IJLER International Journal of Language and Education Research

Volume 5, Issue 3, December 2023 p. 169-193

Ankara / Türkiye

Article Information

Article Type: *Research Article*

This article has been checked for similarity.

Article History:
Received
25/10/2023
Received in revised form
11/12/2023
Accepted
12/12/2023

DIGITAL ENVIRONMENTS USED BY VISUALLY IMPAIRED TURKISH TEACHER CANDIDATES IN THE EDUCATION PROCESS[1]

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Abstract

This research focused on explore the digital environments used by visually impaired Turkish teacher candidates. The research was carried out in a qualitative phenomenology design. The participants of the study are two visually impaired students studying in the Department of Turkish Education. The data of the study were obtained from in-depth interviews with two visually impaired students. The findings obtained from the research were analysed by content analysis method. The data obtained from the student interviews were thematically coded. The findings of this research are as follows: visually impaired Turkish teacher candidates use digital media effectively in language teaching, digital environments facilitate the education process of students, screen readers are the most used digital media and help students in the learning process, digital and programs are mostly used in writing and listening language skills. It has been shown that Turkish education and digital resources in the field of education are insufficient, and computers are preferred more than phones in using environments.

Keywords: visually impaired, assistive devices, digital environments, digital tools, Teaching Turkish.

[1] This article was presented as an oral presentation at Educcon 2022 conference on 24 03 2022.

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Introduction

Visually impaired people are individuals who cannot count the fingers of a hand from a distance of three meters in daylight (Ünal & Yüce, 2017) and cannot read or write texts (Komolafe, 2020). Worldwide, there are at least 2.2 billion people with visual impairment or blindness (WHO, 2019). In our country, there are 281.604 visually impaired people registered in the data system (ASPB, 2020). 6,000 visually impaired students' study in primary and secondary schools affiliated with the Ministry of National Education (Okcu & Sözbilir, 2016). Visually impaired people, whose numbers are not negligible in society, may encounter many difficulties in sustaining their lives and continuing their education.

While visually impaired students who pursue further education develop similarly to their non-impaired peers (Okcu & Sözbilir, 2016), they may experience problems in their psychomotor, social and emotional development (Gori et al., 2016). The delay in the development of other senses due to visual impairment may cause difficulties such as adaptation to the environment and social isolation (Arslan et al., 2014; Ünal & Yüce, 2017). Visually impaired individuals need to overcome these difficulties and adapt to society and act as independent individuals (Arslantekin, 2015; Şahin et al., 2011). They must overcome physical, social, infrastructure and access barriers and be able to live an active, productive and independent life on an equal basis with other members of society (Bhowmick & Hazarika, 2017).

One of the areas where visually impaired individuals have problems is education and training life (Okcu & Sözbilir, 2016). The obstacles that a visually impaired individual may encounter in their education life may differ according to their level of vision (Sözbilir, 2020). They can try to solve these problems himself by using his other senses or abilities. They can compensate for the learning problems caused by the visual impairment by using the senses of listening and touch effectively or by social interaction (Okcu & Sözbilir, 2016). Learning problems caused by visual impairment can also significantly affect language learners (Tran & Pho, 2020). Students' inability to benefit from written materials and computer screens (Mulloy et al., 2014) may be an obstacle in language learning. The problem of not being able to read due to visual impairment in language classrooms, their inability to see the written words, can negatively affect their reading and writing

skills and may create an obstacle in the career process of language teachers (Lailiyah et al., 2020).

It is known that visually impaired students experience various problems such as attending classes, attending school, exams, accessing books, and using computers, educational tools and materials (Bakırcı, 2011; Tanyeri & Tüfekçi, 2010). In order to solve these problems in education life, environments that support the academic and social development of visually impaired individuals should be provided. They need to provide easier access to information (Şahin et al., 2011). Developments in this context are opportunities for teachers who want to make visually impaired students more active participants in learning environments in higher education (Cárdenas & Inga, 2020). The learning environments of students with disabilities, whose entrance to the university is facilitated, should be made physically and academically suitable (Mengi, 2019). The creation of a suitable pedagogical environment for visually impaired individuals (Kamali Arslantas et al., 2019) should be accepted as an opportunity, and digital environments and programs should be made more accessible and used more actively in the teaching environment.

