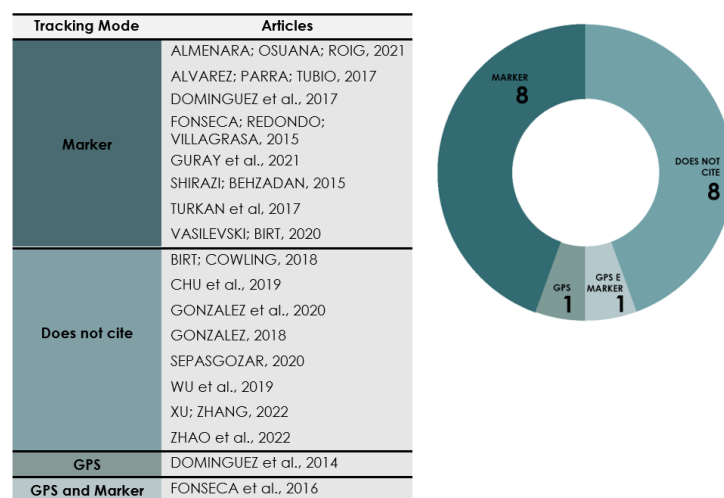


Fig. 14 – Number of articles per tracking mode for AR visualization

In terms of the devices used for the AR experience, the smartphone was the most commonly cited device, used in 12 studies. This can be attributed to its widespread accessibility among students. The tablet was used in nine studies, often provided by educational institutions. HMD appeared in three articles, all of which cited the HoloLens model (MICROSOFT, 2021). One article mentioned the use of a computer in addition to the smartphone, and one did not specify any device. In one study, headphones were also used in conjunction with the smartphone to enhance the experience during the activity (Figure 15).

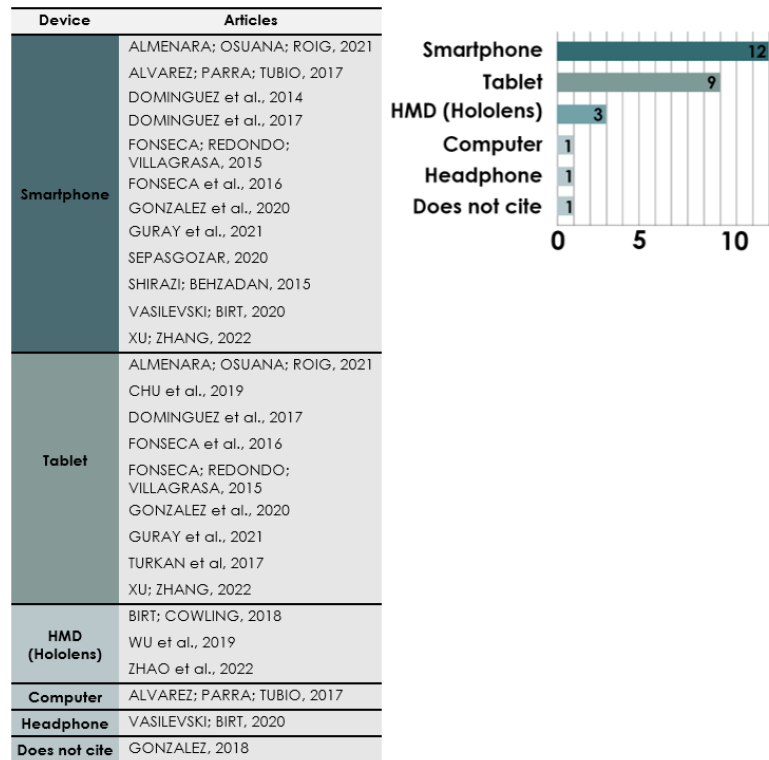


Fig. 15 – Number and types of devices cited for the AR experience

After analyzing the conclusions of the articles, two-word clouds were created to represent the recurrence of words related to the benefits and difficulties encountered during the AR implementation process. Several studies highlighted the benefits of AR, including improvement in learning (9), engagement (8) and motivation (8), interaction (4), satisfaction (3), and collaboration (2). Some studies also pointed out that students showed improvements in analytical skills and critical thinking (González et al., 2020) and communication (Shirazi & Behzadan, 2015). The authors highlighted the importance of fun as an essential part of AR activities (Vasilevski & Birt, 2020). The ubiquity of mobile devices, such as smartphones, makes learning accessible anytime and anywhere, which is another important benefit of AR (Domínguez et al., 2014). Additionally, AR allows for fast and realistic visualization of three-dimensional models during teaching activities (Guray et al., 2021).



Fig. 16 – Word cloud of the benefits pointed out with the use of AR for teaching and learning activities

The present studies suggest that several difficulties are associated with the use of AR in educational settings (Figure 17). Among these challenges, authors have mentioned the difficulty of modeling 3D objects for visualization in AR (4), the AR system itself (4), the low performance of the devices used by students (2), the instability during the presentation of virtual content (2), and the planning of teaching activities (2). Several educators and students

have experienced technical issues and slow response times when using the AR system (Alvarez et al., 2017; Domínguez et al., 2017, 2014; Shirazi & Behzadan, 2015; Vasilevski & Birt, 2020). Additionally, the weight of the devices was mentioned as a challenge for students during extended activities (Vasilevski & Birt, 2020). Some authors have reported that students have shown digital dependence when visualizing digital representations for understanding a study object (González, 2018). Furthermore, the lack of support from educational institutions in the application of AR by professors has also been identified as a significant challenge (Almenara et al., 2021). These difficulties represent significant barriers to the successful implementation of AR activities in the classroom.

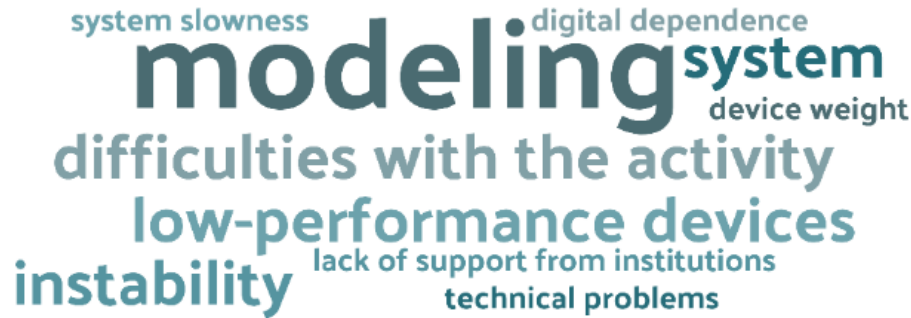


Fig. 17 – Word cloud of the difficulties pointed out with the use of AR for teaching and learning activities

Finally, to compile the data worked in the literature analysis, Table 1 was developed, which presents the information organized by article and the corresponding classification category.

Table 1. Compilation of literature analysis data

Article	Relevance	Activity	Subject of Study	Development / Tools	Platforms	Tracking	Device	Benefits in using AR	Difficulties in using AR
	I = intense M = moderate M = modeling			APP = application		G = GPS M =			
(Almenara et al., 2021)	M	V	Construction Technology	APP	Zappar; Android Studio	M	smartphone ; tablet	motivation	lack of support from institutions
(Alvarez et al., 2017)	I	M V	Topography	NCP	Aumentat y Author; Aumentat y Viewer	M	smartphone ; computer	engagement; motivation; improvement in learning	the slowness of the system; modeling
(Birt & Cowling, 2018)	S	V	Environmental Comfort	APP	Unity3D	-	HMD HoloLens	-	-
(Chu et al., 2019)	I	V	Theory and History of Architecture	APP	-	-	tablet	engagement; motivation	activity
(Domínguez et al., 2014)	I	M V	AU and Landscape Design	NCP	Layar	GPS	smartphone	ubiquitous learning, satisfaction, motivation	system; activity; modeling; low performance devices

Article	Relevance	Activity	Subject of Study	Development	Platforms / Tools	Tracking	Device	Benefits in using AR	Difficulties in using AR
	I = intense M = moderate	M = modeling		APP = application		G = GPS M =			
(Domínguez et al., 2017)	I	M V	AU and Landscape Design	APP	ARmedia Plugin	M	smartphone ; tablet	engagement; motivation; improvement in learning	system; instability; low performance devices
(Fonseca et al., 2016)	M	M V	AU and Landscape Design	NCP	ARmedia Plugin; ARplayer Viewer	GPS; M	smartphone ; tablet	collaboration; interaction; engagement; motivation; improvement in learning	modeling
(Fonseca et al., 2015)	I	M V	Theory and History of Architecture	NCP	Metaio Creator	M	smartphone ; tablet	improvement in learning; satisfaction; motivation	modeling
(González et al., 2020)	M	M V	AU and Landscape Design	NCP	Augment	-	smartphone ; tablet	satisfaction; critical thinking; analytical skills; improvement in learning	-
(González, 2018)	S	M V	Drawing and Means of Rep. and Expression	NCP	-	-	-	dynamism; interaction	digital dependency
(Guray et al., 2021)	M	M V	AU and Landscape Design	NCP	SimLab Composer ; SimLab Viewer	M	smartphone ; tablet	fast and realistic simulations	-
(Sepasgozar, 2020)	S	V	Structural Systems	APP	-	-	smartphone	engagement; improvement in learning	-
(Shirazi & Behzadan, 2015)	I	V	Drawing and Means of Rep. and Expression	NCP	Junaio	M	smartphone	engagement; communication; motivation; collaboration	system
(Turkan et al., 2017)	I	V	Structural Systems	APP	Apple Cocoa Touch SDK; ArToolkit Library	M	tablet	improvement in learning; interaction	-
(Vasilevski & Birt, 2020)	M	V	Aesthetics and History of Art	APP	Unity 3D	M	smartphone ; headphones	engagement; interaction; fun; improvement in learning	technical problems; instability; device weight
(W. Wu et al., 2019)	S	V	AU and Landscape Design	APP	Unity3D	-	HMD HoloLens	engagement	-

Article	Relevance	Activity	Subject of Study	Development / Tools	Platforms	Tracking	Device	Benefits in using AR	Difficulties in using AR
	I = intense M = moderate	M = modeling		APP = application		G = GPS M =			
(Xu & Zhang, 2022)	S	M V	Structural Systems	-	-	-	smartphone ; tablet	-	-
(Zhao et al., 2022)	I	V	Environmental Comfort	APP	Unity 3D; Mixed Reality Toolkit	-	HMD HoloLens	engagement; improvement in learning	-
(-) Does not cite									

SUMMARY OF RESULTS AND DISCUSSIONS

This SLR aimed to investigate the development and application of AR-based experiences in teaching and learning activities related to subjects in AU, as well as to identify the benefits and difficulties associated with this process. The review revealed that the use of AR-based experiences is highly beneficial for enhancing the teaching and learning processes for students, despite some difficulties reported by the authors.

Several studies did not provide details regarding the development of the AR experiences, such as the involvement of programming specialists (Birt & Cowling, 2018; Vasilevski & Birt, 2020; W. Wu et al., 2019) or the technologies used (Chu et al., 2019; Xu & Zhang, 2022). Thus, it appears that their focus was on evaluating the use of AR in teaching activities and its benefits for the learning process, regardless of the development mode of the apps used.

Other studies considered it important to present the development process, and some researchers chose to develop their own and customized applications. Still, platforms that do not require programming knowledge were the most used. Therefore, it is emphasized that this is an alternative for professors who do not know how to develop or edit codes.

It is worth noting that some studies conducted on these platforms were limited to the insertion of three-dimensional models for visualization in AR (Alvarez et al., 2017; Domínguez et al., 2014; Fonseca et al., 2015, 2016; González et al., 2020; Guray et al., 2021). This particular activity yielded several benefits, such as improved learning (Alvarez et al., 2017; Fonseca et al., 2015, 2016; González et al., 2020), motivation (Alvarez et al., 2017; Domínguez et al., 2014; Fonseca et al., 2015, 2016), satisfaction (Domínguez et al., 2014; Guray et al., 2021), engagement (Alvarez et al., 2017), collaboration and interaction (Fonseca et al., 2016). We highlight that the modeling of the study object linked to visualization in AR enhances the learning process in digital modeling (Guray et al., 2021).

Some studies utilized designs created by students (Domínguez et al., 2014; Fonseca et al., 2016; Guray et al., 2021), which may explain why the themes of architecture, urbanism, and landscape design were the most commonly addressed. In this specific activity, the following benefits were mentioned: improved learning and motivation (Domínguez et al., 2014; Fonseca et al., 2016); satisfaction (Domínguez et al., 2014); collaboration and interaction (Fonseca et al., 2016); and the ability to visualize designs in fast and realistic simulations (Guray et al., 2021).

Other research, even if not involving modeling and design of projects, also reinforced the importance of visualization in AR for the teaching and learning processes, with the study of building performance in lighting comfort and structural systems (Sepasgozar, 2020; Vasilevski & Birt, 2020; Zhao et al., 2022).

It is known that it is up to the teacher to plan how to insert AR-based activities into their teaching plans to promote classroom learning (Kerawalla et al., 2006). However, to do so, it is important to overcome barriers such as three-dimensional modeling, system handling, the use of low-performance devices, problems with the activities, instability of the virtual element regarding markers, and lack of institutional support. To this end, institutions could offer training to teachers or even specialized financial or human resources for the development of AR-based activities.

It is worth noting that the most commonly used devices were the students' smartphones, and some studies mentioned the low performance of these devices as a difficulty (Domínguez et al., 2017, 2014). The slowness of the system (Alvarez et al., 2017) and technical problems (Vasilevski & Birt, 2020) were also mentioned, possibly due to the use of smartphones with different configurations. The difficulty of using GPS as a tracking mode was also noted, due to the low accuracy of the students' smartphones (Domínguez et al., 2014).

Markers were the most frequently used tracking mode, but the instability of the virtual element was observed during their use (Domínguez et al., 2017; Vasilevski & Birt, 2020). Surveys utilizing HoloLens did not cite difficulties with the use of the system. However, it is worth noting that the cost of HMDs may pose a barrier to their adoption in other studies.

The utilization of ready-to-use apps has facilitated the development of certain didactic activities (Almenara et al., 2021; Alvarez et al., 2017; Domínguez et al., 2014; González et al., 2020), while others necessitated significant effort for the creation of customized applications (Birt & Cowling, 2018; Vasilevski & Birt, 2020; W. Wu et al., 2019; Zhao et al., 2022). This could potentially present an obstacle to the integration of AR-based activities by educators who have limited time and/or institutional support. Nevertheless, the analyzed studies have demonstrated the pertinence of academic research to the proposed topic, with benefits outweighing difficulties, although a limited number of studies have not shown the benefits of AR utilization (Birt & Cowling, 2018; Xu & Zhang, 2022).

CONCLUSIONS

This SLR enabled a deep analysis of research that studied the application of AR-based experiences, specifically in didactic activities addressing AU themes in undergraduate and postgraduate courses. Despite this specific focus, it was observed that some studies applied other modeling and visualization systems and technologies in conjunction with AR, such as VR and digital fabrication, indicating that researchers seek to diversify the study of systems and technologies for teaching and learning practices.

It is worth noting that students' widespread access to smartphones can be leveraged by teachers in the planning of AR-based didactic activities, with the caution of designing experiences that are compatible with the students' device configurations. The SLR revealed that, in some cases, students showed engagement in developing three-dimensional models for AR visualization. Since this is already a recurring activity in AU courses, it presents a good option for involving students in the development of AR experiences for classroom activities.

Different forms of application development used by teachers and students were identified. As some studies utilized platforms that do not require programming knowledge, these represent an important alternative for teachers with limited or no experience in coding. Additionally, they offer an option for teachers who wish to create innovative, customized activities in less time. Also, existing applications can be seen as a viable option for teachers with limited available time but who still wish to adopt AR in their classroom practices (although, in this situation, it is not possible to customize the experience).

Studies identified numerous benefits on using AR for teaching and learning processes, with improvements in learning outcomes, engagement, and motivation being notable. Another significant advantage of AR is its ability to enable attractive and innovative activities outside the classroom, fostering ubiquitous learning. However, challenges were also indicated, such as modeling, system instability, the use of low-performance devices, and difficulties with the activity itself. This suggests that the adoption of AR in undergraduate and postgraduate education still requires considerable effort from those involved. Hence, it is essential for educators to undergo training in order to develop their own innovative AR-based activities, taking into account their proficiency in AR systems.

The number of articles analyzed in this SLR highlights the need for further research in this specific field. Thus, new studies could provide greater support for teachers who wish to incorporate innovative AR-based didactic activities in their classes.

The main challenge encountered in conducting this SLR was the time required for the in-depth analysis of highly technical articles. Future studies could expand the SLR to include a more thorough analysis of the tools used for application development.

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Social Media Habits of University Students and the Effects of Media on Students

Azmiye YINAL

azmiye.yinal@akun.edu.tr

Faith Umene BANJE

faith.banje@akun.edu.tr

Abstract

With the effect of globalization and digitalization, remarkable progress has been made in internet and smart phone technology. Nowadays especially, with the increasing number of users, smartphones have become an important need for children and young individuals. In this sense, behavioral disorders in young individuals have become inevitable due to the increasing number of users and the diversity of social media applications. Therefore, the problem of internet abuse and risky social media use has emerged. While this affects the social habits of young individuals, it also leads to psychological disorders. In addition, while serious problems arise in the social lives of university-age students, there are also failures in their educational life. Therefore, the main aim of our research is aimed at examining the social media habits of university students and the effects of social media on students in terms of various variables. For the research, data was obtained by online survey method on 333 university students studying in Cyprus. Personal Information Form and Social Media Addiction Scales for adolescents and adults were used for the research. SPSS programs were used in the analysis of the data. In the analysis of research data, due to the increase in the time spent by university students on social media, a significant relationship was found in social media addiction tests in the context of both genders. Especially since the social media habits of the students at the university are in a controlled manner, negative results have been obtained in their social relations and academic achievements.

Keywords: Internet, smart phone, social media, social media addiction.

Introduction

Undoubtedly, the most experienced development of the current century is the diversity of internet technologies and smart phones. Our changing lifestyle and habits with the rapid development of technology have alternated our entire social life, especially the way we communicate (Yinal, Lesinger, & Şahoğlu, 2019). It is seen that social media applications are gradually shaping our lives and transforming all our real relationships around this lifestyle. In this sense, the development of technology and the spread of smart phones have revealed certain pathological effects in human relations. It is thought that these pathological effects occur with the sense of curiosity about technology and the increase in social media use through smartphones. For this reason and with the increase in the use of social networks, some addiction problems have emerged among users (Baykara & Yinal, 2023).

Technological developments which are in a constant change eventually progressed in line with the needs of individuals and gave rise to some fictitious needs. Particularly, smart phones and social media applications have become an indispensable way of life of human life and almost become a control mechanism through users (İşman, 2001). Therefore, cultural changes in human and social life have become inevitable thanks to the developing technological elements. In the face of this situation, individuals faced serious problems in their academic and business lives, as well as experiencing negative mental problems. As a result of these negative effects, various technology-centered addictions have emerged in the lives of individuals (Sarıçam, 2018).

Smartphones and university social media applications are mostly in the lives of adolescents today (Yılmaz, 2018). Following the widespread of social media applications, some mental disorders and pathological addictions occur in adolescents. According to the research data obtained in this sense; The rate of smartphone use among adolescents was found to be 76%. In this research, individuals also stated that they have a second smartphone at the rate of 46% (Phillips, 2011).

In addition, among the studies carried out, it was thought that sociological, psychological and physical factors may be among various factors on social media and internet addiction (Şeker, 2018). In particular, some studies that have determined the relationship between the internet and depression come to the fore. In these studies, problematic internet use was found to be positively associated with depression (Morrisson, 2021).

The use of social media is interrelated and has become a tool used to meet the communication needs of people (Yinal, Kalkan, & Çakici, 2022). Thanks to these social media applications, people have the need to make different friendships and increase their self-esteem. In this age, in which the ways of communicating have completely changed owing it to social media, the problems of adolescents come along with them (Social, 2018). At this point, examining the mental and psychosocial problems faced by adolescents constitutes the basis of our research. To this end, the effects of social media applications on university students will be evaluated through the findings obtained. Below are the research questions:

1. What is the level of social media use of university students and the effect of social media on students?
2. Is there a relationship between students' problematic internet use and its psychological effects?
3. Is there a relationship between social media addiction and academic failure of students?
4. Is there a relationship between students' use of social media and psychological well-being?
5. The effects of university students on the use of social media; Is there a significant difference according to gender, family income level, class level, academic achievement and demographic characteristics?

Purpose of the Study

The main purpose of this research is to examine the social media habits of university students and the psychological effects of these habits. In addition, examining social media habits according to socio-demographic and different variables is among the aims of the research.

Hypotheses

University students;

H1: Social media usage and influence levels are related.

H2: There is a difference between demographic characteristics and social media influence levels.

H3: Social media usage and influence levels of social media differ according to gender characteristics.

H4: Social media usage and influence levels of social media vary according to age.

H5: Social media usage and influence levels of social media differ according to the class.

H6: Social media usage and the effect levels of social media differ according to the education levels of the parents.

H7: Social media usage and influence levels differ according to socioeconomic level.

H8: There is a difference between the time they spend on social media and the effect of social media on students.

H9: Social media usage and influence levels differ according to the means by which social media is connected.

Limitations

1. Findings from the research and our research universe were obtained from 333 students studying at universities in the Turkish Republic of Northern Cyprus in 2020-2021.
2. The data collection method for the research was applied in the form of an online scale system.
3. It is limited to the findings obtained from the research and the scales used.

Importance of the Study

The global era we live in is moving towards changing our habits with the effect of technology and the internet. Most especially with the spread of internet technologies, social media applications have become a way of life used by all segments both by the young and old. In this sense, many researches are being done on the problem of social media addiction and there are still studies on this area. In this study, the use and effect of social media habits on university level students will be examined. In terms of the importance of the research, it is thought that this study will contribute to the suggestions and shed light for the succeeding researches to be done.

Method

Research Model

The “Social Media Addiction Scale (SMDS-YF)” used for this study and the SPSS 28.0 software package were used in the analysis of sub-dimension data. A frequency table of descriptive data regarding the socio-demographic characteristics collected from the participants was created. In addition, the Cronbach Alpha reliability coefficients and participant sub-dimensions of the scale were also calculated. The model of this study; The relational survey model, which is related to revealing the variables between the results obtained from the general survey and general survey models of our thesis titled social media habits of university students and the effect of social media on students, was preferred. Quantitative research technique was preferred for this study. In addition, the social media usage purposes of the students at the university and the effects of social media on the students formed the relational screening model of this study. As a relational screening method, it was used to determine the relationship between two or more variables and to determine its level. For the research, this scanning model was applied to analyze both the demographic characteristics of university students and the effect

of social media with the correlation type scanning model and the comparative relational scanning model between the social media usage habits of university students.

Sampling Method

The research group selected for this study is university students residing in Cyprus covering the 2021-2022 academic year. University students were included in the study. The data collection method for the research was applied in the form of an online scale system. The findings obtained from the research are limited to the scales used in the research. The universe of the research consists of 110 thousand university students residing in Cyprus. It includes university students who can be reached as a sample group and who participate voluntarily, with a total of 333 people. As a data collection tool in the research, it was provided through scale forms in the internet environment.

Data Collection

In this research, the analysis of social media usage habits and addictions in university students was made in conjunction with scales, and it refers to a descriptive research among the relational screening models in examining the effects of social media on students.

1. Personal Information Form

The demographic form will be used to determine the age, gender, internet and smartphone usage status, duration of use, purpose of use and social relations of the participants.

2. Social Media Addiction Scale (SMDS-YF)

Van den Eijnden et al. (2016). The scale was initially developed as 27 items, then a short form was created with 9 items. The cut-off point of the scale, which was scored as “No” and “Yes”, was determined as 5. A range of 0 to 9 points was used for scoring the scale. Here, those who answered "Yes" to 5 or more items out of 9 were considered to have social media addiction. Confirmatory factor analysis fit indices in the scale gave good results [$\chi^2(27, n=601) = 54.129, p=.002, CFI: .989, RMSEA=.041(90\% CI: .025-.057)$]. 27 items were found to be strongly correlated with social media addiction ($R=.94, P<.001$) The reliability of the scale was measured with Cronbach's Alpha (0.82) and had good reliability ($M=1.52, SD= 2.11$).

Results

The shapiro-wilk values were defined as $p < 0.005$ when the study data were analyzed under the assumptions of normality. In addition, it was determined that the deviation values divided by the error were within ± 1.96 . Therefore, the scale and its dimensions were evaluated by correlation analysis. In addition, Mann Whitney's U test, which is one of the non-parametric tests, was used to determine whether there was a significant difference between the scale and its sub-dimensions and the socio-demographic data of the participants. In addition, Chi-square test was performed in the analysis of categorical data.

Table 1. Sociodemographic data of the participants (N=333)

Demographic variables	N	%
Gender		
Female	168	50,5
Male	165	49,5
Total	333	100,0

Table 1 shows the analysis of the sociodemographic variables of the participants. When the gender of the participants was tested, 50.5% were female and 49.5% were male.

Table 2. Cronbach Alpha Internal Consistency Co-efficient for the Scale and its Sub-dimensions

Scale Sub-Dimensions	Number of items	Cronbach (α)/KR-20
Social Media Addiction Scale for Adolescents	9	,465
Social Media Addiction Scale	20	,670
Virtual Tolerance Sub-Dimension	11	,361
Virtual Communication Sub-Dimension	9	,549

Reliability analysis results related to the scale and its sub-dimensions are given in Table 2. Looking at the results of the reliability analysis, it was determined that the Cronbach alpha values ranged between .36 and .67.

