A Brief Reflection on the Use of Assistive Technology by Blind Language Learners

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Abstract

This article aims to reflect on the foreign language learning process for blind people, seeking to discuss the concept of assistive technologies (AT) and how to implement them in the language learning process, with special attention to the potential of ATs to mobilize different learning strategies. AT can be defined as an interdisciplinary field that investigates the resources and services that allow disabled people to overcome difficulties and to be able to perform tasks. As for the concept of disability, the social model states that the problem is not inside disabled people. Rather it is on society itself, that does not know how to deal with the differences. The ATs analyzed presented themselves as high potential resources for mobilizing learning strategies, as they allow the engagement of blind people in learning practices. In this context, audio transcription and screen readers have played a crucial role in the education and academic success of blind students

Keywords: Assistive Technology. Legislation. Blind People. Learning strategies.

1. Introduction

Information and Communication Technologies (ICT) have been increasingly incorporated into practices, resources, and services targeting people with some kind of disability. One example is Assistive Technology (AT), which is any item, piece of equipment, software program, or product system used to increase, maintain, or enhance the functional capabilities of disabled people.

In this perspective, with regard to vision impairment, Pimentel (2013, p. 12) states that "both the blind and the visually impaired need support to improve personal development, and Assistive Technology is one form of support". In general terms, Assistive technology refers to a wide range of tools, devices, and software designed to enhance the independence, functionality, and overall quality of life for individuals with disabilities. It encompasses various innovative solutions that aim to bridge the gap between ability and disability, enabling people to overcome physical, sensory, cognitive, or communication barriers.

Assistive technology can take many forms, including mobility aids such as wheelchairs and prosthetics, communication devices like speech synthesizers and Braille displays, as well as computer software and applications tailored for specific needs. By empowering individuals with disabilities to perform tasks, engage in activities, and interact with the world more efficiently, assistive technology plays a crucial role in promoting inclusivity, accessibility, and equal opportunities for everyone. As a result, considering that the use of computers, tablets, smartphones, social networks, and digital applications has become quite common in the learning process, this paper aims to discuss the significant implications of assistive technologies on the strategic performance of learnersduring the foreign language learning process, with special attention to the potential of ATs for the mobilization of different learning strategies (Oxford, 2011).

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Based on these objectives, this paper is divided into three sections. The first explains the concept of assistive technology; the second discusses the relationship between AT and the foreign language learning process, with special attention to the concept of LS; and finally, the third is intended to analyze two AT resources, seeking to understand the potential of these tools on improving the foreign language learning process for blind people.

2. Assistive Technology: Concept Formation

Data from the last population census performed by the Brazilian Institute of Geography and Statistics (IBGE) report that 24% of the population residing in Brazil lives with some kind of disability (IBGE, 2022). This percentage, equivalent to almost a quarter of the Brazilians, is quite expressive and has been increasing over the years. In this context, the importance of debating the overcoming of segregationist barriers has also increased.

Technology has proven to be a major ally in making people's lives easier, helping overcome the limits imposed by a disability. Therefore, it is crucial to understand how it works and its applications. Although the concept of Assistive Technology is commonly associated with that of Digital Information and Communication Technologies (DICT), it is important to note that they are intended for different purposes, and so they are not synonymous with each other. Despite being a recent concept, AT has been present in the history of humanity from the beginning since disability has always been present in human life. Humanity has always mobilized means to provide well-being and safety, adapting materials used in daily life to enable simple actions to be carried out, which, without adjustments, would never be possible. Thus, a cane is an example of an assistive technology resource, as well as the use of adapted cutlery, for example.

Regarding the term assistive technology, it is an English term officially coined in the USA in 1988 with the Technology-Related Assistance for Individuals with Disabilities Act (Public Law 100-407). According to Bersch (2017, p.02), "Public Law 100-407 composes, along with other laws, Americans with Disabilities Act (ADA)." This set of laws regulates the rights of the citizens with disabilities in the United States of America, besides providing the legal basis for public funds to purchase the resources they need in order to guarantee these rights." (Bersch, 2017, p. 02).

