ASSISTIVE TECHNOLOGIES IN DISTANCE EDUCATION: THE DIS(USE) BY TEACHERS IN THE EDUCATION OF PEOPLE WITH DISABILITIES

TECNOLOGIAS ASSISTIVAS NA EDUCAÇÃO A DISTÂNCIA: O DES(USO) PELOS DOCENTES NA EDUCAÇÃO DAS PESSOAS COM DEFICIÊNCIA

TECNOLOGÍAS AUXILIARES EN EDUCACIÓN A DISTANCIA: EL DES(USO) POR PARTE DE LOS DOCENTES EN LA EDUCACIÓN DE PERSONAS CON DISCAPACIDAD

Letícia Aparecida Alves de LIMA[1]
e-mail: lealveslima26@gmail.com

André Luiz Moscaleski CAVAZZANI[2]
e-mail: andre.ca@uninter.com

Marcus Vinicius Gonçalves da SILVA[3]
e-mail: marvin.gsilva@gmail.com

How to reference this paper:

LIMA, L. A. A.; CAVAZZANI, A. L. M.; SILVA, M. V. G. Assistive technologies in distance education: The dis(use) by teachers in the education of people with disabilities. **Nuances: Estudos sobre Educação**, Presidente Prudente, v. 36, n. 00, e025005, 2025. e-ISSN: 2236-0441. DOI: 10.32930/nuances.v36i00.10130

| **Submitted**: 21/10/2024
| **Revisions required**: 28/03/2025
| **Approved**: 01/04/2025
| **Publicado**: 09/04/2025

Editors: Prof. Dr. Rosiane de Fátima Ponce
Prof. Dr. Paulo César de Almeida Raboni
Deputy Executive Editor: Prof. Dr. José Anderson Santos Cruz

[1] Master's Degree in Education and New Technologies (UNINTER) – Curitiba (PR); Bachelor's degree in Pedagogy (UNIFAEL). Pedagogical and Educational Advisor at the Bradesco Foundation.

[2] Doctoral degree in Social History (USP) – São Paulo (SP); Master's in History (UFPR); Bachelor's degree in History (UFPR). Lecturer in the Postgraduate Program in Education and New Technologies/UNINTER.

[3] Doctorate in Business Administration (PUCPR) – Curitiba (PR); Master's Degree in Planning and Public Governance (UTFPR); Bachelor's Degree in Business Administration (UNESPAR). Analyst at the Strategic Studies Center of the Amazon Military Command.

ABSTRACT: In Distance Education (DE), there are still barriers to accessibility for people with disabilities. However, the use of Assistive Technologies (AT) can contribute to the expansion of new possibilities for organizing the teaching and learning process. From this perspective, the research aims to identify whether teachers who work in distance learning, in a Professional Education Institution, use assistive technologies to serve students with disabilities. For this, the research is based on a qualitative approach, with data obtained from a survey. The research results show that in the vocational courses, in the distance education modality, of the analyzed institution, technological resources are not used in the teaching-learning process of students with disabilities, given that the instructors do not have training or experience in the use of Assistive Technologies.

KEYWORDS: Teacher. Distance Education. Inclusive Education. Disabled People. Assistive Technologies.

***RESUMO**: Percebe-se que ainda há, na Educação a Distância (EaD), barreiras de acessibilidade para pessoas com deficiência. Todavia, o uso das Tecnologias Assistivas (TA) pode contribuir para a ampliação de novas possibilidades de organização do processo de ensino e aprendizagem. Nessa perspectiva, a pesquisa tem o objetivo de identificar se os docentes que atuam na EaD, em uma Instituição de Educação Profissional, utilizam as Tecnologias Assistivas para atender os alunos com deficiência. Para tanto, a pesquisa se alicerça em uma abordagem qualitativa, com dados obtidos a partir de um survey. Os resultados evidenciam que, nos cursos profissionalizantes na modalidade EaD da instituição analisada, não são utilizados recursos tecnológicos no processo de ensino-aprendizagem dos alunos com deficiência, haja vista que os instrutores não possuem formação ou experiência no uso de Tecnologias Assistivas.*