Table 3. Descriptive Statistics of Scores from Scale and Subscales (N=333)

	Min	Max	Ort.	SS
Social Media Addiction Scale for Adolescents (SMBO-KF)	,00	9,00	3,84	1,93
Total				
Social Media Addiction Scale (SMBO-YF)		82,00	57,90	10,04
Total				
Virtual Tolerance Sub-Dimension	30,00 12,00	42,00	29,66	6,26
Virtual Communication Sub-Dimension	11,00	40,00	25,69	5,60

In Table 3, descriptive statistics related to the total scores of the SMDS-SF Scale, total and sub-dimensions of the SMDS-SF Scale are presented.

Table 4. Correlation Analysis of the Scale and its Sub-Dimensions

		1	2	3	4
1- SMBO-KF Total	r	1			
	p	.			
2- SMBO-YF Total	r	,426**	1		
	p	<0.001	.		
3-Virtual Tolerance Sub-Dimension	Sub-r	,402**	,889**	1	
	p	<0.001	<0.001	.	
4- Virtual Communication Sub-Dimension	Sub-r	,390**	,861**	,597**	1
	p	<0.001	<0.001	<0.001	.

Correlation is significant at 0.05 level (Spearman correlation test), ** Correlation is significant at 0.01 level (Spearman correlation test)

According to this analysis, a moderately statistically significant positive correlation was found between the SMDS-SF Total Score and the SMDS-YF Total Score ($r=0.426$ $p<0.001$).

A positive moderate statistically significant correlation was found between the SMDS-SF Total Score and the “Virtual Tolerance” score of the SMDS-YF Sub-Dimensions ($r=0.402$ $p<0.001$).

A weak and statistically significant correlation was found between the SMDS-SF Total Score and the “Virtual Communication” score of the SMDS-YF Scale Sub-Dimensions ($r=0.390$ $p<0.001$).

Table 5. Comparison of the Scale and Subscale Scores of the Participants in terms of Gender

Variables	Gender	N	Ort±SS	Z	p
SMBO-KF Total	Female	168	3,82±2,04		- 0.512
	Male	165	3,88±1,82	0,672	
SMBO-YF Total	Female	168	56,48±9,67	-	0.002
	Male	165	59,35±10,25	3,036	
Virtual Tolerance Sub-Dimension	Female	168	28,98±6,08		- 0.020
	Male	165	30,36±6,39	2,321	

Virtual	Female	168	24,89±5,45	-	
Communication Sub-Dimension	Male	165	26,52±5,65	2,725	0.006
Mann Whitney U Test					

As seen in Table 5, the scale and sub-dimension scores of the participants were compared according to the gender variable. A statistically significant difference was found between male and female participants in the total score of SMDS-YF. It was determined that the total score of SMDS-YF was higher in male individuals than in females ($Z=-3.036$ $p=0.002$).

The “Virtual Tolerance” score of the SMDS-YF Scale Sub-Dimensions showed a statistically significant difference between the female and male participants. The “Virtual Tolerance” score was found to be higher in male individuals compared to females ($Z=-2.321$ $p=0.020$).

A statistically significant difference was found between the female and male participants in the "Virtual Communication" score of the SMDS-YF Scale Sub-Dimensions. It was observed that the “Virtual Communication” score was higher in male participants than in females ($Z=-2.725$ $p=0.006$).

Table 6. Comparison of Gender and SMDS-SF Scale

Women	N	100	68	168
	% Gender	59,50%	40,50%	100,00%
	% SMBO KF Group	52,60%	47,60%	50,50%
	% of Total	30,00%	20,40%	50,50%
Men	N	90	75	165
	% Gender	54,50%	45,50%	100,00%
	% SMBO KF Group	47,40%	52,40%	49,50%
	% of Total	27,00%	22,50%	49,50%
TOTAL	N	190	143	333
	% Gender	57,10%	42,90%	100,00%
	% SMBO KF Group	100,00%	100,00%	100,00%
	% of Total	57,10%	42,90%	100,00%

Chi Square

As seen in Table 6, gender and SMDS-SF scale were compared. According to this analysis, it was determined that 59.5% (n=100) of women were not social media addicts and 40.5% (n=68) were social media addicts. It was determined that 54.5% (n=90) of the men were not social media addicts, and 45.5% (n=75) were social media addicts. This difference between men and women was not statistically significant ($p=0.359$).

Conclusion and Recommendations

Conclusion

Today, it is known that the use of social media covers nearly half of the world's population. Social media, which is a very new fraction of our daily life has started to gain a place in our lives with the development of the technical features of smart phones. Social media which has become the subject of many researches within this area also seeks answers to the socialization needs of people in terms of diversity. In this sense, while social media is an important tool for people to establish social relations, it also encourages the production of digital content. Therefore, due to the increasing frequency of usage, transformations have occurred in human relations and all our life practices have changed in the axis of consumption, economy, socialization, communication, trade and education. A new digital culture has come to the media, especially in areas such as e-commerce, online education and digital media journalism.

Globalization and digital media have a very close relationship with each other. In particular, the fact that social media allows users to interact with users living in different parts of the world has led to the emergence of a digital culture. The fact that users are younger in age also creates a predictive idea for future generations.

On the other hand, it has been determined in the research that the user base of social media users has increased in recent years and covers almost all age groups. Therefore, in the face of this increasing frequency of usage, problems in using the internet and social media have emerged in both young individuals and higher age groups. In this sense, the general subject of our research, the use of social media by university-aged individuals and the effect of social media on university students have been the focus of this research. In the first stage of our research, demographic information and personal information about the students were included. Using this method online, the social media usage levels and addictions of the students were determined. In addition, the social media addiction scale (SMDS) for adolescents and adults was used in the study and the findings were provided through the SPSS program. In the scale study, which was carried out with a total of 333 participants, the participants were reached via the internet by using the Likert type scale method. In the light of the findings obtained in the study, when the statistical data of university students according to gender variables were examined, some different variability in the sociodemographic aspect were determined. When the gender variables of the participants were examined, it was determined that 50.5% (n=168) were female and 49.5% (n=165) were male.

When the obtained findings are analyzed; It has been understood that the students' social media usage purposes are chatting, entertainment, content sharing and following different content, sharing photos and videos, playing games, and being a member of social groups. In addition, disturbing visuals and publications encountered during the use of social media by university students create shock and trauma effects on students. These situations cause students to withdraw from social and social life over time. To a large extent, introverted, high anxiety and anxiety symptoms may be experienced. It was also understood that because the time they spent on social media did not differ in terms of both genders, they faced failures in both genders in their academic lives and lost their control due to the increase in the time they spent on the internet. On the contrary, it has been understood that university students feel very nervous and restless when they spend their time outside the use of social media. However, it was determined that there was no significant relationship on both genders in terms of class, age, number of siblings and family economic levels.

The age of social media, which is a revolutionary era in the field of new media and internet technologies, is known to cause various effects at macro and micro levels for all users. In addition to all these, the social media usage habits of university-aged individuals started from a young age and became the center of their lives. Mostly when staying away from social media, individuals experience significant withdrawal symptoms. Accordingly, while there are deteriorations in family and social relations, there are also failures in educational life. At this point, communication and addiction theorists agreed that social media has become an indispensable life activity for users. One of the prominent approaches among these theories is; uses and gratifications approach. In this approach it emphasizes that social media or internet addicted individuals' cognitive, sensory, psychological needs and socialization needs have become a mandatory requirement for individuals. Individuals feel connected to social media in terms of feeling good both psychologically and physiologically. Similar results were obtained in the light of the data obtained in this study and the literature reviewed. From this point of view, the purpose of this research is to investigate the social media habits of university students and the effect of social media on students and to question their frequency.

Suggestions

Considering the study and its results, it was concluded that the social media usage levels of university students have a negative effect on both genders. For this reason, it has been determined that the level and duration of use of social media have increased negatively in students' academic lives. Therefore, the problematic effects of the internet and social media use of students has become increasingly difficult to control and the duration of use of students has increased. At this juncture, together with the necessary guidance and psychosocial support, students' motivation for their personal success should be provided and their planned studies should be aimed. Contrarily, it may be necessary to examine the environmental factor and family structure of the individual (family, sibling, friend) as well as guidance studies for the examination of adolescents with social media addiction symptoms.

An approach that is far from a prohibitive attitude towards students should be exhibited and dangerous situations in the use of technology and social media should be mentioned. Social media usage times should be regulated in order to create sufficient awareness for students.

In order to eliminate social media deprivation in students, psychosocial intervention trainings for parents should be given as well as guidance studies. Although families have a great responsibility, information seminars should be held on this subject.

In order to be protected from the harmful effects of social media and the internet, the groups or pages that students follow should be monitored. Pages that are considered harmful can be blocked from following. Security services can be used especially in home internet connection.

In addition, in order to control the use of social media in students' home and school lives, restrictions can be imposed on the time of use and by avoiding a prohibitive attitude, students' spending time and socialization needs can be met by timely planning.

For the students with social media addiction symptoms who have insufficient financial situation, solutions should be sought for the necessary preventive studies and necessary social support plans should be provided on this issue.

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Teacher Education MOOCs: Engagement and Experiences of Pre-service Teachers

Zahra Kazmi

*Research Scholar, Department of Teachers Training & Non-Formal Education (IASE),
Jamia Millia Islamia,, New Delhi, India
Email- kazmizahra110@gmail.com, rs.kazmizahra110@jmi.ac.in
Orchid ID- <https://orcid.org/0000-0003-0895-9788>*

Prof. Syedah Fawzia Nadeem

*Professor, Department of Teachers Training & Non-Formal Education (IASE), Jamia Millia Islamia, New Delhi, India
Email- snadeem@jmi.ac.in*

ABSTRACT

MOOCs (Massive Open Online Courses) are a relatively new trend in the field of education. They are gaining popularity day by day all over the world. These online courses can contribute significantly to teachers' education and professional development. In line with this, the present study aims to investigate pre-service teachers' engagement in MOOCs and their experiences with learning through MOOCs. The participants of this study included 200 pre-service teachers from different teacher education institutions in India who have participated in at least one teacher education MOOC. The researchers developed a questionnaire and used the snowball sampling technique to gather data from pre-service teachers. The findings of this study will be relevant to policymakers, educators, and researchers interested in enhancing the quality and accessibility of teacher education programs. The study will also be of interest to pre-service teachers who are considering participating in MOOCs for their professional development.

Keywords: Massive open online courses, MOOCs, online learning, teacher education, pre-service teachers, teacher professional development

INTRODUCTION

Massive Open Online Courses are online courses that are designed to be accessible to anyone, anywhere in the world, and can accommodate an unlimited number of participants. According to Zhu et al. (2020), MOOCs and traditional online courses differ in terms of their accessibility and fee structure. Unlike traditional online courses, MOOCs are open access to all potential learners and do not typically charge registration fees for learners who do not intend to obtain a certificate.

MOOCs offer a range of benefits, such as flexibility, free-of-charge access, and the ability to learn at one's own pace. These features make MOOCs an attractive option for pre-service teachers who may face time and financial constraints while pursuing their education. Moreover, MOOCs offer opportunities for pre-service teachers to interact and collaborate with educators and other learners from all over the world, promoting cross-cultural exchange and sharing of best practices. According to Gómez-Galán et al. (2020), pre-service teachers view MOOC courses as valuable teaching models in socio-educational contexts due to their advantages such as free usage, accessibility to disadvantaged groups, and flexible scheduling. However, these courses also have significant drawbacks. The authors note that the lack of adequate follow-up on the student, uninspired course materials, and inadequate evaluation of learning are all major issues with MOOCs. Notably, the primary concerns identified were pedagogical, rather than technical.

Misra (2018) highlighted the significance of MOOCs as they have emerged as a cost-effective and convenient way to supplement traditional methods of teacher professional development. The study claims that the widespread enthusiasm for MOOCs in the education community is based on the belief that they can provide mass training to teachers across different cultures and languages. These courses can offer teachers access to a variety of high-quality educational resources that can be used to enhance their teaching skills and keep them up-to-date with the latest developments in education (Misra, 2018).

Greene et al., (2015) suggest that teachers may have a higher chance of continuing with, completing, and succeeding in MOOCs. However, Hodges et al., (2016) emphasised that designers need to make intentional design decisions to accommodate observed needs of teachers in MOOC-based professional development experiences.

A study conducted by Koukis and Jimoyiannis (2017) focused on the use of pdMOOC (professional development Massive Open Online Course) created for language teachers, with the objective of enhancing their understanding

and capabilities in incorporating particular Web 2.0 tools into their teaching practices. The study employed both qualitative and descriptive analysis, which demonstrated the potential of MOOCs in promoting teacher engagement and collaboration while also offering improved opportunities for their professional development in a non-formal setting.

Sezgin (2020) explored the views and experiences of both pre-service teachers and teacher trainers regarding the integration of MOOCs in teacher education. It was found that despite a lack of awareness or exposure to MOOCs, the majority of pre-service teachers and teacher trainers perceive them to be beneficial for professional development. Based on the findings, it was claimed that the participants had a positive attitude towards the use of MOOCs in teacher education.

Research on teacher professional development also suggests that equipping pre-service teachers with a diverse range of pedagogical knowledge prior to entering the classroom can enhance their ability to adapt to dynamic and rapidly changing learning environments (Batchelor & Lautenbach, 2015). Using MOOCs into the educational and professional development of teachers can provide a continuous, efficient, and affordable way to improve their skills. Additionally, it allows teachers to keep themselves up-to-date with evolving educational technologies, which is supported by the technology-based structure of MOOCs (Sezgin, 2020).

Donitsa-Schmidt et al. (2020) explored pre-service teachers' perceptions of the use and contribution of MOOCs in initial teacher education programmes, particularly during the COVID-19 pandemic. They found that pre-service teachers who study more MOOCs believed that these courses would positively impact their future teaching. They also recognized the significance of MOOCs during times of crisis and advocated for a higher proportion of MOOCs to be included in initial teacher education programmes.

After reviewing different researches, it was realized that it is important to gain insight into the effectiveness of MOOCs in teacher education and the challenges faced by pre-service teachers while learning through these open courses. Analyzing pre-service teachers' engagement in MOOCs and examining their experiences can provide valuable information on the suitability of MOOCs for teacher education. Investigating the educational value of MOOCs as perceived by pre-service teachers in learning through MOOCs can help in understanding the potential of MOOCs in enhancing teacher professional development. Also, identifying the challenges faced by pre-service teachers in learning through MOOCs can provide useful insights into the limitations of these courses and suggest ways to overcome them.

The objectives of this study are as follows:

1. To analyse pre-service teachers' engagement in MOOCs
2. To examine the experiences of pre-service teachers while learning through MOOCs
3. To investigate MOOCs' educational value, as perceived by pre-service teachers
4. To find out the challenges faced by pre-service teachers in learning through MOOCs

METHODS AND MATERIALS

This section includes information about research design, participants, data collection tool, data collection procedure and analysis.

Research Design

Quantitative research design was used in this study.

Participants

The participants of this study included 200 pre-service teachers from different Teacher Education Institutions pan-India, who have participated in at least one Teacher Education MOOC (irrespective of course completion). The snowball sampling technique was used to collect data from pre-service teachers.

Tools and Techniques

A questionnaire was developed to collect data from pre-service teachers who have participated in one or more MOOC related to Teacher Education. The questionnaire was divided into 4 sections: demographic information of the participants, engagement and experiences with MOOCs, educational value of MOOCs and challenges in learning through MOOCs.

Procedure of Data Collection

The data was gathered from pre-service teachers through snowball sampling technique. A Google form was created to collect the data and the link was shared to some of the identified MOOC participants. They were further asked

to share the details of other MOOC participants who have participated in one or more Teacher Education MOOC. In total, 207 responses were received, of which 200 were usable. The survey was carried out for 6 months..

Analysis of the Data

The quantitative data obtained were entered and tabulated into MS Excel sheet for data analysis procedure. The percentage and frequency count was calculated for each item of the questionnaire.

RESULTS

Pre-service teachers were asked about their demographic information, their engagement and experience with MOOCs, their perception about MOOCs' educational value and the challenges they face while learning through MOOCs.

Demographic information

The study collected data from both male and female pre-service teachers about their experiences of participating in MOOCs. The findings show that 56.5% of the respondents were female and 43.5% were male, as illustrated in Figure 1. This indicates that both genders were represented in the study and provides insight into the experiences of both male and female pre-service teachers in MOOCs.

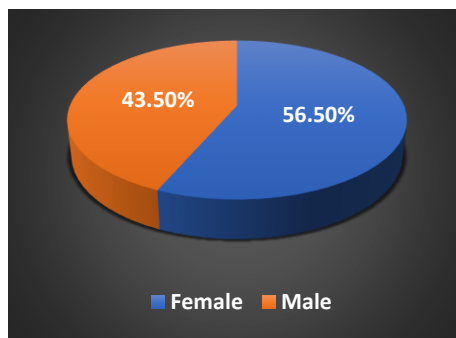


Figure 1: Gender of the participants

A majority of the participants in this study were under 25 years old, comprising 67.5% of the total sample. Meanwhile, 23% of the participants were between the ages of 25 and 30, and the remaining 9.5% were over 30 years old. This suggests that MOOCs may be more popular among younger individuals who are seeking flexible and easily accessible learning opportunities. Also this segment of the population has more risk taking ability and a desire to try new technologies.

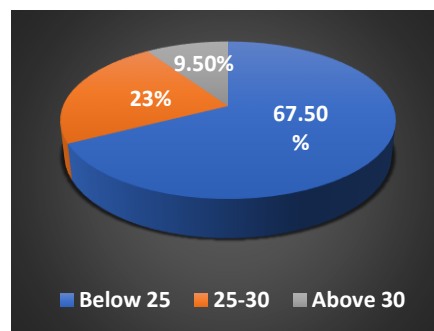


Figure 2: Age of the participants (in years)

Figure 3 shows that a significant proportion of the pre-service teachers who participated in the MOOCs were enrolled in private universities (more than half of them), while around one-third of them were enrolled in central universities and the rest were from state universities. This could imply that private university students are more inclined to use MOOCs as a means of accessing professional development opportunities.

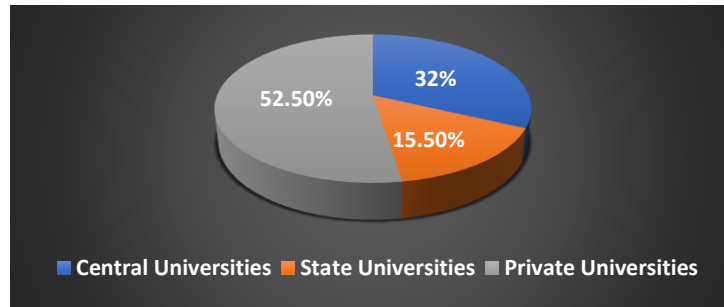


Figure 3: Type of universities the pre-service teachers were enrolled in

Engagement of pre-teachers in MOOC(s)

The pre-service teachers were asked to indicate the current level of their course. The responses are illustrated in Figure 4.

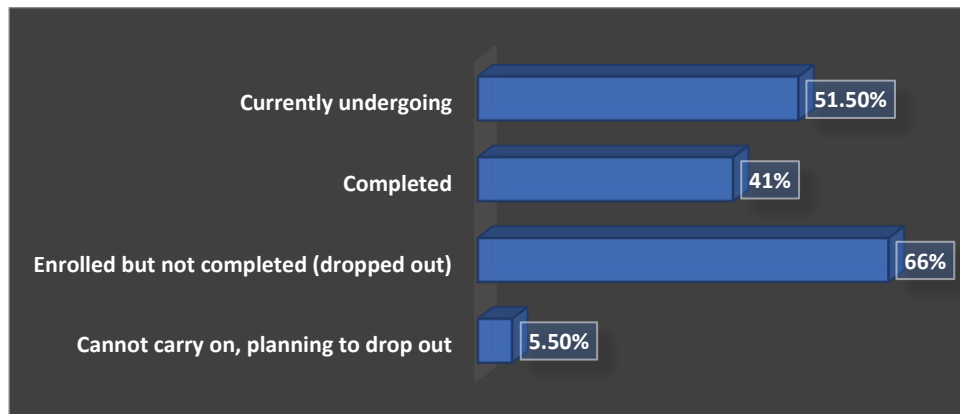


Figure 4: Current level of pre-service teachers' course(s)

The findings of the study revealed that a significant proportion of pre-service teachers who initially enrolled in MOOCs ended up dropping out, with 66% of them reporting this outcome. This suggests that there may be some challenges or barriers that prevent pre-service teachers from completing MOOCs. Additionally, more than half of the pre-service teachers (51.5%) reported that their course was still ongoing at the time of data collection. Of those who had completed one or more MOOCs, 41% of sample reported doing so. However, a small proportion (5.5%) of pre-service teachers indicated that they were unable to continue with the course and intended to drop out. The pre-service teachers reported using a variety of MOOC platforms, including Coursera, EdX, SWAYAM, Udemy, Canvas Network, and Future The use of various platforms to access MOOCs for their personal learning or professional development by pre-service teachers implies that the realm of education is endowed with diverse options and platforms for online learning.

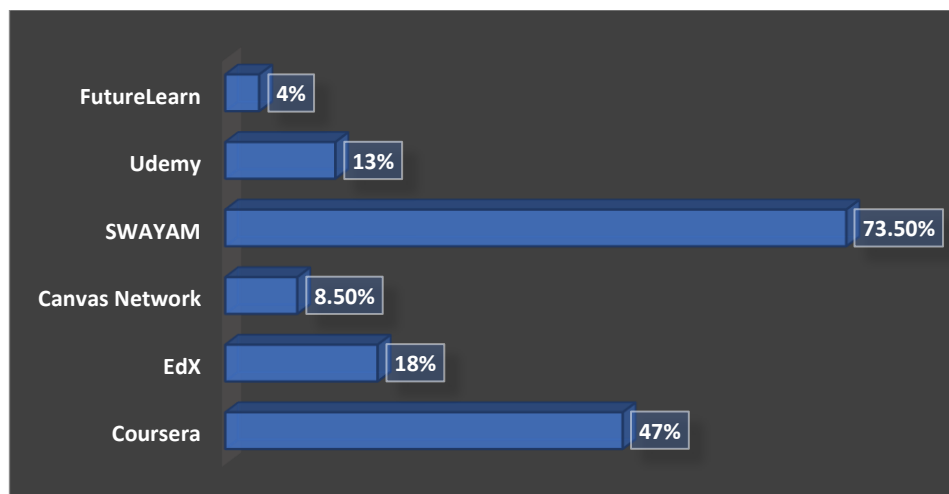


Figure 5: MOOC platforms used by pre-service teachers

From Figure 5, it was found that SWAYAM was the most popular MOOC platform among the pre-service teachers, with 73.5% of respondents reporting enrolment in courses offered through this platform. Coursera was the second most commonly used platform, with 47% of pre-service teachers enrolled in courses through this platform. EdX was used by 18% of pre-service teachers, while Udemy was used by 13%, the Canvas Network by 8.5%, and Future Learn by 4%.

In Figure 6, the responses of pre-service teachers regarding the number of hours they allocate to learning through MOOCs per week are presented.

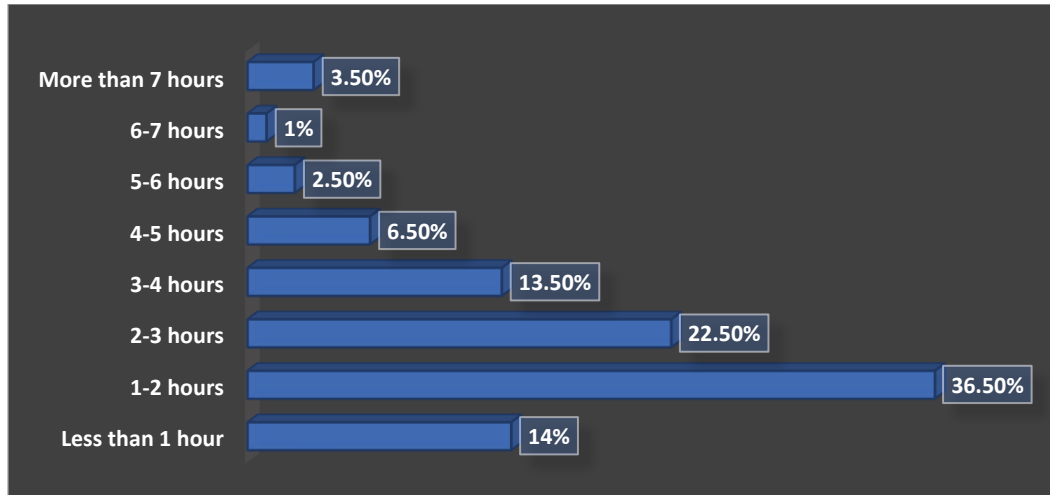


Figure 6: Number of hours allocated to learning through MOOCs per week

The findings suggest that the majority of the pre-service teachers spent 1-3 hours (59%) per week on MOOCs. On the other hand, a smaller percentage of pre-service teachers (less than 5%) reported spending more than 6 hours per week on MOOCs, indicating a higher level of engagement and dedication to the course. However, it is notable that 14% pre-service teachers reported spending less than an hour per week on MOOCs, which may indicate a lower level of commitment or engagement with the online courses.

Figure 7 presents the findings of the pre-service teachers' frequency of completing assigned tasks in MOOCs.