Technologies and Digital Environments in the Education of Visually Impaired Individuals

The government and experts work in cooperation for visually impaired individuals to lead an independent and productive life (Velázquez, 2010). Thanks to these studies, a new one is added to the assistive tools used by visually impaired individuals every day. Ultrasound, infrared or laser sensor assisted assistive technologies are transforming into machine vision (Terven et al., 2013). Developed new technologies offer digital-based solutions for the visually impaired. It enables them to benefit from information and communication environments through software and hardware (Tanyeri & Tüfekçi, 2010). Assistive technologies help learning, cognitive, social and emotional development (Wong & Cohen, 2011). Assistive technology enables students to access school activities by using their other senses and speaking abilities (Mulloy et al., 2014). This situation facilitates the daily life of students and increases their academic skills and performances such as reading and writing (Senjam, 2020).

Various assistive devices have been developed to facilitate the lives of visually impaired individuals (Hu et al., 2019). The first of these is the reading tool that has become a standard in the world, developed by Louis Braille in the 19th century (Velázquez, 2010). Another important invention is the invention of Raymond Kurzweil, which enables listening to a written text by placing it on a machine (Yalçın & Ülker, 2011). This device, which was programmed for many different languages in the 1980s, can read 200 different fonts and over 225 words in one minute (Subaşıoğlu, 2000). These assistive devices have changed in the process and have become used by visually impaired individuals as digital environment and programs used over computers and phones.

Many different assistive technologies are mentioned in the literature. Braille reading devices, Braille slate and stylus, Jot a Dot, Braille typewriters and keyboards, Braille reading materials, Braille output devices, Braille translation software, Braille whiteboard and pen, renewable Braille display, portable Braille computers, optical scanners, note-taking devices, digital audio recorders, large print media, screen magnifiers, embossed screens and printers, eyeball app, low vision devices, video magnifiers, telescopes, ZoomText, abacus, talking calculator, large printed books, typo scope, reading stands, audio materials (AFM) have taken their place in the literature (Abner & Lahm, 2002; Hebebci, 2017; Kan & Wang, 2020; Senjam, 2020; Smith & Kelley, 2007; Ünal & Yüce, 2017). The most common among these assistive technologies are Braille printers, text-to-speech technology and screen enlargement software (Kamali Arslantas et al., 2019).

Screen readers are among the most preferred assistive technologies (Hebebci, 2017). For those who are blind or visually impaired, screen reader software is a crucial tool (Coşkun, 2013; Lailiyah et al., 2020; Tekindal & Arık, 2012). Visually impaired individuals can read screen images with the help of a speech synthesizer (Subaşıoğlu, 2000), and they provide access to the content on the screen with a special software that enables computers to read aloud or enlarge the screen (Kelly, 2009). Visually impaired students who prefer audio materials can save the textbooks and articles they cannot find on the computer with a scanner and read them with a screen reader (Emiroğlu, 2008). Screen reader software such as JAWS, NVDA, COBRA, SuperNova etc. NVDA is available online for free (Senjam, 2020). Screen reading programs such as JAWS for Windows or HAL for Windows, which

are compatible with Turkish, are used effectively by visually impaired individuals (Emiroğlu, 2008). Although there are many assistive devices, not all of them are used effectively by the visually impaired (Hu et al., 2019).

Another medium is mobile devices. Many applications have been developed for mobile devices for the visually impaired (Ünal & Yüce, 2017). With these applications, visually impaired people can communicate via telephone networks (Subaşıoğlu, 2000). They solve both communication and access problems by using mobile applications and social media. Mobile devices enable the development of vision-based technologies that help them participate in various daily activities with applications that provide social interaction (Terven et al., 2013).

Visually impaired Turkish teacher candidates use assistive technologies to facilitate their educational life. Students use some of these assistive technologies effectively and some do not use them at all. There are studies on the use of technology in education by visually impaired individuals. There are studies in English language teaching (Cárdenas & Inga, 2020; Coşkun, 2013). There is a study focusing on the opinions of visually impaired Turkish teachers (Şahin et al., 2011). However, there is no study focusing on the digital environment and tools used by visually impaired students who continue their Turkish education in higher education. In this study, unlike previous studies, the focus was on the digital environment and programs used by visually impaired students receiving language education. This research is important in terms of identifying the digital environment and tools used by visually impaired students in the educational environment and discovering student views and experiences regarding their use. This research aimed to determine the opinions and experiences of visually impaired Turkish teacher candidates about the digital environments and programs they use effectively and how they are used in the educational environment. For this purpose, answers to the following questions were sought:

1. Which digital environments visually impaired Turkish teacher candidates use in the education process?
2. What are the opinions of visually impaired Turkish teacher candidates about the digital environments they use?