***PALAVRAS-CHAVE**: Docentes. Educação a Distância. Educação Inclusiva. Pessoas com Deficiência. Tecnologias Assistivas.*

***RESUMEN**: Se advierte que en la Educación a Distancia (EAD) aún existen barreras de accesibilidad para las personas con discapacidad. Sin embargo, el uso de Tecnologías de Asistencia (TA) puede contribuir a la expansión de nuevas posibilidades para organizar el proceso de enseñanza y aprendizaje. Desde esta perspectiva, la investigación tiene como objetivo identificar si los docentes que trabajan en educación a distancia, en una Institución de Educación Profesional, utilizan tecnologías asistivas para atender a estudiantes con discapacidad. Por lo tanto, la investigación se basa en un enfoque cualitativo, con datos obtenidos de un cuestionario. Los resultados de la investigación muestran que, en los cursos de formación profesional, en la modalidad de educación a distancia, de la institución analizada, no se utilizan recursos tecnológicos en el proceso de enseñanza-aprendizaje de los estudiantes con discapacidad, dado que los docentes no cuentan con formación ni experiencia en el uso. de Tecnologías de Asistencia.*

***PALABRAS CLAVE**: Maestros. Educación a Distancia. Educación Inclusiva. Personas con Discapacidad. Tecnologías de Asistencia.*

Introduction

Reflecting on how educational institutions can adjust to meet students' special needs involves promoting dialog between different areas of knowledge. This is fundamental to finding and implementing appropriate educational solutions for these students, with the main aim of including them.

Within the context of educational institutions, DE has emerged as a teaching alternative to meet the needs of a public that, due to geographical distances or the lack of infrastructure in conventional institutions, opts for DE (Barros *et al.*, 2023; Lima, 2024). Furthermore, we live in a society where

> […] technologies have given rise to new tools aimed at speeding up communication and changing production and human relations in their activities. These events have generated social effects that deserve the attention of educational institutions and their professionals (Lima *et al.*, 2023, p. 3, our translation).

In the context of accessibility and DE, it is important to highlight the role of the teacher-tutor as a facilitator of the educational process. In this sense, teacher training has a significant impact on the teaching strategies used. Investments in didactic pedagogical issues are essential to training teachers to meet the individual needs of students, regardless of the difficulties or limitations they may face (Sales; Missias-Moreira; Couto, 2016).

Marques and Gomes (2014) emphasize the importance of continuing teacher training to improve skills in the use of technological resources. When these resources are used efficiently, they are of fundamental importance at all stages of the teaching process.

The AT is relevant to the study of accessibility and technological resources in DE, as it aims to improve the quality of life and promote the social inclusion of its users. It is, therefore, important for the teacher to be aware of the particularities of each student in order to properly integrate accessible teaching resources into the educational objectives when designing activities. In Brazil, according to Law No. 13,146 of July 2015, AT is defined as:

> […] products, equipment, devices, resources, methodologies, strategies, practices, and services that aim to promote functionality related to the activity and participation of people with disabilities or reduced mobility, aiming at their autonomy, independence, quality of life and social inclusion (Brazil, 2015, our translation).

Lima *et al*. (2020) add that AT is a multidisciplinary field of knowledge whose main purpose is to eliminate barriers that limit the full participation and functional performance of people with disabilities, incapacities, or reduced mobility. Its central aim is to promote greater autonomy and improve the quality of life of these individuals.

Therefore, examining the application of AT in the educational environment is a valuable approach to understanding these resources and expanding the possibilities for student learning. In addition, these tools can help overcome prejudices rooted in outdated pedagogical methodologies.

Law No. 13.005, of June 25, 2014 (Brazil, 2014), which approved the National Education Plan in force from 2014 to 2024, describes, in Goal 4, the actions to be developed to improve the education of people with disabilities and/or specialized educational needs, that is:

> […] universalize, for the population aged four to seventeen with disabilities, global development disorders, and high abilities or giftedness, access to basic education and specialized educational care, preferably in the regular school network, with the guarantee of an inclusive educational system, multifunctional resource rooms, classes, schools or specialized services, public or contracted (Brazil, 2014, p. 55, our translation).