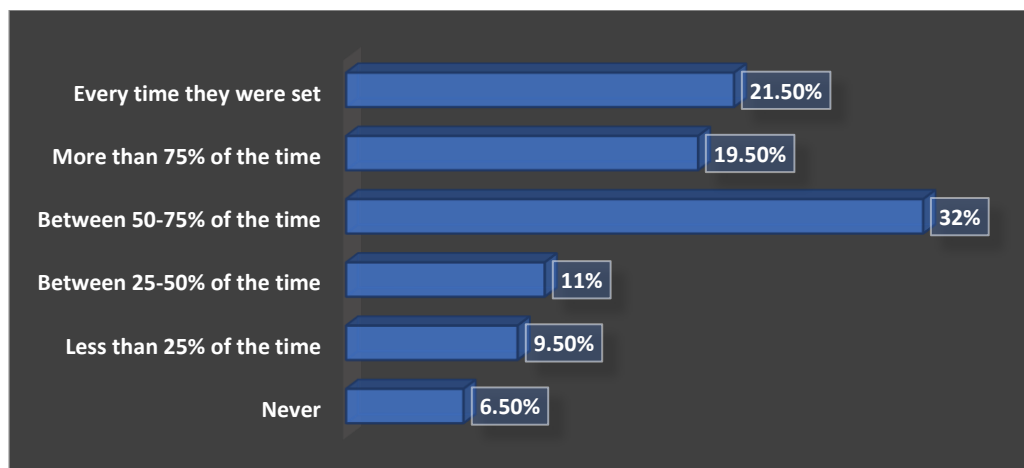


Figure 7: Frequency of completing the assigned tasks in MOOCs

The study revealed that 21.5% of pre-service teachers reported completing the assigned tasks every time, while 19.5% completed them more than 75% of the time. In addition, 32% of the sample completed the assigned tasks between 50 and 75% of the time, whereas 11% completed them between 25 and 50% of the time. Notably, 9.5% of pre-service teachers reported completing assigned tasks less than 25% of the time, and 6.5% never completed them. These findings highlight the variability in task completion rates among pre-service teachers in MOOCs, with a notable percentage of them struggling to consistently complete the assigned tasks.

The pre-service teachers were also asked about their engagement level with the course content in MOOCs. Figure 8 illustrates the responses of the participants.

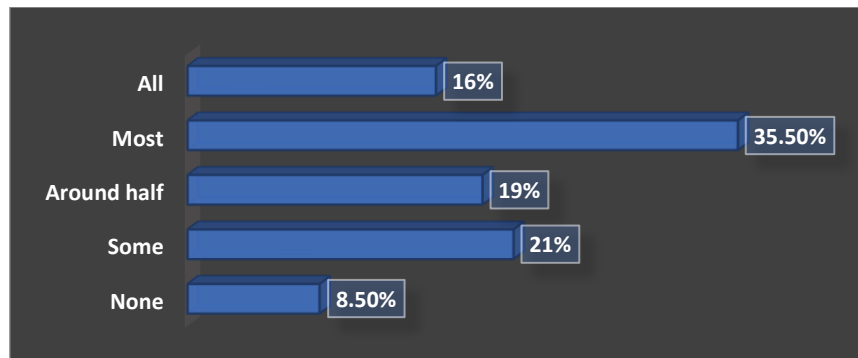


Figure 8: Course content watched or read as compared to the total course length

The findings suggest that a majority of pre-service teachers did not complete the entire course content, with only 16% reporting that they watched or read the entire content. On the other hand, 35.5% reported watching or reading most of the content, while 19% and 21% watched or read about half and some of the content, respectively. However, a small proportion of pre-service teachers (8.5%) indicated that they did not watch or read any course content at all. These findings suggest that while MOOCs provide a flexible learning experience, the learners' level of engagement with the course content may vary, with some learners not completing the course content.

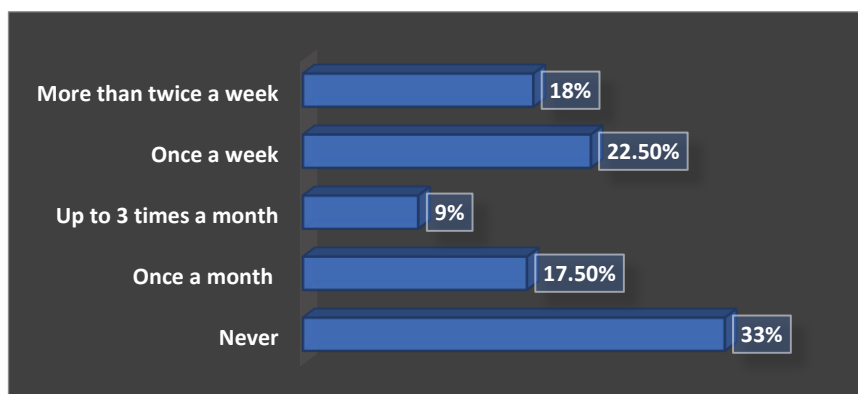


Figure 9: Participation frequency of pre-service teachers in the discussion forum

To gather insights into the participation of pre-service teachers in MOOC discussion forums, they were asked about the frequency of their participation. Figure 9 reveals that a small percentage (18%) of pre-service teachers engaged more than twice a week, while a larger percentage (22.5%) engaged once a week. Additionally, 33% reported that they never participated in discussion forums. The findings also showed that 9% of pre-service teachers participated up to three times a month. Therefore, it was found that the frequency of participation in MOOC discussion forums varied among the pre-service teachers, with a considerable number of them (33%) reporting no participation at all.

MOOC Experiences

The pre-service teachers were also asked about the quality of the course materials provided in the MOOC(s) they attended, and the findings, shown in Figure 10, indicate that a majority of them agreed that the quality of course content was good. Specifically, 40% strongly agreed, while 48% agreed with the statement. Only a small proportion of pre-service teachers were unsure (8%) or disagreed (3.5%). This suggests that, overall, the pre-service teachers had a positive perception of the quality of the course materials provided in the MOOC(s) they attended.

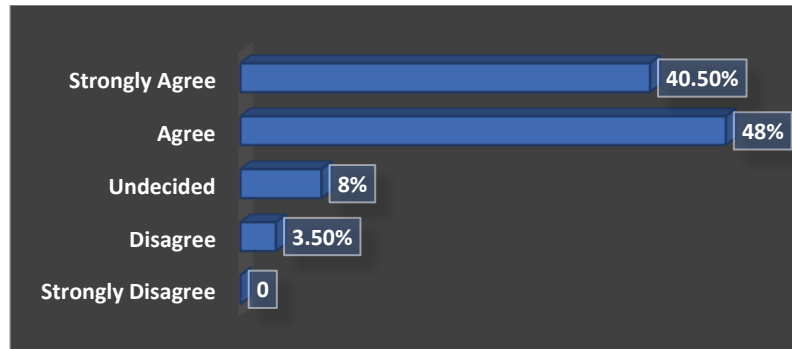


Figure 10: Responses of pre-service teachers to the statement “The quality of the course content was good”

The pre-service teachers were asked about the ease of understanding the course content provided in the MOOC(s) they attended. The results are presented in Figure 11.

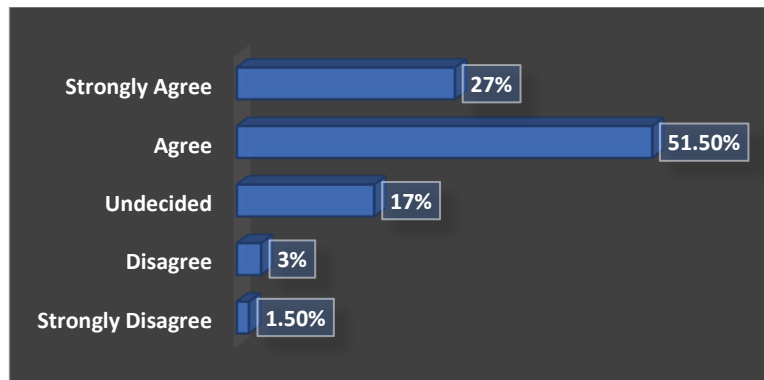


Figure 11: Responses of pre-service teachers to the statement “The course content was easy to understand”

Findings revealed that over half of the pre-service teachers who participated in the survey found the course content to be easy to understand. Specifically, 51.5% of the respondents agreed with this statement, with 27% strongly agreeing. However, there were some who were unsure (17%) and some who disagreed (4.5%). Only 1.5% of the respondents strongly disagreed. This indicates that the majority of the pre-service teachers found the MOOC content to be easy to understand.

Figure 12 shows the responses of pre-service teachers when asked about the adequacy of information on MOOC platforms.

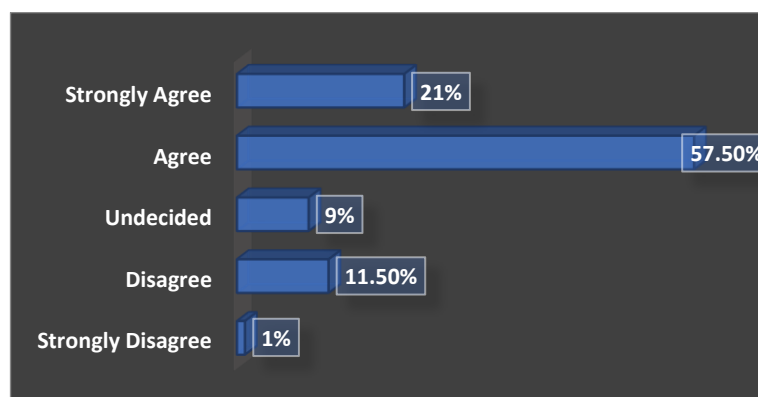


Figure 12: Responses of pre-service teachers to the statement “The amount of information on the MOOC platform was adequate”

The findings show that the majority of pre-service teachers agreed that the amount of information on MOOC platform was adequate, with 21% strongly agreeing and 57.5% agreeing. However, 9% of pre-service teachers were unsure, while 12.5% disagreed, with 1% strongly disagreeing and 11.5% disagreeing. These findings suggest that a significant proportion of pre-service teachers perceive the amount of information provided on the MOOC platform to be inadequate, which may have implications for their learning experience and outcomes. Therefore, it

may be important for MOOC providers to ensure that the information provided on their platforms is adequate and easy to navigate to facilitate the learning process for all learners.

Next, the pre-service teachers were asked if they felt they received sufficient support from their MOOC instructor or technical support. The results, presented in Figure 13, show that 67% of the pre-service teachers agreed or strongly agreed with the statement. However, 17% of respondents were uncertain and 17% either disagreed or strongly disagreed with the statement, indicating that there may be room for improvement in terms of the support provided to MOOC learners.

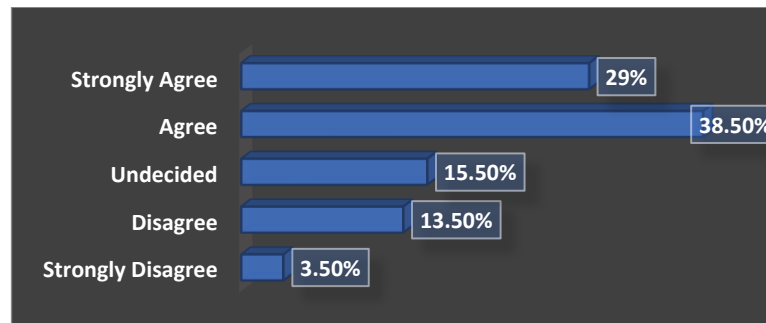


Figure 13: Responses of pre-service teachers to the statement "I received adequate support from my MOOC instructors or technical support"

The pre-service teachers were asked whether they felt that their questions were always addressed by MOOC instructors. The results, as displayed in Figure 14, indicate that a majority of pre-service teachers (66.5%) agreed with the statement, with 18% strongly agreeing and 48.5% agreeing. While 23% were uncertain, 10.5% of pre-service teachers disagreed, with 4% strongly disagreeing and 6.5% disagreeing. Overall, it seems that a majority of pre-service teachers felt their questions were addressed, but a significant proportion still expressed uncertainty or disagreement with the statement.

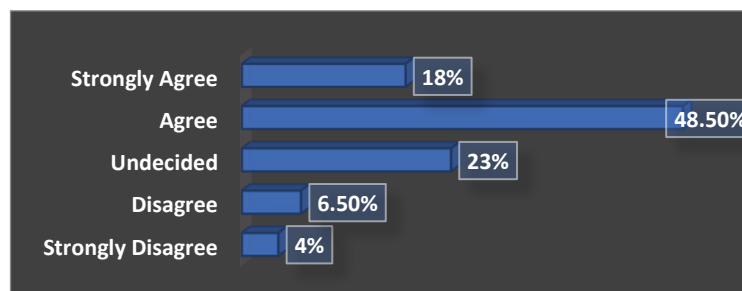


Figure 14: Responses of pre-service teachers to the statement "My queries were answered by MOOC instructors whenever I raised one"

MOOC Educational Value

The pre-service teachers were asked several questions related to the educational value of MOOCs (Figure 15), and their responses shed light on some interesting insights. Firstly when asked about the main reasons for enrolling in a MOOC, all pre-service teachers agreed that the ability to learn at their own pace was one of the primary motivators. This suggests that the flexibility offered by MOOCs is highly valued by pre-service teachers, who may have other demands on their time and schedule.

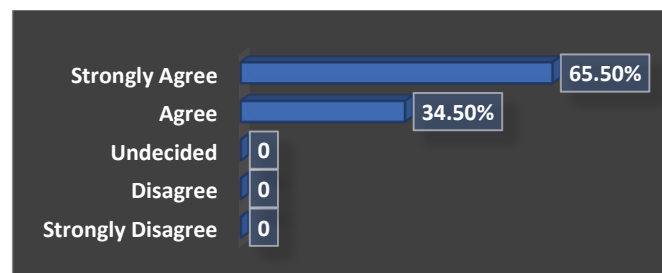


Figure 15: Responses of pre-service teachers to the statement "Learning at my own pace was one of the main reasons for me to join a MOOC"

In terms of professional development (Figure 16), around 70% of pre-service teachers agreed that learning through MOOCs had benefitted them in this area. This is a positive sign and suggests that MOOCs can be an effective tool for promoting personal growth and development.

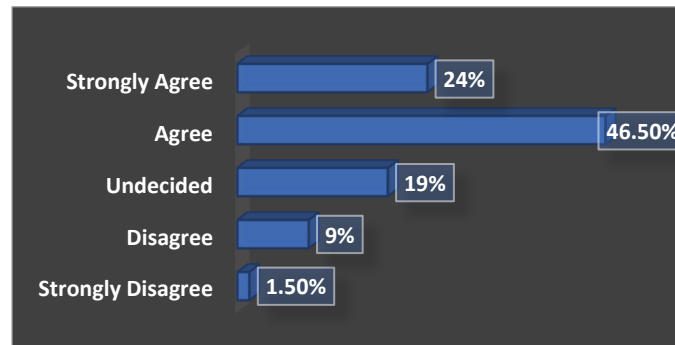


Figure 16: Pre-service teachers' responses to the statement "Learning through MOOCs has benefited my personal development"

When asked if taking a MOOC allowed them to attend a course they would otherwise have missed, around 80% of pre-service teachers agreed (Figure 17). This indicates that MOOCs have the potential to increase access to education and help bridge the gap for those who may not have the opportunity to attend certain courses due to various reasons.

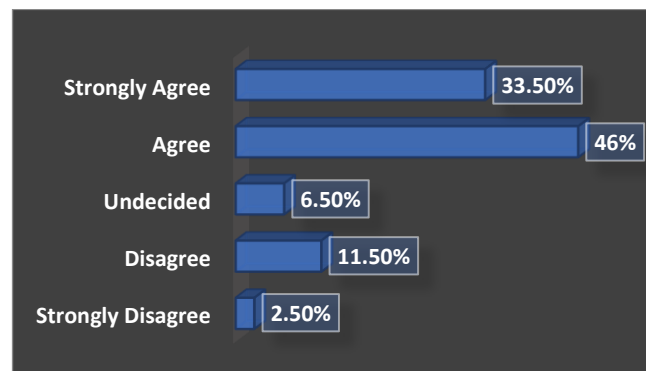


Figure 17: Responses of pre-service teachers to the statement "Taking a MOOC allowed me to take a course I would otherwise have missed"

Furthermore, the pre-service teachers were asked if those courses would be beneficial for teachers' learning and professional development. Their responses are depicted in Figure 18.

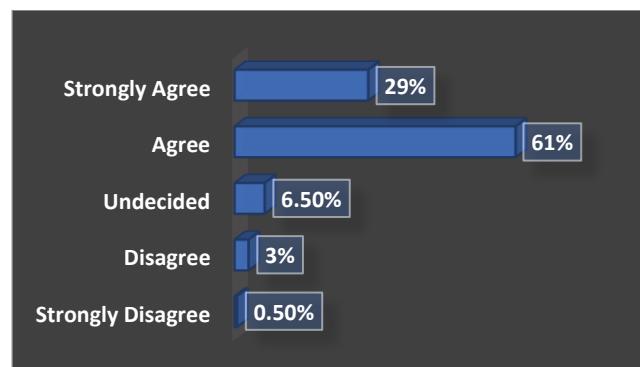


Figure 18: Responses of pre-service teachers to the statement "These courses would be beneficial for teachers' learning and professional development"

The results indicate that a significant majority of the respondents believed that MOOCs would be beneficial for teachers. Specifically, 29% strongly agreed, while 61% agreed with the statement. Only a small proportion of the pre-service teachers were unsure (6.5%), disagreed (3%), or strongly disagreed (0.5%). This suggests that pre-service teachers perceive MOOCs as a valuable tool for their professional development. This is an important

finding as it highlights the potential of MOOCs in addressing the ongoing professional development needs of teachers, especially given the ever-changing nature of education and the need for teachers to keep up with new teaching methods and practices. The high levels of agreement also indicate that MOOCs could be an effective strategy for addressing the challenges of continuing professional development for teachers, especially in contexts where access to traditional professional development may be limited.

They were also asked whether the advantages of taking a MOOC outweighed the disadvantages. The findings are shown in Figure 19.

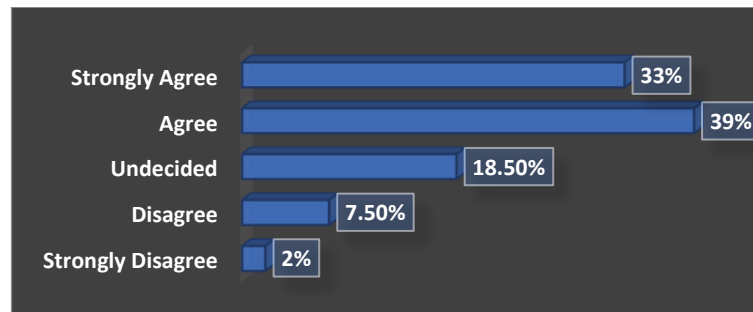


Figure 19: Responses of pre-service teachers to the statement “The advantages of taking a MOOC outweighed the disadvantages”

It was found that a majority of pre-service teachers believed that the advantages of taking a MOOC outweigh the disadvantages (33% strongly agreed and 39% agreed). However, 18.5% of pre-service teachers were unsure on this statement. On the other hand, 7.5% pre-service teachers disagreed and 2% strongly disagreed that the advantages of MOOCs were greater than the disadvantages. This suggests that pre-service teachers perceive benefits of MOOCs as significant and valuable, which could encourage the adoption of MOOCs as a learning tool in teacher education.

Challenges while learning through MOOCs

The pre-service teachers reported the challenges they faced while learning through MOOCs. Findings are shown in Figure 20.

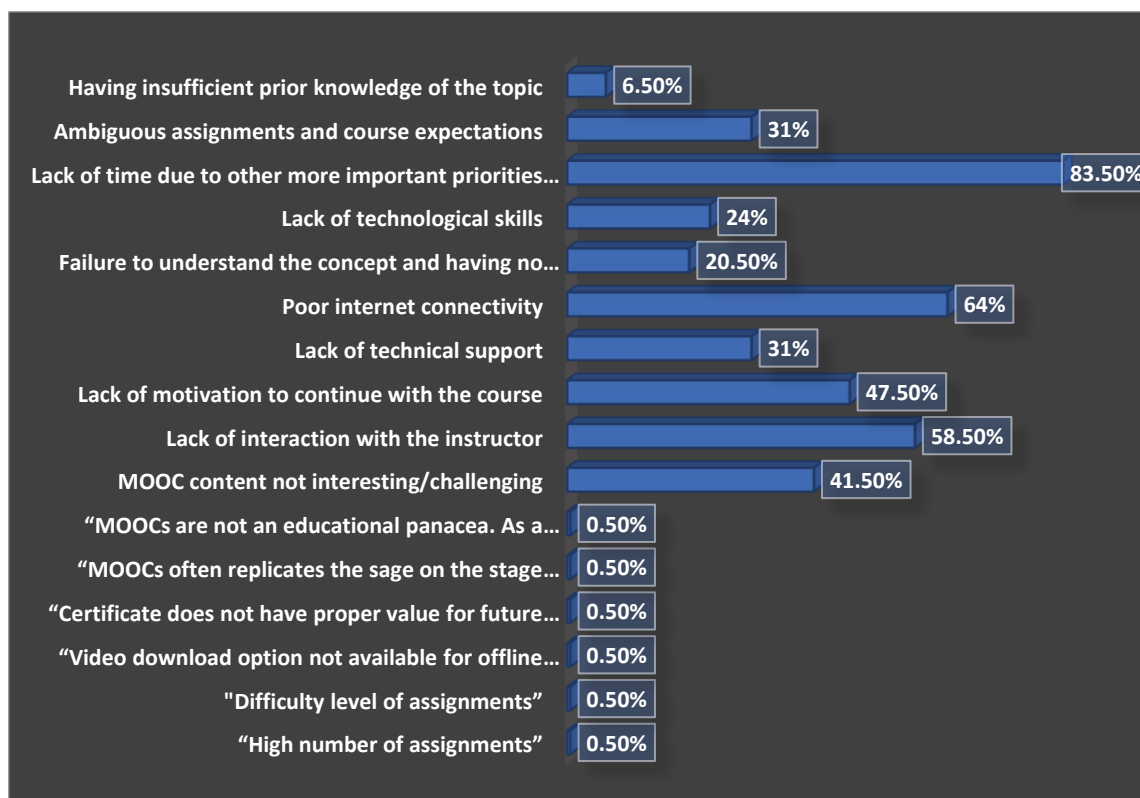


Figure 20: Challenges of learning through MOOCs, as perceived by pre-service teachers

The findings of this study showed that pre-service teachers faced various challenges while taking MOOCs. The most significant problem was not having enough time due to other commitments and priorities, which was reported by 83.5% of pre-service teachers. This indicates that the flexibility of MOOCs, allowing learners to take courses at their own pace, might not always be sufficient to overcome learners' time constraints. Another significant challenge was bad internet connections, which affected 64% of pre-service teachers. This highlights the importance of reliable and high-speed internet connectivity for successful MOOC participation.

The lack of interaction with MOOC instructors was also a significant challenge reported by 58.5% of pre-service teachers. This indicates that learners need a certain level of engagement and support from the instructor to stay motivated and engaged in the course. Other challenges reported included lack of motivation to continue with the course (47.5%), uninteresting or unchallenging MOOC content (41.5%), and ambiguous assignments and course expectations (31%). The lack of technical support and technological skills were also reported as challenges by 31% and 24% of pre-service teachers, respectively.

Additionally, some pre-service teachers reported other challenges, such as difficulty in building a relationship with the instructor, lack of effective instructional design, the certificate's lack of value for future usage, no video download option for offline study, and the high difficulty level and number of assignments. These findings indicate that while MOOCs offer a flexible and accessible mode of learning, learners may face various challenges that need to be addressed to enhance their learning experience.

DISCUSSION

The study found that the majority of pre-service teachers enrolled in MOOCs were under 25 years old, which suggests that MOOCs may be more popular among younger individuals who are seeking flexible and easily accessible learning opportunities. Moreover, private university students are more inclined to use MOOCs as a means of accessing professional development opportunities.

The finding that a significant proportion of pre-service teachers who initially enrolled in MOOCs ended up dropping out is consistent with the findings of Erikson et al., 2017; Narayanasamy & Elci, 2020; Dalipi et al., 2018. This may be due to a variety of factors, including the lack of personal interaction and support in MOOCs, as well as the absence of accountability measures to keep learners motivated and on track (Dalipi et al., 2018; Goopio & Cheung, 2020).

The study found that pre-service teachers used a variety of MOOC platforms, including Coursera, EdX, SWAYAM, Udemy, Canvas Network, and Future Learn. This suggests that pre-service teachers are using different platforms to access MOOCs for their professional development or personal learning, which highlights the diversity in platforms and options available for online learning in the field of education. The finding that SWAYAM was the most popular MOOC platform among the pre-service teachers is interesting, as this platform is specific to India and is mostly targeted towards Indian learners. This findings suggest that MOOC platforms that are tailored to specific countries or regions may be more effective in engaging learners and meeting their needs.

The majority of the pre-service teachers spent 1-3 hours per week on MOOCs, indicating that MOOCs provide a flexible learning experience for learners who may not have time for traditional classroom learning. However, a smaller percentage of pre-service teachers reported spending more than 6 hours per week on MOOCs, indicating a higher level of engagement and dedication to the course.

The findings also suggest that a majority of pre-service teachers did not complete the entire course content, with only 16% reporting that they watched or read the entire content. This highlights the importance of designing MOOCs that cater to the diverse learning needs and preferences of the learners. One possible solution to this issue is to offer more interactive and engaging course content that can enhance learners' motivation and interest in the course. Additionally, the use of gamification techniques, such as leader boards and badges, could also incentivize learners to complete the course content and actively participate in the course. Antonaci et al. (2018) and Klemke et al. (2018) suggests that gamification has the potential to foster social interactions among both instructors and learners, as well as learners themselves. These social interactions are important for creating a sense of community and promoting student retention within a course.

Another key finding of the study is related to the engagement of pre-service teachers in MOOC discussion forums. The results indicate that a small percentage (18%) of pre-service teachers engaged more than twice a week, while a larger percentage (22.5%) engaged once a week. Moreover, 33% of pre-service teachers reported that they never participated in the discussion forums, while 26% engaged a few times a month. These findings suggest that there is a need to improve the design of MOOC discussion forums to increase learners' engagement and participation in

these forums. One possible solution is to encourage learners to actively participate in the forums by assigning tasks and providing feedback on their posts. In addition, the use of moderators and facilitators in the discussion forums could also enhance learners' engagement and promote a collaborative learning environment.