Methodology

In this research, phenomenology (phenomenology) design was used, which allows to collect in-depth information about a phenomenon. In the phenomenology design, it is aimed to understand the phenomenon experienced by a few individuals in depth (Creswell, 2018). In the phenomenology design, it is essential to focus on the facts that we are aware of but do not have in-depth and detailed information (Yıldırım & Şimşek, 2011). In this research, the views and experiences of the visually impaired Turkish teacher candidate about the digital environment and programs used are focused. This research was conducted to have an in-depth understanding of the digital environment and programs they use in education.

Participants

In phenomenological studies, data sources are individuals or groups that experience the phenomenon that the research focuses on and can reflect this phenomenon outward (Yıldırım & Şimşek, 2011). In this study, there were two participants who could reflect the phenomenon of visual impairment. Since the sample selection in qualitative research is dependent on the resources of the researcher, the sample of a research that offers limited resources may even be a single person (Balcı, 2018). Since the students are a risky and disabled group, the sample number in this study consisted of two people. In the qualitative research method, the small number of participants or the sample size has the advantage of providing detailed and in-depth research (Yıldırım & Şimşek, 2018). Participants are visually impaired students in the 3rd year studying at the Faculty of Education, Department of Turkish Education. There are four visually impaired students in the faculty of education. Two of these students are partially sighted and two of them are completely visually impaired. Visually impaired students were included in the study. One of the visually impaired students studying in Turkish education is a girl and is 24 years old, the other student is a boy and is 22 years old.

Data Collection

Research data were obtained from semi-structured interviews with students. The interview method has advantages such as asking in-depth questions on a specific subject and making the situation more explanatory

by asking again if the answer is incomplete or unclear (Çepni, 2009). In-depth interviews were conducted with each student. Seven previously prepared open-ended questions were used in the interviews. These open-ended questions aim to determine which digital environments and tools students use, for what purpose and how they use digital environments and tools in education, and how they benefit from these tools in language teaching. Opinions of two academicians who have studies for specially trained students were taken regarding the questions prepared for the semi-structured interview. The open-ended questions to be used in the interview were finalized by taking into account the opinions of the academicians. An interview protocol form including these questions was prepared. Interviews were conducted based on this protocol form. Interviews took place between the researcher and participant students. The time and form of the interviews were determined by taking the opinions of the students. One student preferred to meet remotely, while the other preferred to meet face to face. Face-to-face and via WhatsApp, the interviews lasted between forty and fifty minutes each. The interviews were audio recorded. Before the interview, the students were informed by reading the ethical agreement in the interview protocol form and the ethical permission in this agreement was read to the students and verbal permission was obtained. Since the students are risky groups, they were treated sensitively both in the preparation of the questions and in the problems that may arise during the interview. Considering that individuals with disabilities are different, attention has been paid to questions such as question types, how to collect data, the appropriateness of communication methods, and reporting of data (Cresswell, 2018).

Analysis of data

Content analysis method was used in the analysis of the data. In the content analysis, the experiences and meanings of the students were tried to be revealed, and themes that could conceptualize the data and define the phenomenon were revealed (Yıldırım & Şimşek, 2011). The data obtained from the interviews were written down. The written texts were coded. The coding is based on words, phrases and sentences. The meaningful units such as words, sentences and paragraphs in the data were coded by giving names (Yıldırım & Şimşek, 2018). While giving code names, names that will most clearly reflect student expressions were chosen. The thematic

approach is based on coding. According to this approach, similar codes are gathered under themes in the coding of data, common aspects are found by examining the relationships between the codes, and themes are determined (Yıldırım & Şimşek, 2018).

For the reliability of the data analysis, after the coding made by the researcher and the expert coded some of the codes, it was seen that there was a harmony between the codes. The expert is an academic who has studies on special students at the faculty of education. More than 20% of the data obtained from the students in the research was coded by another academician on the Nvivo 12 program. According to the coding made by the expert in the Nvivo 12 qualitative data analysis program, the kappa coefficient was found to be 0.78 (high level of agreement). Codes that could not be agreed upon were discussed. The codes that could not be agreed upon were reviewed together and the codes were finalized.