With regard to inclusion, it is clear that Brazilian laws focus mainly on basic education, leaving vocational education lacking legal resources to back up its initiatives. Thus, tackling the issue of accessibility in vocational education is an emerging and, at the same time, a relevant topic for research, preferably looking at everyday practical situations.

However, according to Article 1 of Resolution No. 18 of December 2002 (National Education Council, 2002, our translation): “professional education at technological level, integrated with the different forms of education, work, science, and technology, aims to guarantee citizens the right” to acquire professional skills that make them suitable for insertion into professional sectors in which technologies are used. Thus, professional education is “a strategic factor for national socioeconomic development, as well as for the reduction of social inequalities” (Conselho Nacional de Educação, 2002, p. 4, our translation).

During the COVID-19 pandemic, for example, the lack of preparation of teachers to use digital technologies in education has been evident in practice. In the study by Espírito Santo and Lima (2020), the authors described the results of a survey carried out by the Península Institute with 7,734 teachers from public and private schools. The survey found that “83% of the teachers surveyed were not prepared to teach online. Around 90% reported that they had

never had any experience with distance learning, and 55% had not even been trained to work in a non-face-to-face environment" (Espírito Santo; Lima, 2020, p. 288, our translation).

These findings highlight the deficiency in teacher training in the use of digital technologies, pointing to the need to expand the digital skills required by society (Lima, 2022).

However, the pandemic has forced teachers to use digital technologies, regardless of whether or not they have specific training in education. Vio *et al*. (2020, p. 3, our translation) described that "the teachers, on their own, had to rethink the relevant content to be offered in this context and did not receive training, instrumentalization or technical support."

It should be noted that Information and Communication Technologies (ICT) and DE are interrelated in the educational context, so technological resources should be used with the aim of facilitating the teaching and learning process (Rodríguez-López, 2018; Fialho *et al.*, 2020).

Given this brief contextualization, the following question arises: what AT has been used by teachers in the DE modality in the context of vocational education? To this end, the study aims to identify whether teachers working in DE at a professional education institution use AT to assist students with disabilities.

In order to answer this question, the paper is structured in seven sections. In the introductory section, the field of research is presented, the proposed topic is contextualized, the research problem is defined, and the assumptions that guide the work are set out. The second, third, and fourth sections are dedicated to briefly contextualizing the basic constructs of the study: DE, AT, and the organizational learning program. The fifth section describes the research methodology and its characteristics, the subjects of the study, and the data collection and analysis procedures. In the sixth section, the results are presented and discussed, and in the last section, the final considerations are made, describing the theoretical and practical contributions, the limitations found, and the recommendations for further studies.

Distance Education

Decree No. 9,057 of May 25 (Brazil, 2017) reinforces that DE is an educational modality in which the teaching and learning process is developed based on didactic-pedagogical mediation, through ICT, the integration of qualified personnel and the recognition of access policies, among others, in order to meet development anywhere and in any space.

Turci (2022) corroborates Santos (2018) in describing that mediation is an essential element for students to learn, given the specificities of each one. If we understand the different

ways of learning, we can see that there is no single standard of teaching, and that it is necessary to adapt teaching practice to meet the needs identified on an individual basis.

The mediation carried out in Virtual Learning Environments (VLE) aims to provide students with tools and strategies to broaden their knowledge, strengthening their theoretical and practical bases on the subject under study. Also, according to Decree No. 9.057/2017, in article 2, the provision of DE must comply with accessibility conditions both with regard to the physical structure and the means of communication, with a view to democratizing training.

It is worth considering that the public served by DE has established a social brand that has allowed thousands of low-income student's accesses, but only to certain courses. In this sense, Basso et al. (2020, p. 228) point out that "the state cannot refuse to provide, for example, a national teacher training policy, which does not separate or define tasks for face-to-face and distance learning, disregarding the immense socio-economic distances of this population."