It was found that pre-service teachers had positive perceptions of the quality of course materials provided in the MOOC(s) they attended, with a majority agreeing that the content was good and easy to understand. However, there were some who expressed uncertainty or disagreement with these statements, suggesting that there may be room for improvement in terms of the quality and clarity of the course materials provided. Furthermore, while a majority of pre-service teachers agreed that the amount of information on MOOC platforms was adequate, a significant proportion expressed uncertainty or disagreement with this statement. This may have implications for their learning experience and outcomes, as learners may struggle to navigate the platform or find the information they need to successfully complete the course.

While a majority of pre-service teachers agreed that they received sufficient support from their MOOC instructor or technical support, a significant proportion expressed uncertainty or disagreement with this statement. This suggests that there may be room for improvement in terms of the support provided to MOOC learners, which could ultimately impact their engagement and success in the course. Also, while a majority of pre-service teachers felt that their questions were addressed by MOOC instructors, a significant proportion still expressed uncertainty or disagreement with this statement. This highlights the importance of ensuring that MOOC instructors are responsive to learners' questions and concerns, which can contribute to a positive learning experience and ultimately impact learners' success in the course.

The results suggest that pre-service teachers highly value the flexibility offered by MOOCs, as it allows them to learn at their own pace and accommodate other demands on their time and schedule. This is an important consideration, as it suggests that MOOCs can help address the challenges of balancing professional development with other commitments. The results also suggest that MOOCs can be an effective tool for promoting personal growth and development, as around 70% of pre-service teachers agreed that they had benefitted from learning through MOOCs in terms of professional development. Moreover, the majority of pre-service teachers believed that MOOCs would be beneficial for teachers, highlighting the potential of MOOCs in addressing the ongoing professional development needs of teachers.

Another interesting finding is that the majority of pre-service teachers believed that the advantages of taking a MOOC outweighed the disadvantages. This suggests that pre-service teachers perceive MOOCs as a valuable tool for their learning and professional development, which could encourage the adoption of MOOCs in teacher education. The findings are consistent with Gómez-Galán et al. (2020).

Furthermore, this study shed light on the challenges faced by pre-service teachers while taking MOOCs, which can help identify areas for improvement and enhance the overall effectiveness of MOOCs as a tool for teacher education. The most significant challenge reported by pre-service teachers was not having enough time due to other commitments and priorities, which suggests that the flexibility offered by MOOCs might not always be enough to overcome learners' time constraints. This highlights the need for MOOC designers to consider the time demands of their courses and provide more flexible learning options to accommodate learners' schedules. Another important challenge reported by pre-service teachers was bad internet connections, which can significantly affect their ability to participate in MOOCs. This highlights the need for reliable and high-speed internet connectivity, especially for learners in remote areas or with limited access to technology. Lack of interaction with MOOC instructors was also reported as a significant challenge, indicating that learners need support and engagement from their instructors to stay motivated and engaged in the course. The findings are consistent with Khalil & Ebner (2014) which pointed out crucial factors for high dropout rate in MOOCs including lack of time and the lack of interactivity in MOOCs.

Pre-service teachers also reported challenges related to motivation, course content, and assignments. To address these challenges, MOOC designers should focus on designing courses that are engaging, challenging, and relevant to learners' needs and interests. Providing technical support and clear instructions and expectations can help learners navigate the course more effectively.

CONCLUSION

This study provides valuable insights into the experiences of pre-service teachers in MOOCs, highlighting both strengths and challenges associated with this mode of learning. The findings suggest that MOOCs provide a flexible and easily accessible learning opportunity for pre-service teachers. The study also revealed challenges that need to be addressed to enhance effectiveness of MOOCs for pre-service teacher education. The variability in task

completion rates and frequency of participation in discussion forums highlights the importance of engagement and support for MOOC learners. Nonetheless, the high level of agreement among pre-service teachers regarding the benefits of MOOCs and their value for professional development suggests that MOOCs have the potential to address ongoing professional development needs, particularly in contexts where access to traditional professional development may be limited. Therefore, it can be concluded that MOOCs have the potential to increase access to education, promote personal growth and development, and enhance the professional development of pre-service teachers.

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The Effects of Coding, Robotics, 3d Design and Game Design Education on 21st Century Skills of Primary School Students

AYLİN PAKMAN

ICT Teacher / Bahcesehir University, Institute of Educational Sciences, Educational Technology, Istanbul, Turkey

ORCID ID: 0000-0001-6961-5669

aylinpakman@gmail.com

NABİ PAKMAN

ICT Teacher / Bahcesehir University, Institute of Educational Sciences, Educational Technology, Istanbul, Turkey

ORCID ID: 0000-0001-8820-0602

nabipakman@gmail.com

ASSOC. PROF. YAVUZ SAMUR

Head of Department - Computer Education and Instructional Technologies / Bahcesehir University, Institute of Educational Sciences, Educational Technology, Istanbul, Turkey

ORCID ID: 0000-0003-4269-7099

yavuz.samur@es.bau.edu.tr

ABSTRACT

This study is important because it deals with 21st century skills and current techniques in the field of educational technology and the studies in this field are limited in the literature. The purpose of this study is to determine the effects of coding, robotics, 3D design and game design education on problem solving and reflective thinking skills of 8/10-year-old students and on problem solving and metacognitive awareness levels of 11/14-year-old students. In this study, a quasi-experimental research model with a single group pre-test / post-test pattern, which is considered one of the quantitative research methods, was used. The research was carried out with a total of 36 participants, 15 in the 8-10 age group and 21 in the 11-14 age group, enrolled in a course organized by a higher education institution. The duration of the training is 8 weeks, 2 hours per week. The data of this study were collected through a questionnaire. The questionnaires used consist of 2 parts: Problem Solving Inventory and Reflective Thinking Skills Scale for Problem Solving for Primary Education Level Children aged 8-10, and Problem Solving Inventory and Metacognitive Awareness Inventory for Children - Form B for 11/14-year-old students. As a result of all these applications, it was observed that there was an increase in students' problem solving and metacognitive awareness skills, but it was not statistically significant. It was observed that there was a statistically significant increase in the reflective thinking skills of 8/10-year-old students.

KEYWORDS: Coding, Robotics, Game Design, 21st Century Skills, Elementary Education

INTRODUCTION

The development of science and technology in the 21st century, the information age, has also caused changes in the social structure. In order for the new generation not to lag behind the times, it is expected that they are social, inquisitive, have high reasoning power and have a command of technology (Yükseltürk and Altıok, 2016b). For this reason, alternative methods have increased and education programs have been updated. While coding education in our country was given only in vocational high schools and some undergraduate engineering departments until recently, Ministry of National Education, MEB, made Information Technologies course compulsory for 5th and 6th grades as of 2013. The curriculum included programming, original product development and problem solving (Yükseltürk, Altıok, & Üçgöl, 2016). It is seen that the units of the Computer Science course consist of society, ethics, security, problem solving and algorithms, web-based programming, robot programming, mobile programming. With the introduction of block-based programming education into the curriculum, the importance of such training has increased (Altun and Kasalak, 2018). Karataş (2021), in his survey model study, examined the studies of the countries where the coding course was included in the curriculum and concluded that the Information Technologies and Software course should be compulsory in the 7th and 8th grades.

Skills such as digital citizenship, learning to learn, structuring knowledge, international cooperation and communication, innovative and creative design, computational thinking are the achievements of the Computer Science

course (MEB, 2018a, 2018b). Considering these learning outcomes, the effect of coding, robotics, 3D design and game design trainings given to primary school students aged 8-14, who are the learners of this study, on 21st century skills such as problem solving, reflective thinking and metacognitive awareness has been a matter of curiosity.

Coding, robotics, 3D design and game design concepts have recently become a new focus for researchers with their rapid spread in the world of education. However, the number of studies on these areas is not sufficient. When the studies in the literature are examined, it is seen that the effects on different age levels are discussed by using different approaches and tools in coding, robotics, game design and 3D design education. However, no study has been found that examines the effects of training in 4 different modules on problem solving, reflective thinking, and metacognitive awareness skills. It is expected that this study will be a source for future studies and the research findings will contribute to the literature.

In this context, it was aimed to determine the effect of coding, robotics, 3D design and game design education on problem solving and reflective thinking skills of 8/10-year-old students, and on problem solving and metacognitive awareness levels of 11/14-year-old students, and answers were sought for the following questions:

1. Students aged 8-10 who receive coding, robotics, 3D design and game design education,
 - a. Is there a significant difference between the pre-test and post-test scores of problem solving skills and their sub-factors (confidence in problem solving skills, self-control, avoidance)?
 - b. Is there a significant difference between the pre-test and post-test scores of reflective thinking skills and sub-factors (questioning, reasoning, evaluation) for problem solving?
2. Students aged 11-14 who receive coding, robotics, 3D design and game design education,
 - a. Is there a significant difference between the pre-test and post-test scores of problem solving skills and their sub-factors (confidence in problem solving ability, approach-avoidance, personal control)?
 - b. Is there a significant difference between the pre-test and post-test scores of metacognitive awareness levels?

BACKGROUND

Coding Education

Coding education, forming the basis of this study, is the first module of the research. Coding is the processing of various instruction sets into the computer to perform certain tasks (Sayın & Seferoğlu, 2016). In developed countries, coding education begins to be taught at an early age. This training not only develops the ability to write a computer program, but also develops individuals' skills of metacognitive thinking, looking at problems from different perspectives, and creativity (Yükseltürk & Altıok, 2016a). Even if students do not have the idea of working in the field of software in the future, it is thought that coding education will help them to be successful in other fields (Karabak & Güneş, 2013).

In his studies, Garner (2003) stated that students understand the programming structures (loop, variable, condition) described on the board, but they have problems in producing solutions to them (Demir, 2015). Such problems were avoided by designing different tools to facilitate teaching coding to students. Tools such as Scratch, Code.org, Arduino, App Inventor, Codemonkey, which contain various media tools, have a structure that can attract children's attention with their simple interface and coding logic. Students can do coding activities suitable for their age level by dragging and dropping code blocks. In a study by Baz (2018), 40 different coding platforms were investigated. It has been concluded that Code.org, Scratch and App Inventor coding platforms are more qualified than other coding tools. Even though each programming language contains its own special codes, the working logic of the codes is similar. Therefore, learning algorithm structure from an early age can prepare students to choose a programming language at a later stage.

Scratch and Arduino platforms were used in the coding education in this research. The Scratch platform is a block-based program developer interface improved by MIT University to teach coding to children. It is considered as a coding tool that can eliminate the difficulties in the field of software, thanks to its easy interface and programming language structure, allowing students of all ages to design games (Malan & Leitner, 2007). Arduino is an open source electronic platform designed to create interactive objects that can be used alone or with software on a computer (Sart, 2016). It provides the opportunity to apply basic coding knowledge to electronic circuit components. Students may have difficulties in the beginning because of the need to master the electronic circuit infrastructure (Meço & Arı, 2021). Its microprocessor board can be coded in the C programming language. With the different sensors it contains, the

surrounding data can be collected and communication can be established with the devices in the environment (Erdoğan, 2017). The fact that students can get concrete outputs can help them learn the subject faster.

Robotics Education

The term robotics is a concept that we have heard frequently in education recently and it constitutes the second module of this research. The word robot is derived from the Czech and Slovak word *robota*, meaning work done by slaves, in 1921 (Horáková and Kelemen, 2003). Robots are manageable and coded technological devices with sensors consisting of mechanical and electronic components (Arora, 2008). Afterwards, the concept of robotics was derived from the term “robot” by Isaac Asimov in 1941 and covers all areas related to robotic technology. Although robots were considered as servants designed to help people in the first years they were produced, they have started to play an important role in many fields such as medicine, industry, entertainment, education, search and rescue and space studies in recent years (Ünver, 2017; Şişman, 2016).

The use of robots in education as teachers and teaching materials brought innovation to the field of science and technology in the early 1980s (Yolcu and Demirel, 2017; Şişman, 2016). Training of robotic coding can provide students with the opportunity to embody the software processes and observe the coding outputs on a hardware. (Kasalak, 2017). Robotics education in the world is mainly done using Lego sets. The name Lego, which was pinpointed by the wooden toy manufacturer Christiansen in 1934, means "play well" in Danish and "combine" in Latin (Kılınc, 2014). The learning environment in which Lego is used appears as a combination of constructivist approach and technology. Lego robots allow students to develop their skills in science, technology, engineering and mathematics (STEM) in an entertaining way (Alimisis, 2013). Robotic activities increase students' motivation to learn, as they allow students to create their own products (Liu, Lin, Feng, & Hou, 2013).

Today, different robotic kits such as Lego Wedo 2.0, Lego Mindstorms EV3, Lego Education Spike Prime, Arduino, Makeblock mBot, VEX Robotics are used. In the robotics training of this research, Lego Mindstorms EV3 and Lego Wedo 2.0 sets were used. Robots created with these sets can interact with the environment through the sensors. All basic coding operations can be performed by combining visual code blocks instead of text-based coding (Çankaya, Durak, & Yünkül, 2017). Robotics education is thought to be supportive in the fields of creativity, self-confidence, communication, leadership and putting theoretical knowledge into practice.

3D Design Education

3D design helps students who transition from a concrete period to an abstract period to realize their dreams, and is the third module of this research. 3D printers, one of the technological inventions of recent times, are tools that send files designed with computer software to the printer without the need for models, molds and similar tools, and turn the materials into products by adding them on top of each other (Yılmaz, 2013). With 3D printers, models in the computer environment can be converted into concrete products and customized production can be made. In order to get 3D printing, first of all, a three-dimensional model must be designed in digital environment with CAD (Computer Aided Design) software. This 3D design can be designed on a computer or transmitted to a computer via a ready-made scanner. The STL (Stereo Lithography) output of the model is sent to the 3D printer. The design is created by spraying binders and layers on solid, liquid or powder materials in a 3D printer (Çelik, Karakoç, Çakır, & Duysak, 2013). Plastic, resin, ceramic, play dough, metal, powder, glass, cement, food and composite materials can all be used as raw materials for 3D printers (D'aveni, 2015).

Some CAD software that supports 3D modeling are TinkerCad, Solidworks, SketchUp, Maya, 3ds Max, Fusion 360, Blender, Rhino, ZBrush, 123D Design, Meshmixer, Smoothie 3D and FreeCAD (Dere, 2017). The TinkerCad application used in the 3D design module of this research is a web-based design tool. Founded in 2011, TinkerCad became part of Autodesk in 2013 and joined the 123D family.

The contributions of this technology, whose effects we will see more in the coming years, to many sectors such as engineering, architectural design, industrial design, space science, health, fashion, education and food are noteworthy. 3D design in education can support students to create innovative designs to solve problems in their environment. Being able to touch the objects they have designed can give them a different experience and thus permanent learning can be achieved. The lack of standards, slowness compared to mass production and the difficulty of producing some complex structures can be seen as the disadvantages of this technology (Kuzu D. et al., 2016).

Game Design Education

Game design education, which is the fourth module of the research, supports the students to be the generation that goes into production, not just the generation that plays games. With the development of digital games, the replacement of traditional street games by game consoles has also changed children's understanding of entertainment (Aksoy, 2014). The fact that computers have become a part of daily lives and students spend most of their time playing games in the digital environment has increased the importance of using digital games in the field of education. "Digital games are games that have certain rules and purposes and are played through a hardware (mobile phone, tablet, game console, etc.)" (Samur, 2016). It is thought that computer games make the educational process more interesting, accelerate learning, improve problem-solving skills and collaborative work (Kebritchi, Hirumi, & Bai, 2010).

For a successful education, the game design process should be included in the education as well as digital games. Children's interest in games can be combined with the field of programming and this can help them reach many skills such as creative thinking, collaborative work, and problem solving (Samur, 2016). The game design process is based on design thinking skills. Design thinking skills consist of empathy, identification, ideation, prototyping and testing (Bulut, 2015). Prensky (2001), emphasized that rules, purpose, feedback, competition, difficulty, presentation, interaction and story elements should be included in the designing process of these games.

Many students like to play games but have problems designing their own digital games. These problems can be seen as difficulties in game designing tools and lack of programming language. It is difficult for students to learn languages such as Java, C and C++, which are necessary for programming games, in a short time (Gomes & Mendes, 2007). Platforms such as Kodu Game Lab, Scratch, Unity 3D and Alice have been developed so that students can easily design games. Kodu Game Lab was used in the game design training of this research. Kodu Game Lab, developed by Microsoft and XNA Game Studio, is a game design tool that supports children who do not know the programming language to learn the basics of coding. It has a simple interface with visual elements for programming and a clear coding structure consisting of nouns, verbs and adjectives (Yıldırım, 2016).

21st Century Skills

21st century skills that should be acquired by students are problem solving, creative and critical thinking, analysis-synthesis, innovation, productivity, information literacy, technology and media literacy, responsibility, communication and collaboration skills. When all these skills are put into focus, today's students are expected to use technology effectively (Erdoğan, 2017). It is emphasized to be very important to include problem solving and project-based studies while applying the basic skills of 4Cs (critical thinking, communication, cooperation and creativity) in the classroom environment for students to be successful in the future (Eguchi, 2014; Kivunja, 2015).

Problem Solving Skills

Individuals face many problems throughout their lives. John Dewey defines problems as things that confuse and force people's minds (Çetin, 2012). Problem solving skills are the processes by which people propose appropriate solutions to problems and use their knowledge, experience and skills (Lai & Yang, 2011). According to the PISA 2003 study, the steps of the problem solving process are understanding the problem situation, defining relevant information and constraints, presenting possible solutions, choosing solution strategies, solving the problem, checking the solution and sharing the results (OECD, 2004).

It is predicted that people who have developed problem-solving skills will not be unresponsive to the problems they will face in the future, they will question, think multi-dimensionally, make decisions without difficulty, and produce solutions (Dow & Mayer, 2004). Problem solving ability is an innate trait. However, the maturity, motivation, education, social and cultural environment of the individual affect the problem solving ability. For this reason, trainings that will improve problem-solving skills should be prepared by paying attention to individual differences (Silik, 2016).

Reflective Thinking Skill

According to Dewey's (1910) definition, reflective thinking is the process of careful and continuous evaluation of any hypothetical information, with reasons to support this information, and drawing future conclusions. Reflective thinking is a skill that will improve critical thinking skills and help the individual develop strategies in the face of problems (Kızılkaya & Aşkar, 2009).

It is stated that reflective thinking includes a total of 5 steps: suggestion, problem, hypothesis, reasoning and testing. In the suggestion step, in case the individual encounters a problem, the idea and possibilities of solving this problem

occur. In the problem step, in complex situations, the whole event is looked at rather than the small details. In the hypothesis step, the suggestions formed in the mind are analyzed. In the reasoning step, thoughts, knowledge and past experiences are analyzed. In the testing step, results are found for existing problems and this result is used as a source for new problems.

When the differences between the reflective learning method and the traditional methods are examined, it is observed that the main important point in the traditional learning method is the direct transfer of information from the teacher to the student, the teacher being in an informative position, correcting the student's mistakes directly, and the increase in test scores as the criteria for success. However, in the reflective learning model, the student's competencies and inadequacies are important, the student takes the responsibility of learning, and the teachers communicate with the students in a positive and consistent manner while giving feedback. It is observed that the students' ability to freely express their opinions is a criterion for success (Ünver, 2003).

Metacognitive Awareness Skill

The first step in the information processing process begins when the individual receives stimuli from his environment with his sense organs. Some of these stimuli are perceived and recognized for a short period by sensory recording, and many are discarded. The senses are transferred to short-term memory through processes of perception and attention. The information is then repeated and transferred to long-term memory. It is recalled from long-term memory when necessary. The last step of the system is metacognition that manages the whole process (Berliner, 1988). Metacognition is the individual's awareness and control of his own learning (Özsoy, 2008). According to Karakelle and Saraç (2007), cognition includes perception, understanding, remembering and similar processes; Metacognition involves thinking about mental processes such as one's own perception, understanding, remembering, and so on. Metacognition, in its shortest definition, is thinking to think. It helps individuals know where, how and when to use strategies. Blakey and Spence (1990) suggest that students define what they know and do not know, express what they think, solve collaborative problems, keep a thinking agenda, make plans, question the thinking process, and evaluate themselves in order to develop their metacognitive awareness skills.

It is stated in studies that it will not be possible to acquire and use metacognitive skills at all ages. These are the periods when, for ages 5 and under, strategies are not used at all, for ages 6-9, strategies can be used but there is no production, and for ages 9 and above, strategies can be produced and used (Senemoğlu, 2012). When the studies were examined, it was stated that the recommended method for teaching metacognition was structured teaching.

METHODS

Research Design

This research was conducted with a quasi-experimental research model with a single-group pre-test / post-test pattern, one of the quantitative research methods. This research is a cross-sectional type of research and it is a multi-subject research according to the number of subjects.

Participants

In Study, the universe of the research consists of 8-10 and 11-14 age group students in Istanbul in the 2017-2018 academic year. The sample of the research consists of 15 students aged 8-10 and 21 students aged 11-14, who attended the coding, robotics, 3D design and game design training organized by the Educational Sciences Institute of a private university on different dates.

Descriptive statistics regarding the distribution of students by age group and gender are given in Table 1. In this study, convenient sampling method, one of the sampling methods, was used.

Table 1. Distribution of students by age group and gender

Group	Age Group	Girl	Boy	Total
Study 1	8-10 Age	6	9	15
Study 2	11-14 Age	7	14	21
Total	8-14 Age	13	23	36

Experimental Process

Necessary permissions were obtained from the Institute of Educational Sciences of a private university for data collection studies within the scope of the research. Questionnaire forms were applied to the study group directly. The

average time to answer a survey is 15 minutes. Questionnaire forms were applied for the pre-test in the first hour of the training without meeting the students. For the post-test, 8 weeks after the start of the training, the last hour of the training was applied. Data were collected from the students of 7 different groups participating in the training. All ethical rules were strictly followed during the research process. The number of students participating in the study, the pre-test and post-test application dates are shown in Table 2.

Table 2. Data collection procedures

Study	Group	Number of Students	Pre-test Date	Post-test Date
Study 1	1st Group	5	04.11.2017	24.12.2017
Study 1	2nd Group	4	03.12.2017	21.01.2018
Study 1	3rd Group	4	29.01.2018	02.02.2018
Study 1	4th Group	2	03.03.2018	21.04.2018
Study 2	1st Group	9	04.11.2017	24.12.2017
Study 2	2nd Group	9	03.12.2017	21.01.2018
Study 2	3rd Group	3	29.01.2018	02.02.2018

Training Plan

The education lasted for 8 weeks, 2 hours a week, in the 2017-2018 academic year. Field experts at the university created the achievement points of education, planned the activities for these learning outcomes and applied them to the working group. This designed training consists of 4 different modules for both age groups: coding, robotics, 3D design and game design. The materials used differ according to the age level. Weekly training plans are illustrated in Appendix.

Coding module, which is planned in order to enable students to acquire learning outcomes such as problem solving, algorithmic thinking, and creative and critical thinking, forms the basis of this training. In this study, Scratch and Code.org coding tools were used for the 8-10 age group, and Code.org and Arduino IDE coding tool was used for the 11-14 age group.



Figure 1: Coding module

Robotics module is aimed that students who have acquired coding skills will use these skills in the process of programming and designing robots in line with the 4C approach. In this study, Lego Wedo 2.0 robotic set was used for the 8-10 age group, and LEGO Mindstorms EV3 robotic set for the 11-14 age group.

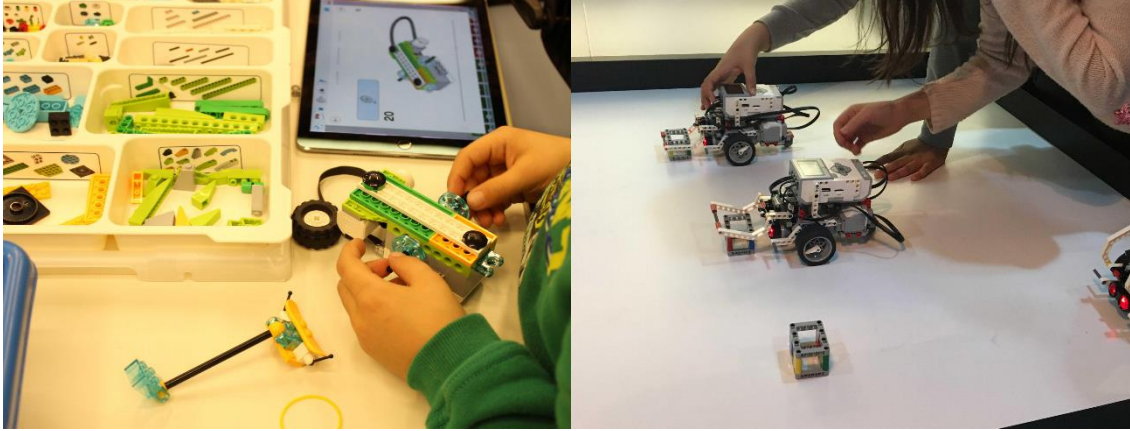


Figure 2: Robotics module

3D design module is aimed that students embody the objects they imagine in order to develop their design and creative thinking skills. In this study, Tinkercad application was used in both age groups. The designs were printed from 3D printers and distributed to the students.



Figure 3: 3D design module

Digital game design module is based on the design thinking steps, it is aimed that students design their own digital games within the framework of game elements. In this study, Microsoft Kodu Game Lab application was used in both age groups.