Findings

In this section, the findings obtained from the research are given. Seven themes were obtained in the thematic coding. The themes and codes obtained from the data are given under seven subheadings. In each title, firstly the coding table and then the opinions of the students in the text were given. In this context, the first student is expressed as "S_1" and the second student as "S_2" in the text.

Findings on Screen Reader Theme

Theme and code information regarding the screen reader theme findings are given in Table 1.

Table 1. *Screen reader code table*

Theme and Code Names
Theme: Screen Readers
Sub-Theme: Screen Readers Used in Computer Environments
Using NVDA when JAWS is insufficient
Problems with pronunciation in screen reader
Few people use the Balabolka program
Screen reader being more efficient on the computer
Experiencing a voiceover problem in UZEM and EBA
IOS users use Voiceover instead of Talkback

Braille embossed displays are useful but expensive
Screen readers compensating for reading disability
Screen readers help with research
Few people use NVDA over JAWS
NVDA's success in English-based programs
Using JAWS when the computer is on
JAWS being an important aid in getting things done on the computer
90% of JAWS and 10% of NVDA
Screen readers make it easier to communicate on the phone
NVDA's translation for screen reading
Using NVDA instead of JAWS in English-based software
Now everyone should listen to audio instead of a braille book
Teaching JAWS instead of reading and writing
The JAWS program compensates for the visually impaired
My voice is better on the computer than on the phone
See every job with screen readers
Screen readers provide ease of access
Problems with some screen readers
Having problems with voice-over Turkish characters
The effectiveness of JAWS in screen reading
Sub Theme: Screen reader and digital tools used in mobile environment
Having screen reading programs other than Talkback
Talkback program provides ease of access
Can't imagine not having Talkback on the phone
The replacement of JAWS and NVDA on the computer with Talkback on the phone
Using the Google voice over program on mobile

The codes in Table 1 show that the technology that visually impaired Turkish teacher candidates use the most is screen readers. The codes of the screen readers theme showed that the students provided convenience in many subjects in the education process thanks to the screen readers. It has been observed that screen readers are used both on the computer and on the phone. It seems that there is more code related to screen readers used over computers.

The students reported that screen readers helped them both on the computer and on the phone while they were doing research during the education process as follows: "When you start searching for anything, when a video comes out, we have a hard time getting information, or if it is a document. Thanks to our screen readers, we try to do research in this way by swiping the screen with two fingers from both the computer and the phone, and using the up and down arrow keys when on the computer (S_2)."

The students stated that screen readers helped them read documents that are not in audio format during the education process and significantly compensated for the reading disability as follows: "Everything does not come to us ready and video recorded. When you enter the PDF or Word document, we start reading the document with the arrow keys in JAWS. This is how we try to make up for the deficiency in reading (S_2). Yes, I can see all my work. Thanks to them (computer and phone), I can see all my images that do not contain images (S_1)."

The students stated that the computer environment provides a more efficient use area compared to the telephone environment and is more advantageous than the telephone environment as follows: "The computer is much better than the telephone. He does not accept dotted letters on the phone, he reads more, but he reads by coding, not in words. But on the computer, he can read it word for word. Therefore, more computers are the most advantageous in language teaching (S_1). It is easier to access information on the computer, you can navigate between the links, you can navigate between the titles, but you will read that screen completely on the phone (S_1)."

Students who stated that they use screen readers effectively in the educational environment have expressed many different opinions that JAWS screen reader provides significant convenience both in their daily life and in their teaching lives. A student stated that JAWS is effective in screen reading and that they use JAWS the most as a screen reader: "We use JAWS in terms of general hardware. I'd say JAWS 90%, NVDA 10%. We use NVDA as an alternative when there is a problem with JAWS. When it doesn't open in JAWS, we talk about whether you tried it with NVDA (S_2). We turn on the computer and we will create a Word document, if JAWS do not direct us, we cannot use the computer. Like Talkback on our phones,

JAWS drives us. It is a program that guides us completely on our screen from the desktop to our documents and from there to Word (S_2)."