With the pandemic caused by COVID-19, Emergency Remote Education (ERE), also called virtual education, emerged due to the need to offer remote (virtual) alternatives in order to continue educational activities. In this way, DE and ERE have become necessary to maintain links between students and the school, through the use of digital information and communication technologies, integrated into the teaching-learning process (Carvalho *et al*., 2020).

Assis and Abranches (2021) reveal that, with the pandemic event of 2019, there was an increase in the use of remote teaching and DE itself, given that online digital platforms were the main technological support for pedagogical mediation. The event anticipated the trend of breaking the dichotomy between face-to-face and distance learning. In this context, it is necessary to encourage discussions on the conception of new pedagogical models for DE, in order to guide the paths to be taken at times of paradigmatic transition.

In the field of DE, there has been a significant evolution in teaching methods and resources. However, one of the main challenges still lies in communication, considering that this type of teaching requires the use of computers and internet access (Lima, 2022). To use the computer, disabled users generally use specific tools and software, known as AT.

Assistive Technologies

We live in a society where technologies have given rise to new instruments that aim to speed up communication, modify production, and transform human relations in their activities. These events have generated social effects that deserve the attention of educational institutions and their professionals. Aureliano and Queiroz (2023), quoting Silva (2019), state that:

> […] digital technologies appear as an important resource in the realization of learning, dialoguing between educator and student, both being builders of knowledge. Thus, the use of this tool allows for a reflective process on the part of the teacher seeking to understand its functionalities and apply them in a meaningful and appropriate way (Aureliano; Queiroz, 2023, p. 6, our translation).

Sampaio *et al*. (2024) add that, when used in an appropriate and balanced way, digital technologies have the potential to enrich children's learning experience, foster cognitive, social, and emotional development and support children with special needs.

Once again, technology has emerged as a human ally in solving problems. Technology has teamed up with human intelligence and has created innovative solutions for this new reality, some of which we may not abandon.

As a result, it can be inferred that the use of technologies in learning processes facilitates the learning of students and teachers and promotes the transformation of their lives through the re-signification of human values. Ferreira and Correa (2019) cite Moran (2012, p. 41) to describe online education "as the set of teaching-learning actions developed through telematic means, such as the internet, videoconferencing, and teleconferencing."

To do this, teachers need to know what technological resources are available in the school so that they can use them with their students in order to develop diversified work, improve their teaching practice, and motivate students toward meaningful learning (Tardin; Romero, 2022). Despite the relationship between ICT and Inclusive Education, Schlünzen Junior (2012) reveals that:

> Technology and inclusion establish a favorable dialogue for educational progress, as they represent catalysts for change at school. […] The establishment of factors that trigger transformations in the school has a direct impact on the teacher training process, as they highlight the two deficiencies (Schlünzen Junior, 2012, p. 121-122, our translation).

With regard to students with disabilities, in order to have equal access to knowledge, they often need AT to ensure progress in educational practices, and teachers must have conscious and transformative attitudes (Pamplona, 2016; Rodrigues; Oliveira, 2022).

Along these lines, teacher training is considered a key element in improving schools and promoting productive curriculum reform, but training proposals are often inefficient, as they disregard the gap between theory and the context in which this knowledge is applied (Bacich; Moran, 2018; Girardi *et al.*, 2019).

This reveals the need to redefine the role of teachers in order to broaden their skills in dealing with transformations in science and technology, combined with the ability to plan and develop skills related to an inclusive culture.

Professional Apprenticeship Program

Articles 60 to 69 of Law No. 8,069 of July 13, 1990 (Brazil, 1990) provide for the right to apprenticeship, treating it in line with the principle of full protection for children and adolescents. Law No. 8,213, of July 24, 1991 (Brazil, 1991), in its article 93, states that:

> Companies with 100 (one hundred) or more employees are obliged to fill between 2% and 5% of their positions with rehabilitated beneficiaries or qualified disabled people, in the following proportion: I - up to 200 employees… 2%; II - from 201 to 500… 3%; III - from 501 to 1,000… 4%; IV - from 1,001 onwards… 5% (Brazil, 1991, emphasis added, our translation).