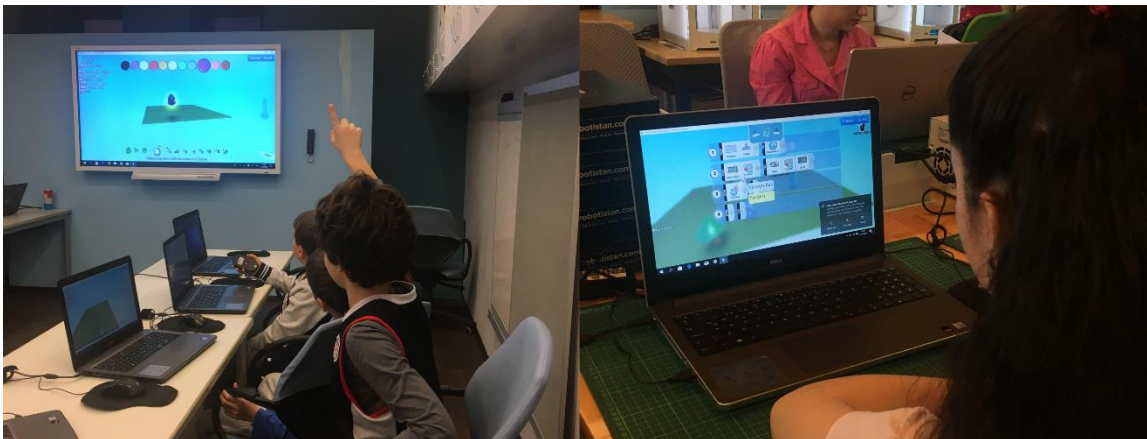


Figure 4: Digital game design module

Measuring Tools

The data of this study were collected by means of a questionnaire, and the questionnaires used differ according to age levels.

Measuring Tools In Study 1

The questionnaire in Study 1 consists of two parts, the Problem Solving Inventory for Primary School Children and the Reflective Thinking Scale for Problem Solving.

Problem solving inventory for primary school children is an inventory consisting of 24 items with a total of 3 factors: confidence in problem solving skills (12 items), self-control (7 items) and avoidance (5 items). The Cronbach's alpha reliability coefficient of the scale is 0.80. This result shows that the scale is reliable. The scale has a 5-point Likert structure. For the items in the scale, "Always", "Often", "Occasionally", "Rarely" and "Never" degrees are used. The items are scored as 1, 2, 3, 4, 5 in order, starting from the "Never" category. While evaluating the items 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23 under the "Confidence in Problem Solving Skill" factor, the degree of participation of the students in the proposition is high when the score is close to 5, and it is considered low when the score is close to 1. Items 2, 4, 6, 8, 10, 12, 14 under the "Self-Control" factor and items 16, 18, 20, 22, 24 under the "Avoidance" factor are reversely scored (Serin, Serin, & Saygılı, 2010).

Reflective thinking skill scale for problem solving is an inventory consisting of 14 items with a total of 3 factors: questioning, reasoning and evaluation. Reliability results of the scale are 0.73 for the "Questioning" factor including items 1, 3, 7, 9, 13. It is 0.71 for the "Reasoning" factor including items 5, 8, 11, 12. It is 0.69 for the "Evaluation" factor including items 2, 4, 6, 10, 14. Reliability result is 0.83 for the whole scale. The scale has a 5-point Likert structure. For the items in the scale, "Always", "Often", "Sometimes", "Rarely" and "Never" degrees are used. The items are scored as 1, 2, 3, 4, 5 in order, starting from the "Never" category (Kızılkaya & Aşkar, 2009).

Measuring Tools In Study 2

The questionnaire in Study 2 consists of two parts, the Problem Solving Inventory and the Metacognitive Awareness Inventory for Children - Form B.

The Problem Solving Inventory for adults developed by Heppner and Peterson (1982) was adapted into Turkish by Şahin, Şahin and Heppner (1993). Later, it was adapted for primary school 5th grade students. The scale consists of 3 sub-factors: confidence in problem solving ability (8 items), approach-avoidance (7 items), and personal control (5 items) (Kardaş, Anagün, & Yalçınoglu, 2014). The Cronbach's alpha reliability coefficient of the scale is 0.74. This result shows that the scale is reliable. Problem Solving Inventory is a 20-item scale with a 4-point Likert structure. For the items in the scale, "I strongly disagree", "Sometimes I agree", "I mostly agree" and "I totally agree" degrees are used. The items are scored as 1, 2, 3, 4 in order, starting from the "I strongly disagree" category. In the process of calculating the scores of the participants, while the items 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 16, 17, 19 and 20 were evaluated, the degree of participation of the students in the proposition was high when the score was close to 4, and it is considered low when close to 1. Items 1, 2, 7, 14, 15 and 18 are reversely scored (Kardaş, 2013).

The Metacognitive Awareness Scale for adults was developed by Schraw and Dennison (1994). It was adapted into Turkish by Akın, Abacı and Çetin (2007). Later, Sperling, Howard, Miller, and Murphy (2002) simplified the scale and developed the Metacognitive Awareness Inventory for Children, which consists of 2 forms for children of different ages. Form A contains 12 items for 3rd, 4th and 5th grade students; and form B contains 18 items for 6th, 7th, 8th and 9th grade students. The Cronbach Alpha reliability coefficient of the Metacognitive Awareness Inventory for Children - Form B is 0.80. This result shows that the scale is reliable. "Never", "Rarely", "Sometimes", "Often" and "Always" degrees are used for the items in this 5-point Likert scale. The items are scored as 1, 2, 3, 4, 5 in order, starting from the "Never" category (Karakelle & Saraç, 2007).

Data Analysis

IBM SPSS Statistics 20 program was applied for statistical analysis used in the study. All statistical operations are based on .05 error level.

In the study, Kolmogorov-Smirnov and Shapiro-Wilk tests were applied to determine whether students' problem solving skills, reflective thinking skills and metacognitive awareness levels were normally distributed in the pre-test and post-test. Kolmogorov-Smirnov and Shapiro-Wilk test results are shown in Table 3.

Table 3. Analysis results of kolmogorov-smirnov and shapiro-wilk tests applied to the study group

	Group	Application	Kolmogorov Smirnov Z	Asymp. Sig (2-tailed)	Shapiro Wilk Z	Asymp. Sig (2-tailed)
Problem Solving Inventory for Primary School Children	Study 1	Pre-test	.120	.200	.974	.915
		Post-test	.143	.200	.927	.245
Reflective Thinking Scale for Problem Solving	Study 1	Pre-test	.119	.200	.965	.786
		Post-test	.206	.088	.940	.382
Problem Solving Inventory	Study 2	Pre-test	.109	.200	.968	.692
		Post-test	.160	.173	.932	.148
Metacognitive Awareness Inventory for Children - Form B	Study 2	Pre-test	.091	.200	.979	.903
		Post-test	.188	.050	.930	.136

As the results in Table 3 were examined, it was observed that the students' problem solving skills, reflective thinking skills and metacognitive awareness levels were normally distributed ($p > .05$). In the Kolmogorov Smirnov and Shapiro-Wilk test, there was no significant difference in the data set according to p value. It was decided to analyze the pre-test and post-test values applied in this analysis with the related samples t-Test.

It was examined whether the changes in the results of the pre-test applied before the 8-week education and the post-test applied after were significant, and samples related to repeated measurements were obtained with the t-Test.

RESULTS

Table 4 shows the descriptive analyzes of the pre-test and post-test scores of the 8/10-year-old students in Study 1 group in terms of their problem solving and reflective thinking skill levels.

Table 4. Related sample t-test analysis results of pre-test and post-test values of study 1 group

	Factor	Test	N	X	S	Sd	t	P
Problem Solving Inventory for Primary School Children	Confidence in Problem Solving Skills	Pre-test	15	45.80	8.46	14	-.711	.489
		Post-test	15	47.20	8.43			
	Self-Control	Pre-test	15	23.86	6.19	14	-1.153	.268
		Post-test	15	25.33	7.67			
	Avoidance	Pre-test	15	19.46	3.56	14	.267	.793
		Post-test	15	19.20	4.42			
	Total	Pre-test	15	89.13	8.52	14	-.891	.388
		Post-test	15	91.73	11.83			
Reflective Thinking Scale for Problem Solving	Questioning	Pre-test	15	16.20	5.15	14	-3	.010*
		Post-test	15	19.20	3.91			
	Reasoning	Pre-test	15	13.73	4.38	14	-1.99	.066
		Post-test	15	15.60	4.18			
	Evaluation	Pre-test	15	17.46	4.01	14	-.988	.340
		Post-test	15	18.33	3.69			
	Total	Pre-test	15	47.40	11.73	14	-2.556	.023*
		Post-test	15	53.13	10.70			

Note. * $p < .05$.

As the data in Table 4 are examined, it is seen that the average of the problem solving skill values of the study group was measured as $X=89.13$ for the pre-test and $X=91.73$ for the post-test. When the pre-test and post-test mean scores of the students were examined, it was seen that there was an increase in the post-test mean scores, but the difference was not statistically significant ($t=-.891$, $p > .05$).

It is seen that the mean values of reflective thinking skills for problem solving of the study group were measured as $X=47.40$ for the pre-test and $X=53.13$ for the post-test. Considering the pre-test and post-test mean scores of the students, a statistically significant increase was found in the post-test mean scores ($t=-2.556$, $p<.05$). When examined in terms of factors, a statistically significant increase was found only in the pre-test and post-test mean scores of the questioning factor value ($t=-3$, $p<.05$).

The findings regarding the descriptive analyzes of the pre-test and post-test scores of 11/14-year-old students in Study 2 group in terms of problem solving and metacognitive awareness skill levels are given in Table 5.

Table 5. Related sample t-test analysis results of pre-test and post-test values of study 2 group

	Factor	Test	N	X	S	Sd	t	P
Problem Solving Inventory	Confidence in Problem Solving Ability	Pre-test	21	23.42	2.92	20	-.400	.693
		Post-test	21	23.71	2.70			
	Approach-Avoidance	Pre-test	21	20.28	2.79	20	-.316	.755
		Post-test	21	20.52	2.71			
	Self-Check	Pre-test	21	15.04	2.08	20	.538	.596
		Post-test	21	14.76	2.09			
	Total	Pre-test	21	58.19	6.74	20	-.217	.830
		Post-test	21	58.47	5.87			
Metacognitive Awareness Inventory for Children - Form B		Pre-test	21	66.19	10.24	20	-1.164	.258
		Post-test	21	68.52	8.47			

As the data in Table 5 are examined, it is seen that the average of the problem solving skill values of the study group was measured as $X=58.19$ for the pre-test and $X=58.47$ for the post-test. When the pre-test and post-test mean scores of the students were examined, it was seen that there was an increase in the post-test mean scores, but the difference was not statistically significant ($t=-.217$, $p>.05$). When examined in terms of factors, no statistically significant difference was found in the pre-test and post-test mean scores.

It is seen that the average of the metacognitive awareness values of the study group was measured as $X=66.19$ for the pre-test and $X=68.52$ for the post-test. When the pre-test and post-test mean scores of the students were examined, it was seen that there was an increase in the post-test mean scores, but the difference was not statistically significant ($t=-1.164$, $p>.05$).

CONCLUSION

In this research, the effects of coding, robotics, 3D design and game design education on the problem solving and reflective thinking skills of 8/10-year-old students, and the problem solving and metacognitive awareness levels of 11/14-year-old students were discussed. According to the findings obtained in the study, it is observed that education contributes to the problem-solving skills of 8/10-year-old students, but this difference was not statistically significant. However, it contributed statistically significant effect to their reflective thinking skills for problem solving. When examined in terms of factors, it was observed that there was a significant increase in the questioning factor. It was seen that education contributed to the problem solving and metacognitive awareness levels of 11/14-year-old students, but this difference was not statistically significant.

When the studies in the literature on coding, robotics, 3D design and game design are examined, it is noteworthy that the trainings given were focused on a single subject area. In a study conducted by Yünkül, Durak, Çankaya, and Mısırlı (2017), a significant increase was observed in the problem-solving, algorithmic thinking and creative thinking skills of students studying coding with Scratch. As a result of Çetin's (2012) research with 17 students, it was stated that programming education had a positive effect on students' problem-solving skills. When the studies of Calder (2010), and Kaucic and Asic (2001) are examined, it is seen that programming education improves students' problem solving skills. In a study conducted by Kasalak (2017), secondary school students were given Arduino programming training with Scratch in a 5-week period. There was a positive and significant change in the students' self-efficacy perceptions towards programming. Olgun (2014) observed that programming education had an effect on 5 out of 13 thinking styles

after Scratch education of 6th grade students. Oluk, Korkmaz and Oluk's (2018) study with 5th grade students concluded that students who use Scratch in algorithm learning have a significant increase in computational thinking skills compared to students who do not. Coşar (2013) gave a web-based computer programming course to 58 7th grade students. It was observed that this study had a positive effect on students' academic achievement, critical thinking dispositions and attitudes towards computers. According to the results of a research conducted by Bağra and Kılınç (2021) with 5th and 6th grade students, they stated that students see coding education as a means of production and that it is very fun for them to produce something. However, problems such as lack of materials, low number of weekly lessons were encountered. Ramazanoğlu (2021), in a study with 63 students, concluded that robotic coding practices reduced students' anxiety about their attitudes towards computers, and their self-efficacy perceptions towards computational thinking skills increased. In a study conducted with 4th grade students, Papatğa (2016) gave training with Scratch for 15 weeks. At the end of the training, it was concluded that the reading comprehension skills of the students improved significantly. Yüksel (2017) gave Scratch training to 6th grade students and concluded that at the end of the training, it had positive effects on the students' attitudes towards the course and the permanence of their knowledge. In his study, Sohn (2014) carried out Arduino applications with 26 students for 5 weeks. It has been concluded that there is a significant difference in the problem solving skills of the students who do activities with Arduino.

In another study conducted on 6th grade students, a positive effect was observed on students' problem solving skills after Lego and robotic activities (Gibbon, 2007). Patterson (2011) states that the use of robots in programming education has a positive effect in 14 out of 19 research articles he has examined in the literature. In a study conducted with 4th grade students, Uşengül and Bahçeci (2020) concluded that there was a significant increase in students' attitudes towards science and computational thinking skills by giving robotic-assisted science education with the Lego Wedo 2.0 set. Koç (2012) carried out robotic-assisted science education with 7th grade students in an 8-week period. At the end of the training, a significant difference was observed in the scientific process skills and motivations of the students who were taught with the Lego Mindstorms EV3 set. In a study conducted by Çankaya, Durak, Yünkül (2017), 9 middle school students were given robot programming training with the Lego Mindstorms EV3 set for one week. At the end of the training, it was concluded that there was a significant increase in the problem solving and creativity skills of the students.

In a study conducted by Derman (2015) with 5th and 6th grade students, it was stated that the process of designing educational games had positive effects on students' creativity. Features such as creative thinking, problem solving, inclination to teamwork, being able to engage in an intense work, and mastery of game design processes come forward in game design students (Samur, 2016). It was seen that the Kodu Game Lab programming environment, which Alkan (2019) applied with gifted students, caused a significant increase in the problem solving skills of students. With the 3D printers integrated into the curriculum, it is ensured that the students' participation in the lesson increases, knowledge is taught in different ways, the subjects that are difficult to learn are made easier to understand for the students and positive support is given to academic success (Taştı, Yücel, & Yalçınalp, 2015).

The reason why the applied training did not show a statistically significant difference in problem solving and metacognitive awareness skills may be that the trainings remained at the entry level since 4 different modules were covered during the 8-week training period. It can be thought that the attention span of the students affects learning because it is studied with a small age group. However, it can be said that this education creates awareness for students. These data are similar to several studies in the literature. Kalelioğlu and Gülbahar (2014) concluded that coding education with Scratch applied to primary school 5th grade students did not significantly contribute to students' problem solving skills. However, students stated that they liked the Scratch platform and the easiness of programming with it. According to a study conducted by Solmaz (2014) on 39 students, it was shown that teaching programming with Alice software made students love programming. However, it was examined that it did not affect metacognitive awareness, problem solving skills and critical thinking skills. According to the results of a study conducted with 14 students in primary and preschool age groups, no positive effect was found on students' problem solving skills after Lego and robotics activities (Pollock, 1997). Sullivan (2008) stated that robotics activities increased students' scientific process skills in the robotics summer camp he held with 26 students. In the study of Yükseltürk, Altıok and Üçgül (2016), the increase in the problem solving skills of the students with the Kodu Game Lab and game design education was not found significant.

It can be said that coding, robotics, 3D design and game design trainings support 21st century skills such as problem solving, reflective thinking and metacognitive awareness. In line with this information, it is safe to predict that coding

education will become a mandatory rather than a necessity (Sayın & Seferoğlu, 2016). According to the data obtained within the scope of the study, the following suggestions can be made:

- The number of similar studies in the literature can be increased by using different teaching methods and tools.
- The effects of increasing the duration of this training and increasing the learning outcomes for the training modules can be examined.
- Studies can be conducted to determine the effect of this education on different variables such as critical, creative and computational thinking. The effects in different branches can be examined.
- Similar other ones to this training can be applied to different age groups in order to generalize the target audience. More samples can be studied.
- With the qualitative research model, students' views on education can be obtained.

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APPENDIX

Table 6. Training plan applied to study 1 group

Module	Week	Activity
Coding	Week 1	Basic Algorithm and Coding Activities aimed at acquiring basic problem solving skills. Definition of coding and its real life equivalent. Using coding for problem definition and solution steps. Basic coding studies with Code.org and similar coding platforms.
	Week 2	Introduction to Coding with Scratch - Dancing Puppets Introducing the Scratch interface and code blocks. Decor library and making your own decor. Adding puppet from the library and creating your own puppet. Giving the puppets the basic movements.
	Week 3	Coding with Scratch - Create Your Own Story Creating a short story scenario. Designing the decor and puppets of the story. Coding the story flow and fixing the errors. Adding sound to the story.
Robotics	Week 4	Robotics with LEGO WeDo 2.0 - Mechanisms -1 (Cogwheels) Robots around us and their tasks. Machines around us and their tasks. Cogwheels systems and motion patterns. Acceleration, deceleration and change of direction with cogwheels systems. Interface and code blocks of WeDo 2.0 software. Animation of the cogwheels system with WeDo 2.0 software.
	Week 5	Robotics with LEGO WeDo 2.0 - Mechanisms -2 (Pulleys) Pulley systems and movement patterns. Acceleration, deceleration and change of direction with pulley systems. Design and coding of a moving pulley system with LEGO WeDo 2.0.
	Week 6	Robotics with LEGO WeDo 2.0 - Racing Car Designing the car that will go the fastest. Coding of the designed vehicle. Race of designed vehicles.
3D Design	Week 7	3D Design with TinkerCad TinkerCad Membership and login to TinkerCad platform. Examination of the TinkerCad interface. Using basic design tools. Designing the given sample objects. 3D printing of the designed keychains.
Digital Game Design	Week 8	Microsoft Kodu Game Lab Ability to add characters to the game field. Ability to add collectible or fixed objects to the game field. Being able to design a score collecting game using the scoreboard.

Table 7. Training plan applied to study 2 group

Module	Week	Activity
Coding	Week 1	Basic Algorithm and Coding Activities aimed at acquiring basic problem solving skills. Definition of coding and its real life equivalent. Using coding for problem definition and solution steps. Basic coding studies with Code.org, CodeMonkey and similar coding platforms.
	Week 2	Basic Electronics, Simple Circuit Design and Introduction to Arduino Coding with mBlock. Voltage, current and resistance concepts. Ohm's law and series/parallel connection. Led circuit designs. Features of the Arduino board. Coding mBlock and Arduino programming led samples with mBlock.
	Week 3	Introduction to Physical Programming with Arduino IDE. Making appropriate settings for Arduino IDE setup. Arduino IDE interface and basic code blocks. LED applications with Arduino IDE.
Robotics	Week 4	Robotics with LEGO Mindstorms EV3 - Basic Mechanical Design and Use of Large Engines Introduction of basic mechanical parts. Relationships between parts. Building the educational robot. Introduction of the software interface. Establishing the connection between the software and the robot. Gaining basic movements to the robot with a large motor.
	Week 5	Robotics with LEGO Mindstorms EV3 - Basic Movements Performing forward and backward movements according to different measurement units. Ability to perform rotation movements appropriately. Completing motion tasks on the theme.
	Week 6	Robotics with LEGO Mindstorms EV3 - Medium Motor and Tasks Medium motor usage. Being able to take the desired object to the desired place. To be able to do the related tasks on the theme.
3D Design	Week 7	3D Design with TinkerCad Membership and login to TinkerCad platform. Examination of the TinkerCad interface. Using basic design tools. Designing the given sample objects. 3D printing of the designed keychains.
Digital Game Design	Week 8	Microsoft Kodu Game Lab Adding characters to the game field. Build the game story by adding craftable objects to the game field. Being able to design a score collecting game using the scoreboard.

The Evaluation of Hong Kong Students' Perception of E-Books in Higher Education

Hon Keung YAU

*City University of Hong Kong, Department of Advanced Design and Systems Engineering,
Kowloon Tong, Kowloon, Hong Kong
honkyau@cityu.edu.hk*

Cheuk Sun Jason HO

*City University of Hong Kong, Department of Advanced Design and Systems Engineering
Kowloon Tong, Kowloon, Hong Kong
jasoncho2-c@my.cityu.edu.hk*

Abstract

E-books have been predicted to have a high influence on higher education. However, the use rate of e-e-book adoption in higher education has been lower than expected in Hong Kong. Therefore, it is essential to investigate how students in higher education think of using e-books. In order to obtain a wide view of this survey, a questionnaire survey will be conducted. Research on the perception of higher education students has been done to illustrate the reasons that might lead to a low using rate of e-books. Therefore, the purpose of this study is to help scholar to notice about this issue and encourage students who are in higher education to use more e-books.

Introduction

E-books have been predicted to have a high influence on higher education. However, the using rate of e-books adoption in higher education has been lower than expected in Hong Kong. Research on the perception of higher education students has been done to illustrate the reasons that might lead to a low using rate of e-books. The objective of the study is to investigate Hong Kong students' perceptions of e-books in higher education.

Literature Review

The E-book was first invented in 1946 by Roberto Busa (Battershill et al., 2017). It was a highly marked electronic directory to the work of Thomas Aquinas. The E-book was originally stored in a lone computer and later distributed via CDs in the CD-ROM version in 1989. Later in 1949, a Spanish school teacher name Angela Ruiz Robles devised a prototype e-reader, which could help her students access information through a single device (Ribas et al., 2018). This followed after she watched her students struggling with heavy books to and from school daily. That is when she was inspired to invent a way her students would be relieved from carrying heavy books to and from school each day. Angela named her invention the Enciclopedia Mecanica or in simple terms mechanical Encyclopaedia. Her book contained printed texts which were operated by the use of compressed air. She redesigned her book, where she included audio, magnifying glass, calculator, and an electric reading light. In the 1960s, Douglas Englebart, together with Andries Van Dam, invented their electronic book, of which numerous people believe that e-book started in this era. This was after the File Retrieval and Editing Systems (FRES) documents started running on IBM mainframes. They were structured-oriented instead of line-oriented as it was before with other e-book invention. However, numerous publications state that after all the earlier invention, Michael S Halt was the discoverer of the e-book. Michael generated his first online file by capturing the United States Affirmation of Unconventionality using the computer in plain text.

Implementation of E-book

After Michael Halt's first electronic document on the independence declaration for the U.S IN 1971, a project named Gutenberg was later launched with the aim of creating the electronic copies of numerous books (Chiarizio, 2013). In the 1970s, another implementation of the e-book on the notebook computer was implemented to display books for reading (Tse et al., 2017). The U.S Department of defense started a conception advancement in 1980 for a portable electric delivery device for maintaining a technical information project known as portable electronic aid for maintenance (PEAM) (Cline, 2019). The U.S Department of defense completed on the detailed information in the financial year 1981/82, and they started on the prototype development using Texas instruments in the same year. In 1986, they produced the four protocols and tested them in the same year (Cline, 2019).

Data Discman (electronic reader) was launched by Sony Corporation in 1992, with the aim of helping in reading the e-books that were kept on the CDs (Jesse, 2014). The library of the future was one of the electronic publication that is played on the Data Discman. The early eBooks were only written for small groups that were devoted to

reading. The availability of the internet, which was launched in most countries in the 1990s, made the transfer of the e-book easier and quicker (Cook & Polgar, 2014).

HyperCard stack is a freeware released in 1993 by Paul Baim, known as E-book, which made it easier the transfer and receive text files to generate a pageable form, which was similar to an electronic paperback book (Kirschenbaum, 2013). A feature was designed to automatically help the reader of the E-Book to the top page that was previously read.

The usage of e-book has increased as more reader software and tools are invented worldwide, and the awareness, as well as the perception of the users, have also evolved accordingly (D'Ambra et al., 2013). The definition of the e-book has so far evolved due to the changes in structures of the e-book as the goes. Researchers have come up with a different definition, and they believe there is a distinctive definition of e-book. Some researcher views an e-book as a script or a manuscript that can be read over electronic devices such as a desktop computer, smartphone or , tablet, while others see it as a designed text to be read over technological devices, distancing itself from published books through the provision of some additional structures that permits the user to interrelate with texts via sounds, visual as well as links. Despite the numerous views of what is an e-book, they all agree that technology is involved in viewing and reading books (Cook & Polgar, 2014).

Students have started using e-books due to the advancement of technology and devices (Martin & Quan-Haase, 2013). The advancement has offered numerous advantages over printed books. To the students, the e-book is cost-effective. The E-book has numerous advantages, some of them being; convincing and portability (Micozzi, 2014). In terms of mobility, the e-book is very convenient since readers do not worry about heavyweight carrying the digital library in their pockets. The accessibility of e-book has benefited both teachers and students since they can easily access them online at any moment, whenever they require them (Simonson et al., 2019). In terms of searching, e-book tools allow the readers to quest for them straightforwardly to enhance their education as well as the teachings (Straus et al., 2018).