Students expressed that they use JAWS effectively on the computer as follows: "JAWS is a program that I use or have to use from the moment I turn the computer on until the moment I turn it off, and spend a large part of my daily life. If there are no JAWS, NVDA can guide us on the computer, but we prefer JAWS because it is a more equipped and more competent program (S_2)."

Similarly, students stated that JAWS helped them do the work on the computer and its effectiveness in compensating for the visual impairment as follows: "JAWS is my eye. It helps me a lot in terms of using the computer in terms of listening and writing. In other words, without it, the computers we use will be of no use to us. For example, we are using a computer, suddenly the device gave an error and turned off. I can't use it after that, so it would be a serious shortcoming. I mostly use writing (S_2)."

Students with visual impairments were taught to use JAWS instead of reading and writing for the first time, reflecting their opinions: "This program voices everything on the screen for us in everything we enter, in every environment we use, and enables us to use that computer with voice commands. It voices all the keys we touch and everything we print out. I've been using JAWS since I was a kid. I started school, we were taught JAWS while everyone was producing literacy. That's why it helped a lot (S_1)."

Another program used was NVDA, which was reflected in the findings. However, students stated that they use NVDA as a screen reader in limited areas: "The fact that we only use JAWS does not make NVDA a bad program. We also have friends who only use JAWS. We have friends who actively use NVDA on computers when JAWS is not installed on some computers. My experience with NVDA is also positive. NVDA is a very positive practice, a second alternative for us (S_2)."

It has been observed that students prefer NVDA screen reader more in areas where they cannot use JAWS. It has been stated that NVDA is particularly successful in digital environments such as ZOOM, which is widely used in English, and serves as a translator while reading the screen: "There are such things in ZOOM. English stuff we had a hard time at first. He was successful in neither reading nor translating from the meeting address to the join

meeting button. We didn't get much benefit from JAWS, but NVDA did it well (S_2). It is not accessible because the compelling language of ZOOM is English. Not suitable for JAWS systems. If NVDA is used instead of JAWS there, it can present it to us in Turkish. ZOOM's pronunciation in English is a language that is not pronounced as it is spelled, and our readers read it as it is spelled. We solved this, actually, there is NVDA, which translates the English text into Turkish and voices it. This is how we use ZOOM, but we mostly use Turkish-language things (S_1)."

It has been observed that mobile screen readers provide various conveniences to the visually impaired. Findings showed that IOS users use Voiceover instead of Talkback, few people use Balabolka program as screen reader, Braille embossed screens are useful but expensive, so they cannot use it.

Students expressed that Talkback, which is a screen reader program on the phone that provides convenience to them, is useful for them as follows: Talkback does to your phone what JWAS and NVDA do on a computer. Makes the phone accessible (S_2). While entering an application or trying to search for something through an application or trying to get information while trying to listen to something… Are we going to press down on the screen, press up or stop the video with his direction? When we download this document, we make use of it like where it will land with its documents (S_2). I definitely think that there is no Talkback for a visually impaired people (S_2)."

Digital Environments in Language Skills Theme

Theme and codes digital environments in language skills theme are given in Table 2.

Tablo 2. *Digital environments in language skills theme table*

Theme and codes
Theme: Digital environments in language skills
JAWS being very useful in the writing process
JAWS vocalized feedback as you type
Using Google docs voice typing
Technology being most effective in writing
Most affect listening and writing

Contribution to writing skill
Using a screen reader in the proofreading phase of typing
Using screen readers for listening
The indirect effect of technology on listening
Technologies are generally aimed at listening skills
Does not contribute to the development of speaking skills

Table 2 consists of codes for the effects of digital media and programs on basic language skills. The codes in this theme showed that students use technology mostly in writing skills among language skills.

The students expressed that technology is most effective on writing, contributes to the writing skill very seriously, and helps screen readers to correct what they write: "Writing is one of the most important things that will relieve the visually impaired in terms of technology. Using pen and paper is more tiring, more tiring, it takes us more time to put things on embossed tablets. But we are trying to do our work in computer environment via Word. This makes our work much easier (S_2). Screen reader has a very serious contribution in terms of writing skills, so I cannot write without it. I write, but he voices what I write and checks what I write (S_1)."