Given this legal framework, Apprenticeship Programs (AP) aim to train apprentices to perform professional activities and deal with different situations in the world of work. At the same time, they enable companies to develop a skilled workforce.

The APs consist of theoretical and practical activities designed for tasks of progressive complexity in a program correlated with the activities carried out by the contracting companies (Sindicato Nacional dos Auditores Fiscais do Trabalho, 2019). In the AP, the company is responsible for recruiting, selecting, and enrolling apprentices, who must be between 14 and 24 years old and enrolled and attending school if they have not completed high school.

On being hired, the apprentice will have their work permit signed by the company and will receive a salary for the theoretical and practical activities of the course. According to Decree No. 9,579 of November 22, 2018 (Brazil, 2018), apprentices must be hired by:

> […] establishments of any kind that are required by law to employ and enroll in courses offered by national apprenticeship service a number of apprentices equivalent to a minimum of five percent and a maximum of fifteen percent of the existing workers in each establishment whose jobs require professional training (Brazil, 2018, art. 51, our translation).

With regard to teachers working in technical vocational education, Moura (2008) states that there are three profiles: graduates, bachelors, and instructors. Those who work in the public sphere are usually graduates, divided into two groups: graduates and bachelors. Meanwhile, in the private sphere, the instructor is the teacher who works in technical education and generally has professional experience in the specific field. In the context of this research, the term "Instructor" will be used, as this is the profile of the institution's AP teachers.

Law No. 13.146, of July 6, 2015 (Brazil, 2015), which established the Statute of Persons with Disabilities, determines that apprentices with disabilities should only be counted towards the apprenticeship quota and not towards the quota for people with disabilities (art. 101). In other words, there is no maximum age limit for hiring an apprentice with a disability.

The National Union of Labor Inspectors (2019) notes that in the contractual relationship between the company and the disabled apprentice, the maximum term of two years does not apply. The additional time stipulated in the apprenticeship contract must be based on disability-related aspects, assessed individually, and a supplementary course plan must be drawn up. It should be noted that training institutions must have an adequate structure for offering the AP, be compatible with the number of apprentices, and guarantee an accessible and inclusive environment for people with disabilities.

Method

Methodologically, the study is characterized as basic, descriptive, and qualitative. Based on the theoretical framework, the possibilities of relating the themes of accessibility, assistive technologies, and DE in a Professional Education Institution (PEI) were established.

By means of a survey, applied during the month of September 2021, the questions were prepared in an open format and collected on Google Forms, with the Coordinator, Pedagogue, and Instructors who work in DE at the institution where the research was carried out as respondents, according to Tables 1, 2, 3 and 4.

The results were analyzed in two stages. In the first, based on an approach to the literature and documents pertinent to the object of the research, we sought to contextualize the themes of Assistive Technologies, Accessibility, and DE in Vocational Education and interrelate them.

In the second stage, we sought to understand educational pedagogical practice and analyze it in the light of theory and current legislation, in order to propose new perspectives in the field of accessibility in vocational education, through existing assistive technologies.

The time frame was delimited between 1990, when the Statute of the Child and Adolescent was published, and 2022. For ethical reasons, as recommended in Resolution 510 of April 7, 2016 (Brazil, 2016), the confidentiality and anonymity of the researched institution were ensured in order to safeguard the information given in confidence.

Results and methods

The PEI surveyed is a private, non-profit organization whose mission is to offer training and professional development. It has 36 units, one of which is DE (Lima, 2022).

The PEI currently has 571 professional instructors. It should be noted that the institution does not use the term “Professor” but “Instructor.” However, they are professionals who have a university degree, with a Bachelor’s or Licentiate’s degree, depending on the area of study. In this study, data was collected from the DE Coordination Office (Lima, 2022).