Based on this document, which represents a milestone for the rights of the disabled people in the USA, Cook and Hussey (1995) define assistive technology, citing the ADA concept, as "any item, piece of equipment, or product system that is used to increase, maintain, or improve functional capabilities of individuals with disabilities". The term assistive technology and its definition by the ADA were fully adopted in Brazil. Other regions, such as Europe, used this document as a backbone for discussions in this regard. In the European scenario, the Empowering Users Through Assistive Technology (EUSTAT) consortium adopted the term support technologies, which "encompasses all products and services capable of compensating for functional limitations, facilitatingindependence and increasing the quality of life of the disabled and elderly people"(EUSTAT, 1999a).

Since the 90's some important initiatives, such as the creation of the Technical Assistance Committee (TAC) were carried out in Brazil. The main goals of the TAC are: to present proposals for government policies and partnerships between civil society and public bodies in the field of assistive technology; to structure the guidelines of this knowledge field; perform surveys on the human resources currently working on the topic; detect the regional centers of reference, aiming at the formation of an integrated national network; encourage, at the federal, state, and municipal levels, the creation of reference centers; to propose the creation of courses in assistive technology; as well as the development of other actions aiming to train qualified human resources; and to propose the elaboration of studies and research on assistive technology. (BRASIL - SDHPR, 2012).

After the creation of the Technical Assistance Committee, other issues were raised, discussed, and problematized before reaching the current concepts. However, studies that promote discussions on ATs are recent, for example, the consensus on the adoption of the term assistive technology to name this knowledge field.

In this regard, Galvão Filho (2013) argues that assistive technologies emerge as an "important horizon of new possibilities for autonomy and social inclusion of disabled people" based on two realities that are relevant today, the first of which is the technological advance, and the other, the inclusive vision (Galvão Filho, 2010). These two realities contribute to breaking paradigms and overcoming exclusive practices. According to Galvão Filho (2013), any studies related to assistive technology (AT) projects in Brazil should prioritize for partiality and their provisional character, due mostly to technological advances, which is why assistive technology is a concept in process of construction and systematization.

In short, we must consider assistive technology as an interdisciplinary field that investigates the resources and services that allow disabled people to overcome certain difficulties and be able to perform tasks that they would not be able to do without the help of such a resource or service.

3. Assistive Technology And Language Learning For Blind People

Within the scope of teaching and learning processes, there are many studies involving disabled people and the use of AT resources for learning Portuguese, Physics, Chemistry, Mathematics, Music, among other things. The use of AT provides these learners with the autonomy to acquire knowledge and skills that would be very difficult for them to have access to otherwise.

Learning a foreign language is widely recognized as a complex process by various experts and institutions in the field of linguistics, education, and cognitive science. Scholars such as Paiva (2005), Lin Sophie Teng and Lawrence Jun Zhang (2022), Li Xu et al (2022) define the process of learning a foreign as a dynamic, chaotic, unpredictable phenomenon, sensitive to the initial conditions, open, and adaptive. These scholars acknowledge the multifaceted nature of language acquisition, which involves mastering vocabulary, grammar, pronunciation, cultural nuances, and communicative skills. Additionally, researchers, linguists, and educators have conducted extensive studies on language learning, highlighting the intricate cognitive processes, linguistic challenges, and individual differences that learners encounter when acquiring a new language

In this context, it should be noted that the foreign language learning process consists of a series of unique features concerning the specificities of each learner and learning context. Therefore, it is relevant to reflect on the type of disability that is the subject of this article, visual impairment or visual disability. Visual Impairment (VI), a term often adopted by official documents and, as a result, one of the most widespread, is defined as any limitation in the eye function. However, even though VI is the most common term to refer to the person who has limited visual abilities, this impairment can still be classified as blindness or low vision, depending on the criteria used for this classification.