However, despite having numerous advantages globally, it also has some drawbacks. In some cases, the e-book has no universal standards, as well as the compatibility of the software and the hardware (Mune & Agee, 2016). Some e-books are not easily accessible since they are not globally accessible due to their formats as well as location restrictions. Some of the e-books cannot be accessed in some areas due to security issues and are only available within some countries. E-books require a longer time when downloading, depending on the storage volume and the download speed (Muir & Hawes, 2013). Another disadvantage is that numerous students and users do not have enough skills to use the e-book, and therefore, they need more training, which might cost them (Connor et al., 2019). Additionally, heavy usage of e-books might lead to health issues such as headaches and eyestrain (Liaw & Huang, 2016). Besides, numerous e-books are copy and paste, and thus they do not have features that are interactive and help the students with materials required for studies out of the classroom, in which the learners will not be in a position to share face-to-face discussion (Schugar, Smith & Schugar, 2013).

According to Peng et al. (2015), the e-book has the ability to annotate and share which promotes the scholars' studies via replication as well as the distribution of the concepts. The E-book has some key feature that enables it to be very useful in learning and teaching. Some of the features include; navigation software, content management, as well as a search tool. According to Hwang et al. (2018), e-books can support learners' education by letting them have a good interact with each other in discussion and knowledge construction.

In numerous schools, the e-book has started being embraced through their libraries, though the assumption is that since the learners have evolved with expertise, they might be interested in abandoning the application of printed books (Walters, 2013). However, the assumption has botched to some degree since the use of e-book has not progressed as swiftly as projected irrespective of the growing technology. The slow movement of the way schools and the learners have embraced the usage of the e-book might be a result of a lack of resources as well as knowledge to use it. According to Muir & Hawes (2013), numerous students prefer using printed books over e-books since the printed books are easy to navigate compared to e-books.

Another challenge of using an e-book is that the publishers of the e-books do not issue them for free, but the sale e-books to the libraries and only a limited license of accessing the title will be given to the libraries (Chiarizio, 2013). Once the library buys an e-book license, its cost is at least three times what it would be for the individual user. The reason why e-books are very costly compared to printed setup is that the editors of an e-book are concerned that e-book that is sold could be read or be sold to multiple people, theoretically ruining the sales (Gutknecht, 2013).

Perceived Description of E-books

We live in the age of electronic everything because people love the idea of doing everything from virtually anywhere on any device. Having said that, it is no surprise that people began revolutionizing the way people do just about everything. E-Books have been introduced as a result. Recently, electronic resources have gain acceptance quickly among students, especially those of higher learning. Reading among pupils is a vital feature of their learning procedure and ought to be encouraged. An innovation or effort that improves the students' reading motivation is worth supporting.

Attitude about E-books

Investigating the attitudes of Hong Kong students towards e-books requires the elaborate collection of data citing the nuances or differences between their perceptions. This is based on the fact that perception is a subjective phenomenon that depends on a wide range of factors including the discipline of study, gender, personal learning preferences among other factors.

Behavioral Intention towards E-books

E-Books integration into schoolroom education makes education fun, and they have an engaging experience. Gone are the days when learners used to carry a bag full of books on a daily basis. With eBooks, one device is sufficient to consist of the whole year's syllabus. The digital books are presented to learners, making sure that education is not boring.

Characteristics Determining Perceptions towards E-books

Students have started using e-books due to the advancement of technology and devices (Martin & Quan-Haase, 2013). The advancement has offered numerous advantages over printed books. To the students, the e-book is cost-effective. The E-book has numerous advantages, some of them being; convincing and portability (Micozzi, 2014). In terms of mobility, the e-book is very convenient since readers do not worry about heavyweight carrying the digital library in their pockets. The accessibility of e-book has benefited both the teachers and the students since they can easily access them online at any moment, whenever they require them (Simonson et al., 2019). In terms of searching, e-book tools allow the readers to quest for them straightforwardly to enhance their education as well as the teachings (Straus et al., 2018).

Method And Findings

In this study, a questionnaire survey was conducted to collect data and information from respondents. The target group of this study was students who are studying in post-secondary levels in Hong Kong.

Population and Sample

The target group of this survey was the students who are studying in the post-secondary level with and without experience in using e-books. Therefore, the information and data from them which will be more useful and precise for the survey. Population and sample 120 questionnaires were distributed, and all were returned and can be used in this survey. Table 1 shows the demographic characteristics of respondents.

Table 1. Demographic Characteristics of Respondents

Variables	Frequency
Gender	
Male	50%
Female	50%
Age	
18-22 years old	85%
22-31 years old	15%
University	
City University of Hong Kong	42%
Hong Kong Baptist University	7%
The Chinese University of Hong Kong	10%
The Hong Kong Polytechnic University	18%
The Hong Kong University of Science and Technology	3%
The University of Hong Kong	8%
Other	13%
Year	
Year 1	24%
Year 2	24%

Year 3	23%
Year 4	22%
Postgraduate or above	7%
Major	
Art/Social Science / Education	33%
Business	22%
Creative Media	3%
Engineering	24%
Law	4%
Pharmacy/Medicine	5%
Science	9%
Mode of Study	
Full time	98%
Part time	2%
Time Spent on E-books per Week	
<0.5 hours	42%
0.5-1 hours	15%
1-2 hours	18%
>2 hours	26%
Time Spent on every Session	
<5 minutes	30%
5-10 minutes	9%
11-20 minutes	16%
21-30 minutes	14%
>30 minutes	31%
Time Spent per Day for Non-Educational Purposes	
<5 minutes	54%
5-10 minutes	9%
11-20 minutes	12%
21-30 minutes	6%
>30 minutes	19%
Time Spent per Day for Educational Purposes	
<5 minutes	52%
5-10 minutes	11%
11-20 minutes	11%
21-30 minutes	9%
>30 minutes	17%

Data Collection Method and Analysis

The questionnaire used in this report has designed according to the four fields of perceived description of e-books, attitude about e-books, behavioral intention towards e-books and characteristics determining perception towards e-books.

The questionnaire was divided into three parts. Part 1 is the personal information of respondents. Part 2 is the issue about habit of students using e-books. Part 3 is the perceptions about e-books of students.

The questionnaires were distributed during summer break through online. As a result, numerous of questionnaires can be distributed to our target group.

Data Analysis and Findings

Table 2 was shown below which is the descriptive statistics which provided a summary about the investigated items in this survey. Besides, five-point Likert scale was used to measure the items. All items below, the scale was measured by (1 = Strongly disagree to 5 strongly agree).

Table 2. Summarized Descriptive Statistics

Descriptive Statistics			
ITEM	N	M	s
11. I think E-book is using electronic devices to read books that are in the digital version.	120	4.15	0.95
12. I think E-book is a dedicated device for reading electronic versions of printed books.	120	3.32	1.14
13. I think E-book is text in digital format.	120	2.96	1.13
14. I think E-books are information on the digital format with embedded multimedia.	120	3.35	1.08
15. I am good at using computer technologies	120	3.82	0.94
16. Using E-books for learning always leads to a predicted result.	120	3.23	0.99
17. The organization of digital text on the E-books is clear.	120	3.55	0.89
18. E-books provide relevant information for my course.	120	3.85	0.77
19. E-books present the information in an appropriate format.	120	3.63	0.89
20. The information contained in the E-books is very good.	120	3.64	0.84
21. E-books have visually appealing materials.	120	3.24	1.05
22. I have the experience to use a handled device (laptops, tablets, smartphones, etc.)	120	4.44	0.92
23. I use E-books for in-class reading resources.	120	3.8	1.07
24. I use E-books for in-class designing resources.	120	3.62	1.03
25. I use E-books in my own research.	120	3.68	1.03
26. I use E-books for my other interest (e.g., Entertainment)	120	3.47	1.26
27. I am easy to get the E-books that relevant to my studying area.	120	3.7	0.98
28. I mostly depend on E-books for my learning.	120	3.53	1.08
29. I am encouraged to use E-books during my study.	120	3.21	1.08
30. E-books are included in my course materials.	120	3.53	1.05
31. E-books are on my reading lists or handouts.	120	3.51	1.11
32. E-books are easy to access.	120	3.72	1.01
33. E-books are useful.	120	3.63	0.92
34. E-books are user friendly.	120	3.86	1.01
35. Using E-books help me easier to finish coursework.	120	3.46	1.08
36. Using E-books are easy for me	120	3.95	0.88
37. I believe it is a good idea to use E-books to assist my coursework.	120	3.69	0.97
38. Overall, I enjoy using E-books	120	3.56	0.96

The collected information was examined before the data analysis to ensure validation and reliability. First, the results of component analysis were used to ensure the components in questionnaires are valid. The obtained value in analysis must be greater than 0.7. For the perceived description of e-books, it included 4 items and ranged from 0.95 to 1.14. For attitude about e-books, it included 8 items and ranged from 0.77 to 1.05. For behavioral intention towards e-books, it included 9 items and ranged from 0.98 to 1.26. For characteristics determining perceptions towards e-books, it included 7 items and range from 0.88 to 1.08. As the result obtained were all higher than 0.7, the collected data perceived as valid.

Discussion and Conclusion

This report investigated experience from students towards E-books. The questionnaire survey was conducted to ask for students from higher education points of view towards E-books.

Four fields of instruction are used for investigating. They are perceived description, attitude about E-books, behavioral intention E-books and characteristics determining perceptions towards E-books. They are used to investigate the level of students towards satisfaction in E-books.

Numerous institutions have adopted the use of e-book since it made the research work easier than it was with perusing the pages of a physical book in search of data. Colleges, Universities, as well as military institutions have embraced e-book technology. The advancement of e-book features have attracted many users and offered numerous advantages over physical printed books. The E-book is very convenient in terms of mobility since the readers do not require carrying heavyweight; they just carry a digital library in their pockets. The accessibility of the e-book is why numerous institutions have adopted it since all the readers can access them anytime, whenever they want as long as the internet is available.

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The Use of Quizlet in Teaching Vocabulary to 9th Grade EFL Students

Esra Atalan

Lecturer, Erciyes University

esraatalan@erciyes.edu.tr

ORCID: 0000-0002-8197-9278

Assoc. Prof.Dr. Gonca Subaşı

Anadolu University, ELT Department of Faculty of Education

goncas@anadolu.edu.tr

ORCID: 0000-0001-7049-5940

ABSTRACT

In recent years, numerous innovative tools such as digital and online flashcards have emerged in the education field to meet the needs of digital natives. Therefore, the current study, it was aimed at investigating the impact of a digital flashcard tool, Quizlet, on the vocabulary acquisition of Turkish EFL learners. Besides, learners' perception of using Quizlet was investigated through a semi-structured interview with 26 participants. An experimental mixed methods research design was implemented to gather data. Pre and post-tests were adapted from Laufer and Goldstein (2004) and Webb (2009). The tests were implemented in two groups to evaluate the effectiveness of Quizlet on vocabulary learning. The findings of this research indicated that there was a statistically significant difference between the Quizlet group learners' pre and post-test scores. When the Quizlet group and regular class were compared, it was found that both increased their scores at different rates. Secondly, the results of the interviews supported that more than half of the participants' opinions of using Quizlet were mostly positive. The study concluded that teachers should evaluate and try digital tools as learning resources for today's learners as digital natives.

Keywords: Vocabulary Teaching, Turkish EFL High School Students, Digital Flashcards, Quizlet

INTRODUCTION

Vocabulary is needed in educational settings to function in healthy communication. With a great amount of vocabulary, learners can perform successfully in four skills (Folse, 2006). Having a lack of vocabulary results in difficulty in processing, expressing opinions, and conveying messages. On the other hand, having a large stock of vocabulary has a positive effect on oral comprehension and production comparing a lower level of vocabulary knowledge which leads to problems in producing oral and written outcomes. It has been discovered that a larger vocabulary repertoire affects learners' oral and written production successfully. Students may have difficulties without enough lexical stock while producing oral and written outcomes specifically for the tasks of productive skills (Sofian and Salam, 2015; Yang, 2015). Therefore, scholars working in the field of vocabulary tried to shed light on different ways of teaching techniques and strategies (Pourakbari and Biri, 2015; Schmitt, 2000; Zou, 2017). Even though the importance of vocabulary knowledge is unquestionable these days, the techniques and methods have been still explored in many research studies (Hulstijn and Laufer, 2001; Karalík, 2016). Vocabulary instruction should be reformed under the formal instruction framework in language classrooms (Marmol and Sánchez-Lafuente, 2013). Hence, vocabulary teaching and learning techniques and strategies became the areas of interest for researchers, practitioners, and language teachers to find out effective vocabulary instruction methods to boost the learners' vocabulary knowledge (Liu, 2009). Since the sheer memorization of the words and the traditional chalk and board method is no longer considered effective vocabulary teaching method, even though they might be useful in some cases, vocabulary instruction has been morphed into web-based e-learning in recent years (Nejati, Jahangiri, and Salehi, 2018).

As L2 vocabulary learning is known as a complex process, there have been many efforts to facilitate and enhance this process (Groot, 2000). In recent years, technology-enhanced vocabulary teaching has been viewed as the new learning medium in language classrooms. the influence of technology-enhanced instruction on foreign language instruction has expanded in ESL/EFL classrooms by using e-mail, networking, videoconferencing, web-based projects, pen pal activities, use of multi-media contexts, animated texts, e-books, and e-animation. Furthermore, the use of technology-enhanced instruction in classrooms provides many benefits for teaching and learning in the 21st century (Ritzhaupt, Dawson, and Cavanaugh, 2012). Web-based e-learning environments increase motivation, foster autonomy, and enhance interactivity as well as independent learning potential (Cellat, 2008). Web 2.0 technologies are one of the tools that provide these advantages to learners. While Web 2.0 technologies and tools help the development of four skills in foreign language teaching, it also plays a facilitating role in vocabulary

teaching. Therefore, it will be appropriate to increase research studies on the use of educational environments that are enriched with Web 2.0 tools in the vocabulary teaching process.

Nowadays, there are many opportunities to access various platforms and various multimedia applications for vocabulary learning compared to the past. With the fact that CALL offers a variety of activities such as embedded exercises and automatically generated multiple-choice questions, computers have now made it possible to make even traditional class exercises in vocabulary teaching interactive and more useful. With the developing technology, new teaching methods have emerged and the use of digital tools in language teaching has not been supported with movies, listening tapes, and televisions in classrooms as it used to be, but supported with the development of digital language learning programs. Specifically, a form of text, audio, and picture in the multimedia context supports vocabulary acquisition (Chien, 2015), and as they are easily accessible to learners via the internet and smartphone applications, they have replaced traditional vocabulary teaching materials such as word cards and paper flashcards. Additionally, Nakata (2011) exemplified the advantages of using flashcards, especially by adding that computer-based flashcards support the enhanced presentation of materials and exercise types more than traditional paper-based flashcards due to their multimedia capabilities.

In the context of Türkiye, although it is common to teach vocabulary with flashcards and traditional methods in English Language Teaching, the studies revealed that newly found digital tools affect vocabulary development (Kılıçkaya and Krjka, 2010; Nakata, 2011; Samur, 2012). Specifically, various e-learning tools focusing on vocabulary acquisition such as My Word Coach, Study Stack, Cram, Word Engine, and the commonly used Quizlet digital tool with 50 million users (Quizlet, 2019) have been developed and integrated into the language classrooms. For this reason, the instructional digital flashcard tool, Quizlet, was administered since it provides student autonomy, and feedback to students, and finally, it provides student observation opportunities for teachers. The Quizlet system which is designed as a website is commonly utilized for language learning. The digital system supports learners' autonomy and pleasure; provides relevancy; and increases the attention span and confidence of the learners.

In this respect, the current study was conducted for high school students who were learning English as a foreign language about improving their vocabulary skills, and a semi-structured interview was conducted to measure the effect of the online tool on students' motivation. The following questions were posed to design the study:

1. What is the effect of Quizlet on the 9th-grade EFL students' vocabulary learning?
2. What are the viewpoints of 9th-grade EFL students about the impact of Quizlet?

REVIEW OF LITERATURE

a- Using Quizlet as a Flashcard Tool to Teach Vocabulary

Digital flashcards have been a focus among learners and teachers. The role that digital flashcards play in vocabulary teaching is a non-negligible trend and the necessity and importance of digitalized flashcards are on-trends in the field. The integration of multimedia and technology types of instruction such as web-based programs, online flashcard games, word annotations, and glossing into vocabulary learning has been recorded in the literature. As a part of multimedia learning, the studies indicated several effects of online flashcards on vocabulary learning concluding that sound, pictures, annotation containing text, and L1 equivalent help EFL learners acquire more words. (Ali, Mukundan, Baki and Ayub, 2012; Browne and Culligan, 2008; Daloğlu, Baturay and Yildirim, 2009; Tuite, Pavlik, Fan, Robison, Jaffe, and Liu, 2012). Most digital flashcards have been specifically designed with capabilities that are not possible with paper flashcards (Nakata, 2011). Several research studies highlighted the efficacy of digital flashcards comparing paper flashcards and the results indicated that using digital flashcards was more effective (Azabdaftari and Mozaheb, 2012; Basoglu and Akdemir, 2010; Kılıçkaya and Krajka, 2010). Additionally, learners' acquisition of word knowledge via online flashcard websites depends on some factors. To begin with, it should have a user-friendly interface regarding how to log in, play online games, or make flashcards. Furthermore, word knowledge of learners encompasses meaning, spelling, pronunciation, connotation, collocation, register, opposite, and a word's derivation (Benjamin and Crow, 2010) the fact remains that it includes the knowledge of meaning, form, and use. Hence, online websites should offer a variety of word knowledge instructions as follows: example sentences, parts of speech, L1 and L2 definitions of words, sound files, pronunciation of the words, and collocations (Browne and Culligan, 2008) and should focus on improving receptive and productive skills by offering exercises to practice and acquire both receptive and productive skills of word knowledge.

As an online flashcard tool, Quizlet with over 50 million users every month (Quizlet, 2019), and offering 18 different languages is known as multidimensional CALL software and an online mobile application. Apart from its extra features for teachers, it can serve as free online learning material.

The Quizlet digital tool can be studied on computers, and cell phones via mobile apps (iPhone or Android). Users can access diverse flashcard sets on numerous topics, or they can create different study sets. Even though the software program presents a prompt on the front and the answer on the back like regular class paper flashcards, the Quizlet flashcard software program enables users to insert visuals to correspond to the target word. Hence, this feature is in line with Mayer's multimedia learning framework that is saying "people learn better from words and pictures than from words alone" (Mayer, 2005, p. 31). Moreover, clicking on the 'Audio on' button supports learners in hearing the pronunciation of the word. Quizlet, with its feature, supports Mayer's 'dual-channel assumptions' by promoting both visual and auditory materials. Following that Crandell (2017) asserts some crucial reasons to utilize Quizlet for vocabulary learning:

- 1) Learners can hear as well as see the information presented on the cards
- 2) Users can engage in several activities in which they must type from memory one side of a card when the other side is presented to them, requiring them to do more than passively review the cards (p.22).

Likewise, with its entertaining and competitive atmosphere, Quizlet gives learners control over their autonomy and facilitates their engagement in the class (Cunningham, 2017).

b- Empirical Studies in Various Countries on Quizlet Digital Tool

Bueno-Alastuey & Nemeth (2022), for example, conducted a study with a total of 23 Spanish students to find out whether using Quizlet was useful or not on students' receptive and productive vocabulary acquisition. The study also aimed to compare the effectiveness of Quizlet word sets and podcasts created by the students. The researchers concluded that students scored higher in the productive post-test after the Quizlet treatment even though the Quizlet group achieved slightly lower scores than the podcast group regarding receptive vocabulary. The research study indicated that students identified the Quizlet method as more efficient than the podcasting treatment. Following that Nguyen and Le (2022) compared three study groups to evaluate whether the Quizlet treatment enhanced lexical retention between in-class and at-home learning modes by employing a quasi-experimental design. Regarding data, the researcher revealed that the difference was not significant between in-class and at-home groups. Both groups gained higher scores after using Quizlet than the ones who did not. Further, Waluyo and Bucol (2021) suggested the elements of gamified learning in Quizlet provided significant improvements between pre and post-test vocabulary scores. The research was carried out with 65 low-level university learners in Thailand. The data was collected in two cycles. The learners did not get any instruction with Quizlet in the first one but were supported with Quizlet in the second cycle. The learning outcomes uncovered the positive impacts of the tool. Additionally, there are several studies conducted in Türkiye to investigate the impact of Quizlet on vocabulary learning. To illustrate, a recent study carried out by İnci (2020) applied the Quizlet application to reveal the effect of computer-aided learning on student participation and vocabulary development with 100 participants in a university. Moreover, the researcher investigated whether the groups showed significant differences by conducting the motivation subscale. Finally, the Quizlet group improved in their attendance compared to the regular class. Additionally, the Quizlet group showed significant improvement in terms of productive vocabulary. Another research made by Bilcan (2019) was to find out whether the Quizlet flashcard tool had an impact on learners' vocabulary gain and recall. The researcher compared the progress of the learners on Quizlet to their immediate test scores. The researcher in this quasi-Quizlet study collected data from 93 high school students. Correlation analysis showed that there was a significant relationship between the immediate tests and learners' progress on Quizlet. Post-test results also indicated a strong relationship between Quizlet progress and vocabulary recall. Regarding pair sample t-test results, it was found that differences between immediate and post-test results were significant, which corresponded with the aforementioned studies showing us how using Quizlet online flashcards showed significant differences between pre and post-test and also between pre and delayed post-test.

Table 1: Review of the Empirical studies

	Author & Year	General Aim	Main Findings
1	Alastuey and Nemeth (2022)	Quizlet's impact on receptive and productive vocabulary learning	Quizlet and podcast groups showed different achievements in productive and receptive skills.
2	Yan (2022)	To compare lexical retention in two different learning modes	The groups that used Quizlet scored relatively higher than the ones that did not.

3	Waluyo and Bucol (2021)	To test the effectiveness of Quizlet by comparing test scores	Quizlet supported the positive improvement of vocabulary learning after applying it.
4	İnci (2020)	To reveal the effect of computer-aided learning on student participation and vocabulary development with 100 participants in a university.	The Quizlet group improved in their attendance compared to the regular class. Additionally, the Quizlet group showed significant improvement in terms of productive vocabulary.
5	Bilcan (2019)	To find out whether the Quizlet flashcard tool had an impact on learners' vocabulary gain and recall	There was a significant relationship between the immediate tests and learners' progress on Quizlet. Post-test results also indicated a strong relationship between Quizlet progress and vocabulary recall.

In conclusion, preceding studies suggested the acceptance of Quizlet in various implementations. However, the effect of Quizlet on vocabulary learning comparing two groups and low-level learners is low. It has become apparent that further research on the effect of digital tools on vocabulary is needed. Even though there have been some studies on the use of Quizlet, the relationship between Quizlet and vocabulary gain is a research gap comparing the regular class. Hence, the purpose of the present study is to shed light on the effects of Quizlet digital web tool on 9th-grade EFL learners' vocabulary development.

METHODOLOGY

a. Participants and Setting

52 Turkish EFL learners aged 14-15 years, who were male and female 9th-grade students at a high school in Gaziantep, Türkiye with Turkish as their native language, were chosen to participate in this study. About 250 students took place in the vocabulary familiarity test to get to know which words were known by the learners. After vocabulary familiarity and pilot tests, 52 students took part in the pre-test based on the convenience sampling method. In total 28 of the 52 participants were female and 26 were male. The participants were divided into two equal groups: the Quizlet group, which used (Quizlet), and the regular class, which had no special treatment but regular class methods. To make sure of homogeneity of the classes regarding their proficiency level, the English teachers working at the research school and the researcher investigated the main coursebook and administered a proficiency test. The proficiency test was run to test whether the students at the school were A1 or A2 level learners according to the Common European Framework of Reference for Languages. Concerning their ages and proficiency level, the subjects were homogenous.

b. Research Design

The study centers upon the digital program called Quizlet as a teaching method to build learners' vocabulary. The research was an experimental mixed-methods design. This study involved two instructional conditions. These included 1) Quizlet group: The participants studied flashcards in class at the school laboratory and on their own time after class for two weeks to make them autonomous learners. 2) Regular class: The participants did not get any treatments, but they had the same class materials as the Quizlet group. Both groups stuck to the same reading materials, however, the vocabulary activities differed between the groups. The design of the study was based on a comparison of the pre and post-test scores between groups to assess the effect of the Quizlet digital app. Even though the pre and post-tests were conducted in both groups, the treatment was only received by the Quizlet group. The research lasted 8 weeks.

c. Data Analysis

To test the reliability of the vocabulary tests designed by the researcher, Cronbach's Alpha analysis was run. At the end of the analysis, Cronbach's Alpha coefficient was found to be as 0.924. Before applying the pre-test, ten English teachers were asked to rate questions by marking appropriate numbers to match their opinion to ensure the content validity of the test. Receptive/ productive knowledge of orthography, meaning, form, and grammar tests was found valid by 9 out of 10 teachers.

For this study, an independent samples t-test was used to see whether Quizlet had an impact on participants' vocabulary gain. An independent sample t-test was also used to present the difference between before and after the treatment and the differences between the Quizlet and regular class. Furthermore, a paired t-test was needed to compare the means of the very same subjects to interpret the effects of the Quizlet on the Quizlet group.

d. Data Collection Procedures

The length of the study was eight weeks. In week 1, the students in the Quizlet group received learner training to increase their familiarity with the Quizlet tool before the start of the treatment. The researcher explained how to log in and how to use features (flashcards, test, spell, learn, write, matching game, gravity) of Quizlet about receptive and productive vocabulary knowledge. The Quizlet group presented tasks and assignments through Quizlet adapted from Schmitt (1995) that are: a) parts of speech; examining whether the target word is a noun, an

adverb, an adjective, or a verb, b) translation; translating the target word into L1, c) making full sentence; constructing a sentence with target words, d) synonyms and antonyms; investigating synonyms and antonyms of the words. During the creation of the cards, the English and Turkish definitions are provided on one side of the cards and how they would be presented in the flashcard format was considered.