It is reflected in the findings that the screen reader JAWS program is an effective program in the writing process. The fact that JAWS is very useful in the writing process and that JAWS gives feedback in writing and facilitates the writing process by vocalizing the written words are reflected in the students' opinions as follows: "JAWS can voice us one by one, character by character. He can voice the words, he vocalizes everything in the visual, size and colour sense of the word we write. That's why JAWS is completely an eye for me during the writing process. Since I had a process to see the details, a smoother writing process was created thanks to him (S_1). I do the writing work with JAWS. From the moment I enter the document, it gives a command to write. It is obvious that there is a blank page there. Sometimes we look to see if we wrote it wrong. When we write wrong, we have the chance to go back to those letters with the arrows up and down or with the right and left arrow keys. JAWS is very important in terms of both this writing and writing development (S_2)."

It has been seen that another digital medium used in writing is Google Docs. They reported that they used the voice typing feature in typing, which Google Docs helped with typing skills, as follows: "Google has its own documents on the phone, I use it. I do more writing on the phone. I say it out loud, he writes. I print more with the Google voice typing method (S_1)."

Findings on the Theme of Accessing Digital Resources and Creating New Resources

The theme and code table for the theme of accessing digital resources and creating new resources are given in Table 3.

Tablo 3. *Accessing and creating digital resources coding table*

Theme and codes
Theme: Accessing and creating digital resources
Lack of sufficient resources in Turkish education
Institutions providing library facilities
The sources are mainly literature.
Limited resources at university level
Scanning resources that cannot be accessed online
Using online tools to convert PDF to Word
Monitoring Word, PDF and audio recording sequence in accessing resources
Difficulty finding source material
Creation of e-books using a scanner
Library applications on phones making it easier to listen to books
Using MEET and DUO for communication

Table 3 consists of codes for the theme of accessing resources and creating new resources. It has been seen that the codes are insufficient in terms of resources and they create the resources that they cannot access.

Students reported that it is difficult to find resources in the field of Turkish education and undergraduate education, and that the resources for Turkish education are mostly literature: "I do not think that there are enough resources in terms of teaching Turkish. It is easier to reach literary sources such as novels, but Turkish education and education faculty are newer, so the resources are more limited compared to the literature department. In

this way, isn't this enough, of course, but as I said, there can be more (S_2). They do not voice it because it will not appeal to many people in terms of professional development. There are mostly books in the field of literature because literature appeals to everyone (S_1)."

It has been observed that some institutions offer library services for the visually impaired, audio books are available in these libraries, and applications are available on phones. The student expressed the library opportunity offered to them by the institutions as follows: "We have audiobook libraries. GETEM is the most comprehensive, then there is the National Library speaking library, then there is İzmir Turkey Library for the Visually Impaired. In other words, there are audio library sections in some of these libraries, but these are the most comprehensive (S_1). In terms of technology, the share of our screen readers and the technological shops you use is very large. There is an application called the telephone library, which Türk Telekom and the Boğaziçi implemented together, and there are all the books there (S_2)."

The opinions that students had difficulty in finding resources, that they tried to find digital resources more audibly, that they scanned the resources they could not find and used in Word and PDF format were reflected as follows: "It is difficult to find resources, that is, there are very few resources in terms of both information and problem solving (S_1). When we can't find either the word form or the voiced part of a book that your friends can easily access, I try to use it by inserting it into the browser and editing it as Word from there. As I said, this is the last option, this is our third option (S_2). If it is a book that I cannot find on any platform, I buy this book and run them through the browser. In this sense, it is a tool that contributed a lot in my education period. I use the scanner of the copier, scan them through a program and transfer them to the computer, then save them as Word or PDF, and that PDF file is spoken to by a screen reader, so I used many textbooks in this way (S_1)."

It is reflected in the findings that the students use the phone to communicate in the learning environment, and they use the MEET and DUO programs for communication over the phone. The students expressed this situation as follows: "Our phone enables us to communicate in terms of both our instructors' directives and information sharing in the classroom environment, and WhatsApp groups enable us to communicate in another

way (S_2). Programs like MEET and DUO are available in Turkish. For example, when my minute is up, I call my friend from DUO, see you there (S_1)."

Another benefit of mobile environments is that there are applications for the use of libraries and reading books: "When we do it over listening, we enter the application thanks to the accessibility on our phones, we look. We join whatever we want and click on the book we want and stop when we want. When the separation is over, we move on to the other division, we go to the other part of the book, it has advantages in this way (S_2)."