Although the clinical definition is necessary, this paper discusses the social model of disabilitysince it comprises the inclusion stage and considers the disabled person as capable as any other person, even though his acuity and vision are not considered satisfactory for the requirements imposed by society. Thus, we understand that the problem of disability is not in the person who lives with it, on the contrary, it is lodged in society, which does not know how to deal with differences, due to its various attitudinal and environmental barriers (Sassaki, 2012).

In this context, researches on the learning process for disabled people have sought to explain some ideas, concepts, suggestions, and guiding principles related to this process. An example of this is the work by Elizabeth de Sá, Izilda de Campos, and Myriam Silva, entitled *Inclusão escolar de alunoscegos e com baixavisão* [School inclusion of blind and low vision students], which draws attention to the fact that "school content favors visualization in all knowledge fields, in a universe full of graphic symbols, images, letters and numbers"(Sá,Campos andSilva, 2007, p. 13). It is something rooted in our culture and very difficult to be deconstructed.This is one of the reasons why the learning process for visually impaired people is so unique.

The particular universe of each human being is constituted mainly from the visual contact established with the surroundings. Practices, attitudes, and knowledge are acquired mostly by visualization. Therefore, it is important to recognize that "the needs originated from visual limitations should not be ignored, neglected or confused with concessions or fictitious needs." (Sá et al., 2007, p. 13). For blind or visually impaired students, these limitations should be reduced to a minimum by providing resources for them to develop their activities.

For the authors, "all senses have the same characteristics and potential for all people." (Sá et al., 2007, p. 15). In the case of blind people, theydo have enhanced abilities in their other senses since their brains need tomake new connections in the absence of visual information. Therefore, "foreign language teaching methods should prioritize conversation instead of visual didactic resources." (idem, 2007, p. 25). According to Oxford (1990), learning strategies are "learning strategies are specific behaviors or thought processes that students use to enhance their own language". The author also adds that, although the origin of the word strategy refers to steps to achieve a goal, the modern concept also includes ideas of control and direction.

In this sense, Vilaça presents a concept suggested by Oxford that is pertinent to this discussion, where the learning strategies are defined as:

Steps taken by students to improve their learning. The strategies are especially important in language learning because they are tools for an active, self-directed involvement, which is essential for the development of communicative competence. Appropriate language learning strategies result in enhanced proficiency and greater self-confidence (Oxford, 1990 *apud*Vilaça, 2011, p. 230).

Historically, learning strategies have always been present in the process of acquiring a second language. In this perspective, Griffin (2017, p. 142) states that "each learner is a world" and different factors, of different natures, can influence how a foreign language is learned. Based on Ellis (1985), the author defines learning strategies as personal factors that affect learning. These personal factors, that also include the dynamics of the group to which they belong, if the learning takes place in a formal or collective context, can impact on learning in different degrees: a little, a lot or not at all. They can also affect the learning process in some moments, but not in others. (Griffin, 2017).

The main merit of Rebecca Oxford's proposal is, without a doubt, the recognition of the dynamic and multidimensional nature of the process of using learning strategies, besides the presentation of an inventory of learning strategies divided into learning dimensions, which results from a rigorous study of the performance of learners. Oxford`s ideas impacted significantly recent studies such as Svensson et al. (2019), Xu (2022), Smith (2020) among others that have recently addressed the learning process for Individuals with disabilities. She understands that learning strategies can be conscious or not, noticeable or not, since uncertainty is part of the complex nature of learning. In this sense, it is not possible to predict exactly how many learning strategies will be used by an English or Spanish language learner in the context of using a digital application (app), for example, although it is possible to raise some hypotheses in this regard.

Oxford also states that the use of learning strategies by foreign language learners makes "[...] learning easier, faster, more enjoyable, more self-directed, more effective, and more transferable to new situations." (Oxford, 1990 apud Oxford, 2003, p. 06). Learning strategies provide learners with effective techniques and approaches to acquire language skills more efficiently. By employing appropriate strategies, learners can optimize their study time, focus on relevant language aspects, and accelerate their language proficiency development. They help learners retain and recall language knowledge more effectively. Strategies such as repetition, mnemonic devices, and organization techniques facilitate memory consolidation and retrieval, enabling learners to better internalize vocabulary, grammar rules, and language patterns.