At PEI, partner companies are responsible for recruiting, selecting, and enrolling apprentices in the AP. The apprentice must be aged between 14 and 24 and enrolled and attending school, if they have not completed high school. On being hired, the apprentice has their work permit signed by the company and receives a salary for the theoretical and practical activities of the course. At the PEI, the AP’s daily workload is four hours, totaling 20 hours a week, divided between the hours of theoretical training and the hours of practical activities in the company (Lima, 2022).

As for the type of education, PEI offers the APs both in person and at a distance. Data from 2020 shows that the number of companies and apprentices participating in the AP is 1,698 and 48,483, respectively. These figures are representative, as they demonstrate the importance of the AP for the community and for companies (Lima, 2022).

Table 1 describes the sociodemographic data of the coordinator and the pedagogue. This data is important as each survey has a specific target audience through which it seeks to relate behavior, needs, and requirements for services to other dimensions (Lima, 2022).

Table 1 – Sociodemographic data of the Coordinator and Pedagogue

Data	Coordinator	Pedagogue
Gender	Female	Female
Age	43 years old	28 years old
Training Areas	Degree in Pedagogy	Degree and Bachelor's Degree in Biological Sciences; Degree in Pedagogy; Specialization in Teaching in Higher Education; DE; Special Education and Inclusion and Master's Degree in Science Teaching and Mathematics Education.
How long have you been working at the PEI?	9 years	2 years and 6 months
How long have you had experience in DE?	2 years and 10 months	8 years

Source: Survey data (2022).

It can be seen from Table 1 that the PEI seeks to organize its professional staff in management and leadership positions, valuing those with the longest service in the institution, even to the detriment of experience and academic qualifications. It can be seen that the Coordinator has less experience in DE and has fewer specializations than the Pedagogue (Lima, 2022).

The training of educators is not just about their technical and didactic skills and their mastery of a body of information. Tardif and Lessard (2014, p. 257, our translation), cited by Lomba and Schuchter (2023), describe that "producers of knowledge that they are, teachers have long been perceived as professionals of human interactions, considering them as the essence of their work, and such interactions can move changes in their practices and their professional identity."

The questions asked were answered by the Coordinator (Table 2), the Pedagogue (Table 3), and the Instructors (Table 4), with the aim of verifying the current state of the PEI in terms of the use of AT by students with disabilities and teachers.

Table 2 – Questionnaire applied to the Coordinator

Questions	Answers
How many students are enrolled in the DE course?	Approximately 2000 students
How many instructors work in DE?	09
How many pedagogues work in DE?	Only one
Does the PEI offer training courses for professionals who work in DE with students with disabilities?	No
What strategies does the institution use to eliminate barriers/limitations in the teaching and learning process for students with disabilities?	Due to the expansion of services for students with disabilities, we are structuring exchanges of experiences between teachers and the technical teaching team, adapting activities, individualized monitoring, and seeking information about the student's educational path with a view to inclusion and integration of the students into the educational process.
What is the number of students with disabilities enrolled in the Apprenticeship Programs and the types of disabilities related to these students?	13 students, 10 of whom have physical disabilities, 02 have hearing disabilities, and one has an autistic spectrum disorder.
In DE courses, are Assistive Technologies used to facilitate the teaching-learning process and promote accessibility for students with disabilities? If yes, what Assistive Technologies/Technological Resources are used?	- *Hand Talk*; - Transcription of videos and audio in PDF.

Source: Research data (2022).

According to the Coordinator's answers, the PEI has approximately 2,000 students enrolled in the eLearning program, with only 9 instructors, corresponding to an average of 222 students per instructor, a number considered inadequate for effective, individualized monitoring (Lima, 2022).

Souza (2021) points out that the ideal ratio in DE is one tutor for 20 or 30 students. Thus, in the Apprenticeship course alone, the PEI should have at least 65 instructors on its staff.

At PEI, only the Hand Talk device is used as an AT in DE. Hand Talk is an application that translates text and voice into sign language. Data from the company that created the app shows that it has been downloaded more than four million times from Google Play and the Apple Store. It's worth noting that it's free for users to download the app to their smartphone. In other words, even though PEI provides access to Hand Talk for hearing-impaired students, the app does not require any financial investment on the part of the institution (Lima, 2022).