Next, a piloting test was conducted to decide whether there would be any modifications to the pre and post-tests such as time allocation and question types. It was done to test some question items to make them easier to understand. The piloting study was administered with 30 students which corresponds to more than 10% of the number of students in the main study. The participants took the pre-test during the regular class time in the first week. Following the piloting and pre-test, the actual data collection started in the second week and lasted 7 weeks. Then, the post-treatment test was administered to 52 students at the end of the 8 weeks. Also, at the end of the last week to examine the Quizlet group's pronunciation production level, the participants were asked to read the target words aloud in a sentence while the instructor was recording them. Finally, to analyze whether a digital flashcard program called Quizlet affected learners' vocabulary and pronunciation knowledge, a semi-structured interview was applied to all subjects in the Quizlet group for the qualitative research part after the post-treatment test.

e. Qualitative Analysis of the Interviews

First, the coding was determined as the first step of the analysis. The answers of the students were coded for each question according to the negative and positive answers of the participants, and common patterns were categorized. Through this analysis, the categories were formed, and participants' utterances were put into categories based on the similarities of codes. After putting together, the relevant codes, the number and percentage of learners for each category were presented. Finally, the findings were determined as 2 themes: positive and negative findings of the semi-structured interview. Those two themes were analyzed under 5 categories for negative findings and 9 categories for positive findings. To provide consensus for codes and categories, a few examples (30% of the whole data) of coding were analyzed together with the research assistant and the researcher, and the rest of the content analysis was carried out by individuals.

f. Data Collection Instruments

Pilot study

The researcher specifically prepared a pilot test designed with non-target words to construct a pre-test. The pilot study was a researcher-made piloting vocabulary test (adapted from Laufer and Goldstein, 2004; Webb, 2009) that consisted of 8 parts and 5 vocabulary items. Expert opinion was taken for the validity of the test.

Vocabulary familiarity test

To determine the words the learners were familiar with a self-checking vocabulary familiarity test was administered to 250 participants from the research school. They were asked to only indicate whether they knew the word or not. To prevent the overuse of tick words they did not know, the researcher constructed a word list including some nonwords. The students who ticked nonwords more than three times were excluded to control unreliable marking.

Vocabulary tests

To collect data, pre-and post-test were used in the current study. Vocabulary tests were comprised of eight tests assessing knowledge of orthography, and grammatical functions which were adapted from Webb (2009) and meaning & form adapted from Laufer and Goldstein (2004). The vocabulary knowledge was measured in the aspect of receptively and productively.

RESULTS

First, the researchers explore whether the students who work with a Quizlet online digital tool achieve better vocabulary than students who learn only with regular class methods over six weeks. To answer this, 52 participants in two different groups were selected to take part in the study. The Quizlet group received treatment with an online flashcard tool that lasted eight weeks and the other group did not use any tool (no-tool group). Secondly, this section presents the findings on whether using an online language learning tool improves the success of Quizlet group students' learning a foreign language in English in terms of vocabulary. Finally, the chapter reports the findings of the opinions of the students who learn English as a foreign language on the effect of Quizlet on their vocabulary studies.

1. The Difference in the Vocabulary Tests according to the Groups

Research Question 1: What is the effect of Quizlet on the 9th-grade EFL students' vocabulary learning? To answer this question, an independent t-test was utilized to explore whether there were statistical differences in the pre and post-test scores of vocabulary tests according to the groups. Descriptive findings regarding pre and post-test differences were presented at first, and then inferential findings related to pre and post-test differences for 8 different vocabulary tests were introduced. Means and standard deviations for each set of scores received from the

experiment and regular class on all assessments were measured. For the aim of the study, a significance level of $p < .05$ was used to make all determinations of statistical significance.

The Difference in the Mean Scores of the Orthography Receptive Test

Table 2: Difference between pre-post orthography receptive test

	Group	N	Mean	SD	<i>t-test</i>			Cohen's d
					t	df	p	
Pre-posttest Differences of Orthography Receptive	Quizlet	26	19.230	9.745	-0.342	50	0.734	-0.095
	Regular class	26	20.266	11.981				

When it comes to investigating the difference between Pre-Orthography Receptive and Post-Orthography Receptive test scores, the Quizlet group averaged 19.2. To be more specific, the difference between the pre and post-test for the Quizlet group was 19.2, which means the Quizlet group increased their vocabulary scores at the end of the study. On the other hand, the regular class group averaged slightly higher than ($M = 20.266$, $SD = 11.981$) for the Quizlet group and the difference between pre and post-test for the regular class group was 20.2 showing that their vocabulary scores increased at the end of the study. Even though the regular class increased their difference between pre and post-test more than the Quizlet group, post-test scores were in favor of the Quizlet group. Finally, according to the results of pre and post-test differences in Orthography Receptive between the Quizlet and regular class, the results produced non-significant results ($t(50) = -0.342$, $p > 0.734$, $d = -0.095$). This posits that they gained almost similar vocabulary scores, but as it can be seen in Table 5., the regular class group obtained more scores in terms of the Orthography Receptive test.

The Difference in the Mean Scores of the Orthography Productive Test

Table 3: Difference between pre-post orthography productive test

	Group	N	Mean	SD	<i>t-test</i>			Cohen's d
					t	df	p	
Pre-posttest Differences of Orthography Productive	Quizlet	26	29.142	15.120	-0.675	50	0.503	-0.187
	Regular class	26	31.953	14.896				

An independent samples t-test was performed to measure the difference between the Pre and Post- Orthography Productive tests for both the Quizlet and regular class. Both groups increased their post-test scores, however, the difference was in favor of the regular class group ($M = 31.953$, $SD = 14.896$). The Quizlet group produced a mean of 29.1, which means the group only increased their vocabulary score average by 29.1 from the beginning to the end of the study. Even though the Quizlet group gained higher scores in the Post-Orthography Productive test, the difference between mean scores decreased since the regular class increased their scores more in the post-test. There was not a statistically significant difference when investigating the significance of the difference between Pre and Post-Orthography Productive tests. ($t(50) = -0.675$, $p > 0.503$, $d = -0.187$). The result of the comparison of the mean scores on tests for individual groups is presented in Table 3.

The Difference in the Mean Scores of the Passive Recall Test

Table 4: Pre-post differences of passive recall

	Group	N	Mean	SD	<i>t-test</i>			Cohen's d
					t	df	p	
Pre-posttest Differences of Passive Recall	Quizlet	26	52.440	16.919	-0.352	50	0.727	-0.1098
	Regular class	26	54.215	19.401				

As can be seen in Table 4., the difference between the Pre-and Post-Passive Recall test was in favor of the regular class ($M = 54.215$, $SD = 19.401$) still, the Quizlet group gained a higher score in the post-test and the difference between the Pre-and Post-Passive Recall test for Quizlet group was identified a mean of 52.4. The results indicated

that both groups made improvements in the vocabulary test as seen in the table, however, there was not a statistically significant difference between the groups. ($t(50) = -0.352$, $p > 0.727$, $d = -0.1098$).

The Difference in the Mean Scores of Active Recall

Table 5: Differences between pre-post active recall

	Group	N	Mean	SD	<i>t-test</i>			Cohen's d
					t	df	p	
Pre-posttest Differences of Active Recall	Quizlet	26	42.012	23.216	-4.455	50	<.001	-1.236
	Regular class	26	68.860	20.132				

Although the Quizlet group had a higher post-test score, the difference between the pre and post-test was in favor of the regular class obtaining a mean of 68.8. The Quizlet group had a mean of 42.0. The fact that the measured central tendency of difference ($M = 68.860$, $SD = 20.132$) for both immediate and post-test in the regular class was higher than the Quizlet group's difference between the tests ($M = 42.012$, $SD = 23.216$). When it came to comparing the mean scores of differences between the groups, there was a statistically significant difference between the Quizlet and the regular class ($t(50) = -4.555$, $p < .001$, $d = -1.236$) as shown in Table 5.

The Difference in the Mean Scores of Passive Recognition

Table 6: Differences between pre-post passive recognition test

	Group	N	Mean	SD	<i>t-test</i>			Cohen's d
					t	df	p	
Pre-posttest Differences of Passive Recognition	Quizlet	26	35.282	15.968	-1.455	50	0.152	-0.404
	Regular class	26	41.938	17.003				

When it comes to comparing the difference between the pre and post-test mean scores, there was no statistically significant difference between the groups. ($t(50) = -1.455$, $p > 0.152$, $d = -0.404$). However, the difference was in favor of the regular class group. ($M = 41.9$, $SD = 17.0$). The students made the highest improvement as pre-test scores rose from 48.2 to 90.1. On the other hand, the Quizlet only raised their scores by 35.2 points as displayed in Table 6.

The Difference in the Mean Scores of Active Recognition

Table 7: Differences between pre-post active recognition test

	Group	N	Mean	SD	<i>t-test</i>			Cohen's d
					t	df	p	
Pre-posttest Differences of Active Recognition	Quizlet	26	30.695	13.127	-1.898	50	0.063	-0.526
	Regular class	26	39.940	21.083				

The results of the post-test that were carried out throughout the treatment period showed the expected progress for both groups. The difference between the pre-and post-test difference for the Quizlet group was 30.6 whereas the regular class had a mean of 39.9. The difference was in favor of the regular class however the results yielded that there was not a statistically significant difference between the groups ($t(50) = -1.898$, $p > 0.063$, $d = -0.526$).

The Difference in the Mean Scores of Receptive Knowledge of Grammatical Functions

Table 8: Differences between pre-post receptive knowledge of grammatical functions

	Group	N	Mean	SD	<i>t-test</i>			Cohen's d
					t	df	p	
Pre-posttest Differences of Receptive Knowledge of Grammatical Functions	Quizlet	26	19.157	11.518	3.107	50	0.003	0.862
	Regular class	26	8.875	12.334				

When it comes to analyzing the difference between the tests for both groups as shown in Table 17, the Quizlet group made the highest improvement by gaining a 19.1 mean score. On the other hand, the regular class group only increased their mean score by 8.8 points between Pre and Post Receptive Knowledge of Grammatical Functions.

The Difference in the Mean Scores of Productive Knowledge of Grammatical Functions

Table 9: Differences between pre-post productive knowledge of grammatical functions

	Group	N	Mean	SD	<i>t-test</i>			Cohen's d
					t	df	p	
Pre-posttest Differences of Productive Knowledge of Grammatical Functions	Quizlet	26	44.230	19.985	3.617	50	<.001	1.003
	Regular class	26	25.667	16.895				

When it came to their Pre and Post-Productive Knowledge of Grammatical Functions tests differences according to the Quizlet group and regular class, as a result of the analysis, there was a statistically significant difference ($t(50) = 3.617, p < .001, d = 1.003$). The difference was in favor of the Quizlet group students engaged in a digital app ($M = 44.230, SD = 19.985$) when compared to the students in the regular class group ($M = 25.667, SD = 16.895$).

2. A Brief Summary of the Results of Quizlet Group

The results of the comparisons of mean scores based on pre-post vocabulary tests over time using one-way repeated measures of ANOVA were presented as follows:

Table 10: Tests of within-subjects effects for the Quizlet group

Cases	Sum of Squares	df	Mean Square	F	p
Time	15360.148	1	15360.148	387.220	< .001
Residuals	991.694	25	39.668		

Note. Type III Sum of Squares

As displayed in Table 10. there was a statistically significant difference between the pre-test (and post-test regarding vocabulary test scores in time ($F = 387.220, p < .001$).

Table 11. Findings of the averages of mean scores with respect to pre-post-test mean scores of participants in the Quizlet group

Time	Mean	SD	N
pretest	44.545	14.030	26
posttest	78.919	13.299	26

According to the findings, the mean vocabulary scores were $M=44.5$, ($SD= 14.03$) in the pretest. In the post-test, the mean vocabulary scores were computed to be $M= 78.9$ ($SD= 13.2$). The mean scores of pre and post-test scores seemed to indicate an increasing trend over time.

To summarize all the findings by given representation to figure out the impact of Quizlet on learners' vocabulary development, based on the results of pre and post-test scores of the Quizlet group, a Raincloud Plot was presented to explore how the Quizlet group improved their scores in terms of pre and post vocabulary tests.

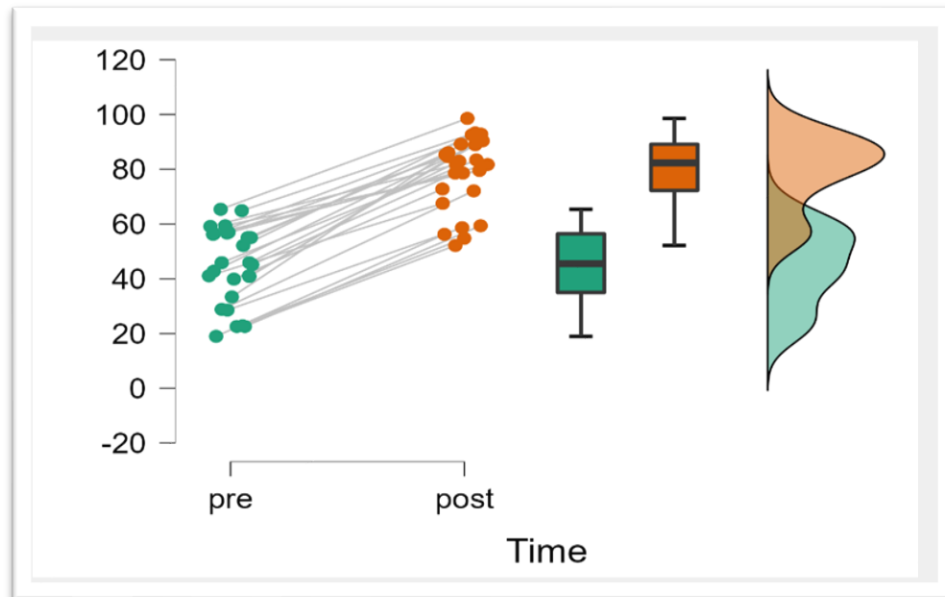


Figure 1: Raincloud plot for pre-post test scores of the Quizlet group

When the pre-test and post-test scores ranges were examined, it was observed that the students' scores increased over time. The scores from the pre-test range from 20 to 60 while the scores from the post-test range from 52 to 100. In the pre-test, the distribution of scores in the bar plot was wide, on the other hand, the bar plots of the post-test were narrowed revealing that the vast majority of students had approximately the same scores.

As seen in Figure 4.1. Raincloud Plot, although all students increased their scores on the post-test at almost the same rate, some students whose scores range from 20 to 30 were unable to increase their scores as much as others on the post-test. In addition, the pre-test average was also found to be relatively low for these participants. Scores of the students who scored slightly lower on the pre-test were compared with scores obtained from their post-test and these students were detected and possible reasons were analyzed in the results of the qualitative data section.

Results of Qualitative Data: Interview for the Quizlet Group

In this section, the data obtained from 26 participants from the Quizlet group employing the semi-structured interview were analyzed via content analysis. The second research question asking, "*What are the viewpoints of 9th-grade EFL learners about the impact of Quizlet?*" was answered from data gathered from Quizlet group participants' responses to the interviews at the end of the study.

To begin with, to investigate the learners' perceptions of using the Quizlet tool, interview questions were designed based on the related sources in the literature. While preparing interview questions, two English instructors examined the questions and provided feedback.

In the second place, the transcription of the conversations was translated into English and checked by an ELT expert. Thirdly, for the content analysis of the interviews, the coding method was applied. Categories and codes were determined by the researcher and another research assistant based on common patterns and counted. Among 81 codes, interrater reliability was 91.7% between the raters. The percentage agreement between the researchers was calculated. Finally, the analysis of the interview data revealed two themes: positive findings and negative findings.

In order to investigate the impact of Quizlet on students' vocabulary learning, the first question was asked 'What is the effect of Quizlet on learning new words?' The summary of the responses is given in Table 12.

Table 12: Learners' overall opinions on the effects of the Quizlet on their vocabulary and pronunciation studies

Categories of Positive Findings	(n)
Effectiveness of using Quizlet	10
Satisfaction with using Quizlet	6
Appropriateness of the Quizlet on vocabulary learning	5
Memorability of the words	5
The success of the Learners	3

THEME 1: Positive Findings of the Semi-Structured Interview

Effectiveness of the Quizlet:

With respect to Table 12. 10 students out of 26 participants (38.4%), of all applications they have used so far to learn English, Quizlet was the first app they did not give up so easily. They stressed that more or less other apps could also help them to learn the words, however, they had not been monitored by the teacher until now. They indicated that they were more eager to try study and game modes because they knew that the teacher could check their progress and give feedback weekly on what they did or not. They suggested that even if they could download the application on their phones and work on it individually, they got the most out of it when they were working in the lab with their teacher and friends. Student 21 stated that *“Though whiteboards are crucial for classrooms, these tools should also be integrated into lessons, especially in English and German classes.”*

Since English is not written as it is read, 6 of the participants also agreed that the ‘Spell’ mode of the app, helped them especially improve pronunciation and how to write a word correctly. Student 17 responded *“I have always struggled to hear and write an English word. My middle school English teacher always practiced dictation activities in English lessons, and I always failed. I did not believe that I could spell a term fully correct. At the end of the test, I could see what I missed and correctly spelled. I got used to the app in time and now I can feel self-confident to study English again.”*

Satisfaction with using Quizlet:

Creating study sets was another most frequently reported effect of the Quizlet by six participants out of 26 participants (23%). It was reported that when they were given homework on using words in a sentence, they were asked to create study sets and write sentences through the ‘Create Study Set’ feature increased their attention. Student 2 also briefly elaborated on the relationship between creating study sets and the effectiveness of doing tasks through Quizlet *“If I was asked to write the same sentences in a notebook, I would get bored and I would not, but I knew my friends would see my study sets and maybe study my own sets. I was creating them carefully and was making the changes immediately with the corrections of my teacher, which I think I never do for usual homework.”*

E9 put forward that they always kept vocabulary notebooks when they were studying for the LGS but never be able to remember those words even though they encountered them in the 9th-grade English coursebook. However, Quizlet increased their vocabulary gain and motivation to learn the vocabulary in the reading passages.

Student 9: *“I was always motivated to improve my English, but I always got stuck on remembering new words. Even I was so frustrated that I did not even remember the word I have encountered before. Now I understood that using the digital application and using technology in the class affected my vocabulary learning process.”*

Another reported element as to the effect of Quizlet on vocabulary learning was seeing study sets on the games. Three students emphasized that for some sets, the instructor created sets not only by providing L1 or L2 meanings but used in a sentence for practicing. Seeing these sets playing the Gravity game was perceived as having a positive effect on vocabulary learning. Student 14 explained as follows:

“In the gravity game, you have to be quick, and your score depends on how fast you act. Playing the Gravity game with Turkish or English definition sets did not help me recall the words but reading sentences with target words and deducing the meaning as fast as I might be the only thing for me to give my attention to the target words and helped my vocabulary learning.”

Appropriateness of the Quizlet on vocabulary learning

Five participants out of 26 participants (19%) considered that using Quizlet digital application was appropriate for the way they learn English outside of the classroom. Hence, using a digital tool and integrating the English class appealed to them. Four of them stressed that when the Covid-19 pandemic came into their lives, it led them to have

more motivation toward learning through technology. In addition, a student asserted that English is a world language, and learners cannot be separable from the digital era. On account of being good at and into computer games made it easier to learn vocabulary and keep up with studies in the Quizlet application. Some comments of participants about the appropriateness of the Quizlet in their vocabulary learning process are as follows:
Student 4: *“I am very into computer games. I wish we could have studied other courses through Quizlet.”*

Memorability of the words:

Five students out of 26 (19%) in the Quizlet group unanimously agreed that they had numerous flashcards with different topics set and clicking on the ‘Audio on’ button and the chance to see the picture of the word made it possible for them to remember the words. They stated that ‘flip and flow’ enabled them to recall words covered in the class. One of them is attributed to the efficiency of Quizlet in timesaving during vocabulary learning. Some comments of participants about the memorability of the words through flashcards modes are as follows:

Student 15: *“I was always checking different dictionaries to check meaning and pronunciation and I was getting bored, but it was more fun through Quizlet. It was so organized that I could reach everything whenever I wanted. It was really helpful to have access to everything through an application.”*

Moreover, participants pointed out that they remembered the words well when they saw the words in any other texts because they encountered definitions, synonyms, antonyms, and thanks to prerecorded pronunciations and visuals. Student 2 emphasized that *“I was so surprised to see my improvement in vocabulary and pronunciation while I was reading a passage after the third week. I was so determined to follow everything on Quizlet, and I believe it worked well for me.”*

The success of the Learners:

Another common thought shared by the three students (11%) was their success in vocabulary and pronunciation. They put forward that Quizlet digital application tool facilitated their vocabulary learning process to gain more vocabulary. Some comments of the learners about the benefits of Quizlet in their English language are as follows:
Student 24: *“I noticed that whenever I finished a word set, I actually learned more than that word. I have learned possible synonyms, antonyms, and how to use that word correctly in a sentence. For some sets, our teacher did not give the meaning of the words but used that word in a sentence in the flashcards. It really improved my English.”*

In order to investigate the participants’ comments on their favorite features of the Quizlet app, the participants were asked ‘What is your favorite feature of Quizlet to study vocabulary?’ The summary of the responses is given in Table 13. below.

Table 13: Learners’ overall opinions of the features of the Quizlet

Categories of Positive Findings	(n)
Focus	11
Game elements	7
Fun & Enjoyment	6
Frequency	3

THEME 1: Positive Findings of the Semi-Structured Interview

Focus:

With respect to Table 13., 11 students out of 26 in the Quizlet group (42 %) agreed that typing words after they heard was their favorite feature among all others, which was consistent with the Orthography Receptive and Productive test results that they had increased their scores in both tests. They reported that the ‘Spell’ mode made enabled them to get progress reports and see the total number of words they learned fully, partially learned, and yet-to-be-learned words. They also said that it was the most needed skill because they wanted to pronounce the words correctly and be skillful when spelling words if they wanted to be proficient users of English.

When they were asked which of the options from dictation, matching, or games options were useful for them, the most common answers are Spell and Write modes. Student 1 mentioned she realized that learning a word’s meaning is not sufficient alone. She was so sure of the meaning of the word, but she could not type it correctly or pronounce it. She was also asked to what extent she got the most out of the Quizlet. She reported that hearing the pre-recorded audio with visuals at the same time and then working on Spell mode helped her progress a lot.

Student 1: *“I was quite focused on how to say and write the words correctly. I realized that I was following the wrong routine to learn the meaning of the words. I always tried memorizing them at first. However, when my*

teacher said even the exact word, I couldn't recognize it or when I needed to pronounce it, my pronunciation did not satisfy me at all. I could learn the meaning of the word anywhere on the Internet; however, I quite enjoyed how the Spell and Write section progressed my improvement for the specific word set."

Game Elements:

Game elements appeared to be another most common answer to this question. Seven out of twenty-six students in the Quizlet group (26%) answered they always played some popular games but not for the purpose of learning a language. Racing against time and one another was something new for them. One student points out that competitiveness encouraged him to learn all the words. Another student pointed out that Quizlet Live was the game he realized what he knew or did not know. Since it created a rivalry between classmates, Quizlet Live made vocabulary learning more fun. Moreover, the Gravity game became one of the outstanding modes among the others for the participants. Based on their progress on Quizlet and their attributions to the game, it was observed during the data collection procedure that the majority of the learners engaged mostly in this game. Some comments of the participants about games of the Quizlet are as follows:

Student 15: *"Whenever I see my name on the leaderboard after playing Gravity many times to become a winner of the week, I never felt bored."*

Fun & Enjoyment:

Six students out of 26 in the Quizlet group (23%) also emphasized that they did not want to engage in English class most of the time. They were not fully concentrated on the words in the reading passages. However, when it added fun and excitement to exercises, which they were doing on paper before, they increased their engagement and helped them to be more self-confident in answering questions in a text. Student3: emphasized that *"I think using a digital applicant can make even a tedious class more fun."*

Student 14: *"Normally I play games even in English without fully comprehending the situation. However, this time I knew what I was doing. I was so eager to finish other study modes and then move on to Gravity. I really liked the usability of Quizlet. Even if you move in the direction of the games, it is nearly impossible to be a winner without completing other modes."*

Frequency:

Regarding Table 13 the students were then asked how often they used features they interacted with most in the Quizlet. Three participants (11%) replied that they knew the teacher had the chance to follow their progress. For this reason, they always completed every study section to achieve better scores on the *Test* and *Games of the Quizlet*. Another student described the reason that it would not make any sense to skip a study mode because they were all connected and the more you fully mastered studying online flashcards, the more you would be successful in *Test* mode or *Write and Spell*. Student 13 highlighted that *"Even though I did not have any Quizlet assignment for that week, I regularly checked my Study Flashcard sets to brush up on my previous knowledge of the vocabulary sets."*

In order to investigate the participants' comments on how Quizlet digital tool can be improved, the participants were asked 'How can we improve Quizlet? What is your opinion?' The summary of the responses is given below.