According to Vilaça (2010, p. 24), "studies indicate that often the highest or lowest level of success in learning is related to the best and greatest use of diverse and adequate learning strategies". It is understood that the proper use of learning strategies results in improved proficiency and greater self-confidence when acquiring foreign language. Learning strategies empower learners to take ownership of their language learning journey and develop a sense of self-efficacy. By using effective strategies, learners can overcome challenges, build their language skills step by step, and gain confidence in their abilities to communicate in the target language. In other words, they provide learners with tools to enhance their language production and communication skills. Strategies like self-monitoring, paraphrasing, and chunking help learners express themselves more fluently, accurately, and appropriately. They also assist in overcoming language barriers and improving conversational competence.

In this perspective, the strategies classification and inventory proposed by Oxford (1990), adopted methodologically as the main reference of our study, identify learning strategies in two major classes: direct strategies and indirect strategies. While Direct strategies are learning procedures directly linked to the foreign language studied and are divided into memory strategies, cognitive strategies, and compensation strategies, Indirect strategies refer to procedures, practices, and attitudes adopted by learners, concerning planning and management of learning, and are divided into three groups: metacognitive strategies, affective strategies, and social strategies. These learning strategies can be mobilized, for example, through the employment of digital technologies and, in the case of blind learners, through assistive technologies.

In this sense, assistive technologies should be efficient tools that can foster learners' adaptability and autonomy in various language learning contexts. Effective strategies enable learners to adapt to different environments, resources, and tasks. They empower learners to identify their individual learning needs, set goals, and make informed decisions about the most suitable strategies for their learning style.

4. Analyzing Assistive Technology Resources

As mentioned before, important discussion has been raised in the last decade regarding learning process for Individuals with disabilities. In *Assistive Technology for Individuals with Disabilities* (2020), Smith et al cover a wide range of AT resources, including mobility aids, communication devices, and cognitive support tools. The study explores the impact of AT on the quality of life, independence, and social participation of disabled individuals.

Also innovative was *The Impact of Assistive Technology on the Quality of Life of Individuals with Disabilities* (2019) by Miller et al. These scholars focus on the impact of assistive technology on the quality of life of individuals with disabilities assessing the effectiveness of various AT resources, including mobility aids, environmental control systems, and assistive communication devices, in enhancing functional independence, social participation, and psychological well-being.

In this regarding, it is worth mentioning *The Impact of Assistive Technology on Employment for People with Disabilities: A Systematic Review*(2019), by Chen, C. et al.The authors examine the impact of assistive technology on employment outcomes for people with disabilities. It analyzes the effectiveness of AT resources such as adaptive software, ergonomic devices, and alternative input devices in facilitating job performance, workplace accommodations, and overall vocational success.

All these researches explore a wide range of possibilities that encourage professionals from different areas to apply, verify and validate the effectiveness of each method. Among the ATs available for blind learners, audio description and screen readers were chosen for this discussion in order to emphasize their contribution to the foreign language learning process, especially regarding mobilization of learning strategies.

4.1 Audio description

Audio description is a narration resource that attempts to describe images or videos. This feature provides blind people with access to audiovisual or image content, such as photographs, plays, or television programs (Braun & Starr, 2021;Mazur & Chmiel, 2021;Tor-Carroggio & Casas-Tost, 2020; Tor-Carroggio, 2020).In the study *Mapping new horizons in audio description resea*rch, Braun and Starr (2021) state that by rendering images into words, audio description (AD) enables people who are visually impaired to access audiovisual content. In Translation Studies, AD is usually discussed as a form of intersemiotic or audiovisual translation.