Discussion and Conclusion

This research focused on determining the opinions of visually impaired Turkish teacher candidates about the digital environments they use. The findings of the study show that visually impaired Turkish teacher candidates use digital media effectively in language teaching, digital environments and programs facilitate the learning process of students, screen readers are the most used digital media and help students in the learning process, digital environments and programs are mostly used in writing and listening. It shown that they use the computer, the Turkish education and digital resources in the field of education are insufficient, and they prefer the computer over the phone in using the environment.

In the research, it has been seen that screen readers are the digital environments that visually impaired students use and benefit the most in their teaching life. Students stated that they solved most of the problems caused by visual impairment with the help of screen readers. The fact that students' experiences with screen readers are spread over a wide area shows that screen readers are an important assistant for students in digital environments. It is among the important findings of this research that students use screen readers as a digital tool that compensates for their visual impairment. The fact that most of the codes belonging to other themes are related to screen readers shows that screen readers are a digital environment that solves many problems of visually impaired Turkish teacher candidates. The concentration of students' opinions in this area shows that this environment is effective enough to continue their education life without using any other aids. The students used the expression "our eye" to explain this situation. It is seen that screen readers are used

effectively both in daily life and in education environment. The function that speech synthesis programs emphasized by Tekindal and Arık (2012) provide great convenience for the visually impaired was seen in the findings of this study. The findings of this study showed that screen reader programs are the most important assistants of the visually impaired on computers (Coşkun, 2013; Hebebci, 2017; Kamali Arslantas et al., 2019; Lailiyah et al., 2020; Tekindal & Arık, 2012).

It has been observed that students use JAWS screen reader program effectively and widely as screen readers, and NVDA programs where they cannot use Jaws. Among these programs, the students' opinions reflect that JAWS has an important place in the teaching lives of the students. It is reflected in the findings that the students use the JAWS program effectively on the computer. The use of the computer until the moment of turning it on and off, and the students' ability to solve many of their tasks on the computer, thanks to this program, were reflected in the students' opinions. The fact that students learn the JAWS program instead of reading and writing shows the functionality and importance of the program. Another screen reader used by students was NVDA. The use of this program as an alternative tool shows that it is not very useful for the visually impaired. The feature that makes JAWS more preferable is that it has a strong Turkish voiceover feature and it is a program that is well adapted to Turkish. However, it is seen that NVDA is an important alternative to be effective in English-based digital environments. The fact that students use this program in widely used digital environments such as UZEM and ZOOM indicates that these environments are English-based, and that this program is used in English-based environments and software. It has been seen that the NVDA program is a solution in the widely used UZEM, OBS, ZOOM and EBA environments.

The effective use of screen readers both on the phone and on the computer has enabled their use in wider areas. The effective and widespread use of screen readers in the teaching environment is on computers, and the use of screen readers over the phone, which is limited to communication in teaching life, is another remarkable finding in the research. The fact that students have more experience with computers indicates that the computer is a more effective environment for using programs. It is noteworthy that students continue their studies on the computer in the classroom

environment. The findings of this research showed that the phone, which is always with them, is expected to provide a solution in learning, but that the phone is a tool that is not used effectively in the classroom environment. The fact that the computer is more effective than the phone can be explained by the ideal size of the screen and the fact that the software is more effective than the computer environment.

It is reflected in the students' opinions that the use of digital media in students' language skill areas remains at the level of a helpful tool. It has been seen that the screen reader program JAWS is among the repetitive codes. It has been seen that especially the use of computers in writing skills and JAWS working on the Word program have made a significant contribution to the writing problem, which is a problem for the visually impaired, by giving feedback on writing studies. It has been seen that JAWS is an effective tool in solving the writing problem, which is a big problem for visually impaired students, due to the fact that written words are not visible when typing (Lailiyah et al., 2020). It has been seen that solving the writing problem in the digital environment thanks to screen readers saved the students from the problem of writing with Braille pen. It is reflected in the findings of this research that the barrier caused by the inability to use the writing skills of visually impaired students in their career as a language teacher (Lailiyah et al., 2020) can be solved by screen readers. It is seen that students are used as an assistive tool in writing skills thanks to screen readers, as in many others.