Table 14: Learners' overall opinions on the improvements in the Quizlet

Categories of Negative Findings	(n)
Recording voice	9
Infrastructural-Incompetence	8
Inappropriateness	5
Unfamiliarity	4
Satisfaction	5

THEME 2: Negative Findings of Semi-Structured Interview

Recording voice option:

Table 14. represents the overall responses of the learners on the difficulties they had using Quizlet. The majority of the answers were about the recording of their voice. 9 students out of 26 in the Quizlet group (34.6%) preferred to be recorded after they listened to the audio especially when they worked on flashcards. They suggested that Quizlet always showed their progress and that kept them updated. It would be more useful if it recorded their voices and rated them. Moreover, 3 students added that when they worked individually after school, they were not sure whether they pronounced correctly or not. Two of them responded that they were monitored by the teacher in the class, however, it was problematic not to record each word set. Student 10 expressed his concern by saying

that: *"I don't feel self-confident when I need to read a passage after the teacher or in fact, I have concerns about how I pronounce a word. I feel insecure and have the feeling my friends will make fun of me. Before we used the Quizlet application, I already started using Cake, which has voice recording options. When your recording did not satisfy the expectations, you need to practice again until you are done. However, Cake does not have what Quizlet has at the same time. I wish we could combine all beneficial features in one app."*

This technical drawback of Quizlet was mentioned by the other three participants saying that there should be a feedback scoring system regarding their mistakes. Additionally, two students complained about the loudness in the classroom caused by the ineffectiveness of understanding the pronunciation of the words in the Spell mode. Student 15 and Student 19 put forth that: *"We did not have enough headphones. I think we should study this tool as an individual work because using Quizlet and audio option in a crowded classroom where the sound effect is noisy caused us not to receive voice accurately."*

Infrastructural-Incompetence:

8 out of twenty-six students (30%) shared that they were more disadvantageous than their peers in terms of their technology use. When the scores pre and post-tests of these participants were tracked, it was seen that they were the ones who had relatively lower scores than others. It was observed that even though they increased their scores in the post-test, that increase was not as much as other participants. Those eight students expressed a variety of reasons for their development of the Quizlet app. They commented that they could only have access to the Quizlet application in the school during or after class, or if they needed, the teacher provided her devices for revision. However, their peers had access to the internet constantly and at least had a technological device. Their technological device opportunities and internet habits were asked these eight learners to find out how this affected their overall success in vocabulary tests. It was noted that five of them did not have any computers, phones, or tablets. When they were asked how often they reviewed the words, they addressed that they completed their sets in the school lab since they did not have internet access or any technological devices at their home. One of the comments of participants about using Quizlet for English studies at school is as follows:

Student 4: *"I believe this is not fair. My friends were racing one another at home all the time in the Gravity game to become the winner. I cannot even check previous weeks' study sets because I needed to complete weekly sets."* Another opinion discussed by participants was about the internet connection of the school. 3 of them reported that sometimes the Wi-Fi connection provided by the school was low. They needed to race against time for Gravity and Match games. Even if the teacher sometimes provided her internet connection hotspot Wi-Fi from time to time, it affected their performance and motivation. Student 13: *"Even if it did not affect my overall progress, it affected the Quizlet Live game in the lessons. I was feeling frustrated when the internet connection affects my game score on the Match and Gravity."*

Satisfaction:

Another technical drawback of the Quizlet app was that the mobile application of Quizlet did not support the Gravity game. Considering that the vast majority of the learners downloaded the mobile app version of Quizlet and attributed that Gravity was one of the modes they liked and motivated them to learn words, this drawback reveals an imperative infrastructural shortcoming of the Quizlet app. Five participants out of 26 in the Quizlet group (19.2%) shared their unpleasant feelings about being reluctant to study other study modes when they needed to study via mobile phone. One participant complained about how this shortcoming affected his overall satisfaction to learn the words through Quizlet. One of the student's comments was presented as follows:

Student 1: *"I was so reluctant to study other modes without playing the Gravity game. It was the only feature I practiced the words, however, if we are not in the school lab, studying words through Quizlet did not satisfy me at all."*

Another participant also commented that seeing only the definitions was not enough to recall the words. Besides, he reported that seeing a variety of examples would increase memorability. The participant emphasized that he forgot the words when there was no example sentence which made him reluctant to study through Quizlet. Some remarks made by one participant are as follows:

Student 17: *"If my teacher had not provided an example sentence for each word, I would not have remembered many of the words. I forgot so easily when only definitions were given. However, Quizlet did not provide extra sentences and made me so reluctant to study words."*

Other than that, three of them commented that the target words did not appeal to them and were challenging for them to acquire. They indicated that they would prefer to study the words they decided on. One of the remarks made by one participant is as follows:

Student 4: *"I felt so bored when I had to learn the words in a specific order. I would prefer being more independent."*

Inappropriateness:

When asked whether they would use Quizlet in their future studies, they expressed their beliefs by indicating that they were willing to use Quizlet software in their future studies. However, it appeared that 5 of the participants (19.2%) were uncertain that learning and practicing vocabulary with an online application tool was appropriate for their way of learning. When they were asked which ways, they like most when they practice vocabulary, they responded that digital applications were not like regular class methods. Student 7 added on by saying that: *"I also never attended any Zoom or EBA lessons during the pandemic. It seemed so artificial to keep up with everything on screen."* They would prefer to write in their notebooks and take notes. Moreover, two of them indicated that they never left keeping notebooks with given target words on the Flashcard mode. One of the participants stated that: Student 2: *"I cannot deny that Quizlet was useful, but I feel more secure when I write everything in my notebook."*

Four of them put forward that they could easily forget the words if they did not review them daily. Additionally, two of them mentioned another digital flashcard tool they interacted with before. Unlike Quizlet, Anki gives options for the learners to categorize the words in terms of difficulty levels. If you choose a word as a difficult one, you encounter that more often, which Quizlet does not offer for the users. Since the users could not review the words at increasingly spaced intervals to get benefit from the application in long term, spaced repetition was identified as another drawback of the Quizlet application. Regarding that Student 3 stated that: *"I know it was our responsibility to review previous weeks' words, but even if my teacher kept track of my progress, I did not review them again. I was so sure I have learned them; however, I could not recall some of the words on the test."*

Unfamiliarity:

Four of the participants (15.3%) indicated that they were not sure they would use Quizlet in the future in their self-studies since they never engaged in any digital tools before. They did not feel they could keep up the work regularly.

Student 12: *"I never used any teaching tools before, and I was not familiar with how to work on English efficiently through an application. I would stick to my exercises in the coursebook. I think they are safer for me."*

To sum up, it can be seen from the students' statements the socioeconomic status of the students, readiness level, technology use opportunities, and learning style preferences shaped their experiences with the Quizlet application.

DISCUSSION

The primary aim of this current research was to explore the effect of integrating a digital web tool (Quizlet) into the EFL high school classroom to investigate whether it had any effects on learners' vocabulary and pronunciation achievement. To achieve this aim, an experimental mixed-methods research design was run to provide triangulation through a combination of both qualitative and quantitative methods to obtain more in-depth insight and a better portrayal of the links between the findings.

1. Discussion of findings for RQ1: the overall vocabulary performance of the Quizlet group comparing the regular class

The present study attempted to answer whether the students who work with the Quizlet web tool achieve better vocabulary than the students who work with regular class methods. To answer the first question, an independent t-test was run to explore whether there were statistical differences in the pre and post-test scores of vocabulary tests according to the groups. The findings of the analyses of students' vocabulary test scores before and after Quizlet were introduced, and pre and post-test scores for all test groups indicated significant improvement for the Quizlet group. The same improvement was verified for the regular class as an expected outcome due to the effect of instruction. Both the Quizlet group and the regular class made improvements at different rates. The vocabulary gains obtained within each group yielded significant differences in terms of Orthography Productive, Passive Recall, Receptive Knowledge of Grammatical Functions, and Productive Knowledge of Grammatical Knowledge post-test scores were compared. Furthermore, when analyzing the difference between pre and post-test scores of each test, Active Recall, Receptive Knowledge of Grammatical Functions, and Productive Knowledge of Grammatical Knowledge test scores significantly differed.

In the OP test, the learners were asked to listen to the words pronounced and then write them correctly. The Quizlet group with a mean score of 84.2 outperformed the regular class and scored an overall mean of 73.8, however, the

fact remains that the regular class gained slightly higher scores in the post-test. The difference between mean scores decreased. Regarding the Passive Recall test, the participants provided the Turkish meaning of English words. Quizlet scored higher than the regular class when post-Passive Recall test scores were compared. The difference between the pre-and post-Passive Recall test for each group did not significantly differ as in the same case on the OP test which means that the groups had almost the same knowledge of vocabulary. Lastly, when post-test scores were compared with respect to RKGF and PKGF, an investigation of the significance of mean scores revealed significant differences between the regular class and the Quizlet group. The findings revealed that Quizlet facilitated the Quizlet groups' recognition and production of the L2 words with grammatical accuracy because there was a statistically significant difference between the Quizlet and the regular class.

Regarding the differences between pre and post-test scores, significant differences were observed in the Active Recall, Receptive Knowledge of Grammatical Functions, and Productive Knowledge of Grammatical Knowledge tests. When the participant's vocabulary recall was measured whether they would provide the L2 words given Turkish words, the Quizlet group obtained more scores. Interestingly, the difference was in favor of the regular class even though the Quizlet had higher scores in the post-Active Recall test. The regular class increased its Active Recall post-test scores more. On the other hand, the difference between RKGF and PKGF pre and post-test scores was in favor of the Quizlet group. This finding confirms that Quizlet provides more PV tasks for users (Dizon and Tang, 2017). It can be concluded that the Quizlet group made progress during the Quizlet implementation.

Finally, according to the analysis of pre-and post-Passive Recognition test results, it can be deduced that although all the participants increased their scores in the post-test and there was a slight difference between the post-test means scores. The regular class managed to give the most correct answers in the post-test. Regarding the Active Recognition test, it can be concluded that both groups had almost similar scores on the post-test. Whereas the Quizlet group had higher scores in the post-test, non-significant results were obtained between the pre and post-test.

Similar to this research, Dizon and Tang (2017) compared the impact of digital flashcards and paper-based flashcards to enhance receptive and productive L2 vocabulary. Furthermore, they found that the vocabulary gains compared to digital tools and a regular class method did not significantly differ. Account of the fact that the striking findings of the regular class are attributable to using the same materials, activities, and course books they are used to. Contrary to similar research studies which compare the efficacy of digital and paper-based flashcards confirm that regular class forms of vocabulary learning were not as efficient as DFs (Azabdaftari and Mozaheb, 2012; Başoğlu and Akdemir, 2010; Kiliçkaya and Krajka, 2010). Even though paper-based flashcards were not implemented in the study, the effect of instruction was observed in the vocabulary scores of the regular class. It is evident to indicate that it is likely that regular class methods can improve vocabulary acquisition as well as online vocabulary learning tools.

Quizlet learners' vocabulary gain on each post-test score indicated a vocabulary recall. This coincides with the claims of Laufer, Meara, and Nation (2005) that integrating flashcards in vocabulary learning was an efficient way for learners to improve their vocabulary size. To illustrate, Bilcan's research study (2019) yielded significant differences in the immediate and post-test scores of the learners. Furthermore, the learners engaged with the Quizlet tool by practicing words with flashcards, retyping tasks, matching, true-false, multiple-choice, and games. It is attributable to the increase in the scores in the post-test, which was also stated by Mayer (2005) that "People learn better from words and pictures than from words alone" (p.31). Mayer (2005) claimed in the generative theory of multimedia learning that encoding verbal and visual information simultaneously increases the possibility of recalling the information. This theory is parallel with the results of the current study since the Quizlet group practiced the target words in both verbal and imagery coding systems.

To sum up, some external variables such as individual differences, motivation, learner preferences and strategies, and attitudes to learning the language might play an important role in the study (Brown, 2000; Gardner and Lambert 1972; Lombaard, 2006; Saville-Troike, 2006). External factors that might have affected the results are discussed under research question three.

2. Discussion of findings for R2: the perceptions of the quizlet group learners on the Quizlet

Twenty-six students' perceptions of the effects of Quizlet on their overall vocabulary and pronunciation improvements were gathered through semi-structured interviews. According to the similar responses of the participants, given responses were categorized under various sub-heading, and positive and negative viewpoints of the students were determined as themes of the interview and listed in the current study. While the negative theme was categorized as satisfaction, recording of the voice, inappropriateness, unfamiliarity, and infrastructural incompetence, the positive theme was categorized as focus, the effectiveness of using Quizlet, memorability of the

words, appropriateness of the Quizlet on the vocabulary learning, fun, frequency, satisfaction, game elements, the success of the learners.

The participants were asked about the effect of Quizlet on learning new words, their favorite features of Quizlet, and how we could improve Quizlet. Taking the results of the participants' responses, it may be deduced that the participants in the Quizlet group benefitted from the Quizlet tool to learn vocabulary. Five participants asserted that using Quizlet increased the memorability of the words (See Table 12). Inserting visuals and audio into the flashcards and being able to 'Flip and flop' the cards as their preference order increased the effectiveness of the tool. Some participants (n=5) attributed that they could recall the words when they see them in other contexts. Even though keeping vocabulary notebooks used to be a method for their previous vocabulary studies, they recalled the words more after using Quizlet. There were still two participants who prefer using vocabulary notebooks for their future studies. Besides, some participants (n=5) stated that they were familiar with using digital tools since they were already engaged in technological tools and any digital technology tool. Hence, the teaching method was appropriate way they learn (See Table 12). Hence it was easier for them to use Quizlet to learn vocabulary. The results of this study along with the previous studies suggest that Quizlet facilitated vocabulary learning and retention (Bilcan, 2019; Çınar and Arı, 2019; Dizon, 2016; Ho and Kawaguchi, 2021; Kalecky, 2016; Wright, 2016).

As the participants worked on Quizlet modes, they indicated that their success in vocabulary and pronunciation increased. The vocabulary success was in line with aforementioned studies nevertheless there were not many studies addressing pronunciation teaching. Ho and Kawaguchi (2021) suggested that a new Quizlet mode giving diagnostic feedback like other study modes would be useful for L2 learners. Kalecky (2016) found out that learners indicated that Quizlet supported their spelling and pronunciation. Additionally, this result was in line with the current study. When the learners were asked their favorite feature in the Quizlet app, they put forward that they enjoyed working with Spell and Write mode. Most of them (n=11) agreed that prerecorded audio and visuals improved their vocabulary learning and spelling as indicated in Table 13.

Furthermore, with respect to Table 13. most of them (n=10) have already tried other language learning applications, however, they gave up so easily since they were not monitored by the teacher. They were aware that the teachers kept track of their progress to give feedback, which kept them focused and motivated. According to the results of interviews, having positive and negative instant feedback on the words learned fully, partially learned, and yet to be learned kept them updated. This finding seems to be along with the current literature (Ashcroft and Imrie, 2014). The study administered by Ashcroft and Imrie (2014) yielded that Quizlet supports learners with its immediate feedback feature and improves their performance.

Another common response repeated by the participants was the game elements as displayed in Table 13. (n=7). The gravity game was liked most and found enjoyable and competitive among the learners. Learners' perceptions and attitudes toward vocabulary learning through the sense of achievement changed positively. Similar to this finding, the learners in Çınar and Arı's study (2019) found the English lessons more fun, and their interest and motivation increased. However, the game elements category was listed under the negative findings of the interview as well.

They were also asked what kind of improvements were needed for Quizlet. The voice recording option and space repetition were outstanding responses. Four students put forward that they should have encountered previous words more often in study modes so that they could review the words at increasingly spaced intervals.

In conclusion, the reasons for not having the same results in line with some Quizlet studies in the literature in terms of not having a significant difference between the regular class and Quizlet group except for OP, PR, RKGF, and PKGF test scores might include the individual differences of learners and inappropriateness of the learning material that is Quizlet for this current study. The individual differences of the learners are an important element in ICT-supported activities. Although all the participants were A2 level during the study, it was noted that eight students identified in the study had slightly lower scores in the pre-test and could not increase their scores as much as other participants. Some learners stated that they could not attend any of the English classes during the COVID-19 pandemic because of the lack of technical infrastructure. Therefore, the results might have been affected by these language level differences. It was also confirmed that five students were uncertain to study English with any digital tools as displayed in Table 14. They asserted that they would prefer regular class methods like keeping notebooks. Different learning styles of the learners might have affected their motivation during the implementation. Another reason might be related to the unfamiliarity with any instructional technology. Eight out of twenty-six students attributed that they were more disadvantageous than other participants in terms of their opportunities in technology use and readiness to learn through instructional technology since they were not into using any

technological tools and never engaged them before. (See Table 14). Dreyer (2014) uncovered that the learners gained more vocabulary scores when they spent more time practicing words on Quizlet. The use of Quizlet requires different experiences and needs compared to the regular class group, the impact of socioeconomic background and technology opportunities have been important factors that may affect the result of the findings. Hence, it can be postulated that the aforementioned reasons might have affected the overall findings.

CONCLUSION

1. Quizlet group versus regular class group

The current study asked whether learners in the Quizlet group achieved better vocabulary than students who learn only with regular class teaching methods. According to statistical analyses, both groups had vocabulary gains regardless of the intervention. The effect of instruction on the regular class and the Quizlet digital tool on the Quizlet group had positive effects on the vocabulary acquisition of L2 learners. There might be concerns about the Quizlet application does not improve productive knowledge of a word since it does not provide example sentences in a context, however, there was a significant difference between the two groups for the Receptive and Productive Knowledge of Grammatical Knowledge tests. Even though this digital flashcard might be more appropriate for receptive knowledge of a word with its features (Crandell, 2017), the teacher can design study sets with example sentences containing contexts as appeared in the present study. Moreover, the participants were encouraged to practice L2 definitions first in Flashcard mode, and the ‘Spell’ mode was repeated more than other modes by the participants, which contributed to their OP test which yielded a significant result between pre and post-test.

2. The attitudes of the Quizlet group on the Quizlet digital tool

Students’ perceptions of the effects of Quizlet on their vocabulary and pronunciation were also investigated and responses were analyzed according to positive and negative themes in the study. The findings revealed that a great number of students took advantage of the Quizlet app within the bounds of opportunities. Designing a vocabulary learning instruction through Quizlet transformed learning into a playful context with Quizlet Live and Gravity game and the learners created study sets that scaffolded learner autonomy. Except for a few students, they found the interactive Quizlet digital flashcard tool beneficial and appealing for their vocabulary and pronunciation. As appeared from the findings, the Quizlet digital flashcard tool has established a positive impact and promoted collaborative learning for more than half of the participants in the Quizlet group and most of them agreed that they would use Quizlet in the future. Only a few participants indicated that digital tools do not impact their language improvement in particular.

In the case of low-level students, a monitoring system is needed. Due to the flexibility and varieties of digital flashcards over paper-based flashcards (Waluyo and Bucol, 2021), those with low proficiency levels can be allowed to work at their own self-paced. Program developers and designers of Quizlet, and foreign language teachers, in general, could benefit from these findings to improve and increase the impact of Quizlet on English courses.

IMPLICATIONS

After the results of the study and the related research on the impact of Quizlet on vocabulary and pronunciation improvement, the following implications were drawn up for English language teaching and learning.

Ever since technology manifested itself in the education field, it has been a crucial issue for teachers to meet the needs of digital natives and immigrants who are inclined to lose their motivation and may have a negative perception of the vocabulary learning process. In that sense, gamified student response applications and other digital tools can be adopted as learning resources for today’s learners as digital natives and digital immigrants. The teachers first need to understand and acquire some skills to integrate technology into the classroom. It is a serious issue for effective vocabulary teaching to know how to engage and integrate with the tool. The teachers need to introduce the tool on using and practicing vocabulary items in terms of the skills used, spaced repetition, and recycling of the difficult words (Stroud, 2014).

First, one of the notable results of the current study is that the Quizlet group made a significant difference between pre and post-tests. This demonstrates that the Quizlet tool as a digital flashcard tool is sufficient to expand vocabulary knowledge. On the other hand, there was not a significant difference between the regular class group and the Quizlet group for some tests and some of the interviewees from the Quizlet group indicated that the software did not meet their expectations with the way it works. Other digital tools that build vocabulary along with engaging learners with customizable vocabulary learning activities especially to build productive vocabulary knowledge by using words in a correct sentence structure should be analyzed with certain criteria before any implementations. At this juncture, Kahoot!, Socrative, Quizizz, Quiz Game, and Anki have been one of the tools studied in much research (Çakır, 2019; Kayseroglu and Samur, 2018; Ciaramella, 2017; Yapıcı and Karakoyun,

2017). The teachers can evaluate and try these tools as to the needs of their learners. For Digital Flashcard tools, Nakata's Digital Flashcard Criteria (2011) can be utilized for evaluating any instructional tool.

In the present study, the target words they studied through the Quizlet application were not determined by the participants. Instead, the researcher chose the words they would practice. Some of the students shed light on how they felt bored and were not autonomous enough, which made the vocabulary learning process boring and challenging for them. Furthermore, some of the interviewees from the Quizlet group indicated that target words were challenging and did not appeal to them. McCarthy (1990) and Schmitt and Schmitt (1995) advocated that when the learners structure their notebooks, the words they prefer to study should be decided by them. That notion can be applied to digital flashcard tools that the learners might decide what words they include and what information they want to note down in their self-studies. In that sense, learner autonomy can be promoted as Quizlet offers with its Flashcard creation feature. The teachers can give extra vocabulary tasks or projects for learners to create flashcard sets based on themes they study. Accordingly, Kalecky (2016) put forward that Quizlet could be an effective tool to improve learner autonomy since learners can study in their self-paced self-study by creating their sets, searching for ready-made sets and they can go through the difficult items determined by them. For instance, the teachers can assign the learners to create flashcards with unit words at the beginning of the units to make a presentation in the classroom. With other Web 2.0 tools, students can prepare content with scheduled themes for a longer period of time, and the prepared content can be collected in the form of assignments, projects and portfolios. Quizlet is an appropriate digital tool to incorporate inside and outside the classroom so that the teachers can create authentic in-class vocabulary activities within an authentic context for both vocabulary growth and pronunciation practice. Instead of using Quizlet in isolation from content and curriculum, the teachers can integrate it inside the classroom once a week.

Different digital gamified applications with their game elements such as badges, points, and leaderboards might be part of the examination system and the curriculum as they can boost students' motivation and engagement. The importance of feedback and feeling of competency may be supported by these game elements, however, it is less likely that individuals' high value is maintained over time. Intrinsic motivation should be increased with some rewards including real objects (Zichermann and Cunningham, 2001).

All in all, it is, therefore, governments need to take action to facilitate educational technologies in and outside the classrooms and to enhance innovative learning opportunities for learners. During COVID-19, providing tablets for students became one of the first actions taken by the Ministry of Education. Through this implementation, more commercially available language teaching software, programs, and tools need to be allowed for free for the learners.

FOR FURTHER RESEARCH

To start with, it may be useful to employ different gamified student response applications to have more accurate and generalizable results about CALL and digital learning.

As for the second suggestion, there is a need for some concrete results to compare and interpret participants' interview comments more comprehensively and thoroughly so that the implementation of the Intrinsic Motivation survey helps prospective practitioners in their research. For further research, the intrinsic motivation of the Quizlet group can be investigated since their inner feelings have a link to the way they engage with a task or activity. Under self-determination theory, three intrinsic needs that are autonomy, relatedness and competence can be searched for as crucial factors of motivation (Rigby and Ryan, 2018).

Furthermore, similar research can be carried out with a larger population of participants from different proficiency levels. In the shed of this idea, it might give better results to carry out the study with higher-level students. Lastly, it is likely to be the case that there might be other factors that cause the progress of the learners in the Quizlet group such as the practice effect. For further studies, the design of the study can be implemented with the same participants and can be attributed to the improvement of digital web tools.

LIMITATIONS

To begin with, this study is only limited to two classes (26 were in the Quizlet group, and 26 were in the regular class.) Because of its limited number of students, the results cannot be generalized to a larger student population. In the second stage, in the present study, a delayed posttest was not administered to observe any possible effects on retention and vocabulary learning due to time considerations. A longitudinal study that investigates retention over a long period would present more reasonable results on the validity of the web tool. Additionally, the present study only covered the 52 vocabulary items selected from three units in the coursebooks and skills books that the

Ministry of Education recommended on the EBA platform over 6 weeks. The target words selected from coursebooks with a certain number and variety might not be overgeneralized.

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APPENDICES

Appendix 1: Example Questions of Vocabulary Tests

1) Orthography Receptive

Circle the correctly spelled words. (10 min.)

Tower	Centurie	Acrhitecture	Haeght
Towwer	Centuury	architecture	height
Trowere	Cantury	architekture	heightt
Towwerr	Century	architecteru	height

2) Orthography Productive

Listen to the words pronounced twice and then write it correctly. (10 min.)

1. -----
2. -----

B) Knowledge of Meaning:

1) Active Recall (10 min.)

Please Write English Meaning of Turkish

Turkish	English	Turkish	English
1. Mimari	a	27. Meşrubat	s
2. Şaheser	m	28. Uygarlık	c

2) Passive Recall (10 min.)

Please write Turkish meaning of English words.

	English	Turkish	English	Turkish
1	Height:		27	Entertain:

3) Passive Recognition (15min.)

Look at the English words given. Choose its meaning from four Turkish options.

1. Century	a) gelecek	b) ülke	c) milliyet	d) yüzyıl
2. Architecture	a) gökdelen	b) mimari	c) doktor	d) meslek

4) Active Recognition (15 min.)

Look at the Turkish words given. Choose its meaning from four English options.

1 Yükseklik	a) ruler	b) length	c) slope	d) height
2 Miras	a) Doctor	b) architecture	c) vision	d) job

C) Grammatical Functions:

1) Receptive Knowledge of Grammatical Functions (15 min.)

Please choose the grammatically correct answer.

1. Height

- a) Jane is a woman of average height.
- b) I heighted this trousers.
- c) They are height same.

2. Heritage

- a) This tower is heritagely beautiful.
- b) It heritage this castle.
- c) Turkey has a rich heritage

Appendix 2: Vocabulary Familiarity Test

VOCABULARY FAMILIARITY TEST

Write Turkish meanings of the words below. You have 40 minutes to complete it.

ENGLISH

TURKISH

- 1. The news
- 2. Weather forecast
- 3. Talent show
- 4. Documentary
- 5. Cartoon