This tool is becoming increasingly present on the Internet and social media, especially Facebook and Instagramthe most popular ones for image sharing. According to Jackie Xiu Yan &Kangte Luo(2023), these social media allow visually impaired people tohave access to the content of images with the hashtags #forblindtosee and #foralltosee. Also, since 2016 it is possible to insert image descriptions on Facebook and Instagram through a tool called Automatic Alternative Text that integrates with the description system of screen readers using artificial intelligence. Suchinstrument uses object recognition technology to create a description of a photo sent by a user so the blind and visually impaired can have access to its content using a screen reader,which reads aloud the alt text provided. Therefore,the audio description tool provides autonomy and inclusion for blind people, preponderant factors for the exercise of their full citizenship (Wang et al., 2020; Fryer, 2019; Ramos & Rojo, 2020).

These applications also have built-in language settings so blind and visually impaired users are able to understand photo captions in any language. It is noteworthy, however, that the automatic translator can make mistakes that can make the description inaccurate sometimes. In this regard, Jackie Xiu Yan and Kangte Luo (2023) highlight some important limitations that should be acknowledged: the level of experience of the students in using AD, the students' perceptions and personal experiences of creating a prepared AD and the relationship between the designated sets of AD and interpreting criteria. Although it is related to a specific study conducted in Hong Kong, their observation shed light to important issues regarding to the limitations of any study:

The students had more experience in interpreting than in AD at the time the survey was administered. It is possible that the results would be different if the students had longer time in AD training. Second, the students' perceptions were based on their experience of producing a prepared AD. Given that audio describers can have different perceptions depending on the type of AD service they provide (Mazur & Vercauteren, 2019), cautions should be taken when generalising the results of the present study. Third, the relation between the designated sets of AD and interpreting criteria can be further investigated in the future study, more questions can be explored in the respect, for example, can interpreting be part of a tertiary-level AD programme? Given the shortage of research and practice of AD training in the university setting and the explorative nature of the present study, the study can lay a foundation for more comprehensive and in-depth research in the future. Still, the findings may shed light on future AD training and research in general and university settings in particular (Yan&Luo,2022, p.07).

As suggested by Yan and Luo, students' perceptions and experience as well as their level of contact with the designated sets of AD can make huge difference in the final desired result. Thus, direct learning strategies, such as memory strategies, can be easily mobilized and used to create mental connections through the association of objects that are described by the Automatic Alternative Text tool or using the hashtags #forblindtosee and #foralltosee since both resources work with the help of a screen reader and, therefore, audio description.

Cognitive strategies can also be mobilized to analyze expressions and reason deductively about the content of the imagesusing audio description. Finally, compensation strategies also present potential for mobilization since blind language learners can use their mother tongue to understand the subtitles used through hashtags in other languages.

4.2 Screenreaders

A screen reader is a form of assistive technology that provides the visually impaired with accessibility to the technological resources present on smartphones or computers, allowing access to books, news, social media, etc. It uses speech synthesis through a recording made by a digital sample, which is driven by binary and electrical signals, generating a sample of a digital signal that sounds identical to the simulation of the human voice.Thus, screen readers narrate the contents on smartphones, tablets, and computers, such as texts, messages, or even graphics, since this technology is contained in the text-to-speech (TTS) system that converts normal language text into speech.

Recent studies have underscored the transformative impact of screen readers on the educational outcomes of blind students (Kearney-Volpe & Hurst, 2021; Lazar, 2019; Sankhi & Sandnes,2022). By providing access to digital content, facilitating navigation, fostering inclusivity, and promoting digital literacy, screen readers empower blind students to fully participate in educational activities and achieve their academic potential. As technology continues to evolve, it is essential to recognize the importance of screen readers and ensure their availability and accessibility to blind students, thus creating an inclusive and equitable educational environment.

Among best screen readers for the blind or visually impaired are DOSVOX/ LINVOX, ORCA, VIRTUAL VISION, and TALKBACK. These tools help blind users interact with new mobile digital technologies. However, it is noteworthy that most screen readers are not free, which sometimes leads blind users to opt for screen readers that offer a lower quality speech synthesis. They can also be used by blind people on smartphones to learn a new language since they can promote the mobilization of learning strategies, especially those of the direct strategies type, which are directly involved in foreign language learning and the indirect strategies related to the learning planning and management process since they constitute a mosaic of actions, thoughts and skills aimed at handling text input (AraújoJúnior, 2013).