It was observed that another skill experienced by the students was the listening skill. However, the absence of different and repetitive interpretations on listening indicates that listening is used only as an auxiliary tool. Another remarkable finding is that there is no comment on the effect of digital environments on students' basic language skills, and that these media are only used as an auxiliary tool in language teaching. This can be explained by the fact that digital environments are not effective enough to affect students' language skills or students are not aware of this situation. Although there is a code for speaking skill, the lack of other codes for students to develop it shows that it is not effective on speaking skill. Findings on language skills show that digital environments are not a developer but an auxiliary tool for the visually impaired.

The findings shown that students had difficulties in reaching and finding digital resources. Although there are library services provided by the state and institutions, it is seen that these libraries cannot fully meet the needs of students. It was reflected in the findings that they had problems in finding resources, especially in the field of undergraduate education and Turkish education. The fact that the resources related to Turkish education are generally in the literary genre shows that they are not oriented to the needs of the students. It is seen that universities and libraries should work on this issue. It has been observed that students have solved their problems in finding resources by using browsers. It has been observed that the students read the textbooks and articles with a screen reader by saving them to the computer with a scanner (Emiroğlu, 2008). It is seen that they search aloud the resources they cannot find as documents for education, and make up for the resources they are not found by scanning. In order for the visually impaired to not have problems with resources and other issues, it is necessary to train teachers about assistive technologies and to consider assistive technologies in curriculum development (Smith et al., 2010). Each teacher who attends the course for visually impaired students is required to undergo a basic education for students with disabilities. Government institutions, universities and libraries should work by determining needs according to different branches at the undergraduate level.

It was observed that the students did not have much problem in using digital environments. On the contrary, it has been seen that digital environments and programs have a facilitating role in the education process for the visually impaired. It was seen that the problems experienced were caused by the program incompatibility, and there were no problems caused by the visual disability. They may have experienced similar problems in other environments, but students stated that they had problems originating from UZEM, OBS, EBA and ZOOM in this study. It was also stated in the students' opinions that the problems related to UZEM and EBA were resolved over time. In order to overcome this environment-related problem, they used the English-based NVDA screen reader. The use of NVDA program as an alternative to JAWS is limited to these programs. In order to eliminate these problems, digital environments for the visually impaired should be adapted.

Another remarkable finding is that students see digital media and programs as a facilitating factor for them. The findings of this research have shown that technology removes dependence on someone else both in their lives and in their learning, and that many problems that may arise from visual impairment are solved in this way. The fact that digital environments make visually impaired students more advantageous than face-to-face education shows that students should use digital environments more effectively. It has been seen that one of the important advantages of digital environments is to reduce dependency on others. Digital environments will enable the visually impaired to overcome difficulties and act independently (Arslantekin, 2015; Şahin et al., 2011). It is seen that visually impaired individuals can overcome the barrier of access and live an active, productive and independent life (Bhowmick & Hazarika, 2017) thanks to assistive technologies.

It has been observed that mobile environments have become usable thanks to screen readers. It is seen that mobile technologies are preferred in the educational environments to meet the communication needs of students. It has been observed that students use the phone thanks to the Android-based Talkback screen reader. Another feature of the phone is that it makes it easier for students to access libraries and access resources with book reading applications. Increasing such practices and applying them to various branches will be beneficial in terms of education. Especially for visually impaired students at the undergraduate level, these resources should be made accessible both in mobile and computer environments.

In this study, it is focused on determining the opinions and experiences of visually impaired Turkish teacher candidates about the digital environment and programs they use. The findings of the research show that visually impaired Turkish teacher candidates use digital environments and programs effectively in language teaching. It is seen that the digital environment and programs have positive contributions to the learning processes of the students. It is seen that the most used environment by the visually impaired is the computer environment and the most used programs are screen readers. It is seen that the JAWS screen reader program is very effective in the learning environment and writing where it is used effectively. Another result determined is Turkish education and the lack of digital resources in the field of education.

The results show that assistive technologies enable visually impaired students to lead an independent life, and they do not experience difficulties in using technology (Kan & Wang, 2020). The results also show that students use assistive technology effectively. It is seen that they use a limited number of digital environments and programs effectively, according to their area of use, among the large number of assistive technologies. It is seen that assistive technologies have the capacity to increase students' learning outcomes and increase their participation in classroom activities (Komolafe, 2020).

This research is limited to the experiences of visually impaired Turkish teachers regarding digital media and programs. The general focus of the research on environment and programs is among the limitations of the study. Studies can be carried out for students studying in other departments or for their restricted environment and programs.

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