Therefore, based on Oxford's (1990) learning strategies inventory, the learning strategies that can be mobilized for blind language learners using a screen reader are memory strategies, enabling mental connections to associate new and previous information, in addition to language-sound connections made between words from the native language and the target foreign language that may have similar sounds; cognitive strategies, since learners can spontaneously practice the language through the repetition of sounds using a screen reader, which can assist blind users with message exchange; and compensation strategies, as blind learners can use their mother tongue with screen readers to understand the words in the foreign language they are learning.

Undoubtedly, screen readers play a crucial role in the education and academic success of blind students (Kearney-Volpe & Hurst, 2021; Lazar, 2019; Sankhi & Sandnes, 2022). As said before, recent studies have emphasized the importance of screen readers as indispensable tools that empower visually impaired individuals to access digital content, navigate the internet, and engage with educational materials. These assistive technologies have significantly enhanced the learning experience and inclusivity for blind students, enabling them to participate on equal footing with their sighted peers.

It is widely agreed that screen readers allow blind students to independently access and consume written content. With the use of text-to-speech technology, screen readers convert written text into synthesized speech, providing blind students with a means to listen to and comprehend written materials (Du, C., Guo, Y., Chen, X., &Yu, K., 2022;Fahmy, F. K., Abbas, H. M.,& Khalil, M. I., 2022). This includes textbooks, articles, research papers, online resources, and other educational materials. By eliminating the barriers posed by printed text, screen readers enable blind students to explore a vast range of academic content and engage with subjects across various disciplines.

In addition to reading text aloud, screen readers facilitate navigation through digital interfaces. They offer features such as keyboard shortcuts, headings navigation, and table exploration, enabling blind students to efficiently browse websites, online platforms, and software applications. These functionalities are particularly important in educational settings where blind students may need to navigate complex learning management systems, access online course materials, or interact with digital tools and resources. By providing seamless navigation, screen readers enable blind students to independently explore digital environments and engage in educational activities.

In this perspective, screen readers contribute to fostering an inclusive classroom environment by promoting active participation and collaboration. Recent studies have shown that blind students who utilize screen readers have greater opportunities to contribute to class discussions, participate in group projects, and collaborate with their peers. Through the use of screen readers, blind students can access and read digital content in real-time, allowing them to keep pace with classroom discussions and actively engage in academic activities. This not only enhances their learning experience but also promotes a sense of belonging and equal participation within the educational community.

5. Final Considerations

This paper provided a discussion on how blind people experience the foreign language learning process, focusing on assistive technologies – a concept still in development – and how they are able to provide autonomy and social inclusion and how they can contribute for the mobilization of different learning strategies, making the foreign language learning process easier for the blind and visually impaired. Thereafter, the social model of disability was discussed, in which the problem of disability is not in the person who lives with it, but in society itself, which does not know how to deal with it, imposing an infinity of attitudinal and environmental barriers on these individuals, which hinders, among other aspects, the language learning process.

In this sense, the concept of learning strategies is opposed to this generalist view, which does not consider the particularities of individuals, as it considers each learner to be a unique world, with its different contextual, motivational, biological, and technological factors, etc., each of which influences how a person learns a foreign language. Assistive technologies, in this perspective, can contribute to overcome barriers in language learning through their high potential to mobilize learning strategies, enabling the blind learner to engage in meaningful learning practices. Furthermore, screen readers are instrumental in promoting digital literacy and technological skills among blind students.

As technology continues to shape the modern educational landscape, it is vital for blind students to acquire proficiency in utilizing digital tools and platforms. By incorporating screen readers into their academic routine, blind students gain practical experience in utilizing assistive technologies, honing their digital literacy skills, and becoming proficient in navigating the digital realm. This prepares them for future academic pursuits, professional endeavors, and empowers them to be active contributors in a technology-driven society.

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