As for the transcription of videos and audio in PDF files, this is also a free resource in the file format developed by Adobe Systems in 1993, which requires no investment. As for the technological resources used by the institution, both to eliminate barriers/limitations in the teaching-learning process of students with disabilities and to expand the service to students with disabilities, they are incipient and under development (Lima, 2022).

Table 3 – Questionnaire applied to the Pedagogue

Questions	Response
Do you have academic training to work with students with disabilities?	I have a specialization in special education and inclusion, but this training has only given me a general basis for my work, which is a little deficient for working closely with students with disabilities.
Are there any rules regulating accessibility in PEI e-learning programs?	Yes, but they are still sensitive in some respects and are being adjusted.
In DE, are there rules regulating the use of Assistive Technologies in the teaching-learning process of students with disabilities in Learning Programs?	No

Source: Research data (2022).

It can be seen from the Pedagogue's answers that, although the institution has documents regulating accessibility in DE, these are precarious or are being adjusted, and that there are no rules regarding the use of AT in the teaching and learning process of students with disabilities (Lima, 2022).

Table 4 – Sociodemographic data and questionnaire applied to instructors

Questions	Answers		
	I1	I2	I3
- What's your gender?	Female	Female	Female
- How old are you?	42 years old	40 years	44 years old
- What are your academic qualifications?	Administration; Education.	Marketing; Administration; Education.	Secretariat. Executive.
- What is your highest academic degree?	Master's Degree	Specialization	Specialization
- How long have you worked at the PEI?	17 years old	1 year	1 year
- How long have you been working in DE?	7 years	6 years	10 years
- Do you have students with disabilities? If so, what type of disability?	Yes. Hearing and Autism Spectrum Disorders.	No	No
- Do you have experience in the teaching-learning process of students with disabilities? If so, what type of disability?	Yes. Visual, Intellectual and Auditory.	No	No
- Do you have academic training to work with students with disabilities? If so, what training and what type of disability?	No	No	No
- What Assistive Technologies are you familiar with?	*Hand Talk*	None	None
- Do you have experience using Assistive Technology?	No	No	No
- Do you have academic training in the use of Assistive Technologies? If so, what training and what technologies?	No	No	No

Source: Research data (2022).

Of the nine instructors belonging to the institution, only three answered the questionnaire (Table 4). The answers show that the instructors have been working in DE for a long time, but they have not been trained to work with students with disabilities and/or AT. Only one instructor is familiar with *Hand Talk*, a technological resource used by people with hearing disabilities, but has no experience using the application (Lima, 2022).

The appropriation of AT resources by teachers should be the focus of the pedagogical area in institutions that offer DE courses, while the team of professionals involved in the teaching and learning process should observe the minimum accessibility requirements to guarantee access to information and knowledge, whether in person or at a distance (Lima, 2022).

The AT has established itself as one of the main ways of mediating inclusive education in schools, as it makes it possible to promote the autonomy, communication, empowerment, and inclusion of students with disabilities. Thus, its implementation will be all the more effective, the more teachers are trained and qualified, and the more they will be involved in using these resources with students with disabilities (Lima, 2022).

Final considerations

The study corroborated the idea that most of the obstacles in DE are linked to pedagogical practices and teacher training. In addition, it was observed that, in the vocational education institution analyzed, the technological resources offered in the teaching and learning process, in the DE modality, for students with disabilities are limited and/or inadequate.

As far as instructors working in DE are concerned, it is essential that these professionals overcome any obstacles they may encounter when using AT, so that they do not hinder the school inclusion process. On the other hand, it is up to higher education institutions to promote the training and continuing education of teachers.

However, this training needs to be conducted in a practical way, so that teachers can understand the environment and how students carry out their activities using technological resources.

The AT resources aim to remove or reduce communication barriers and difficulties in accessing course materials available on VLEs. Given the impact that technology can have on students' academic lives and professional futures, as well as the importance of respecting the

right to accessibility and social inclusion, it is essential to consider these aspects with a critical eye. Thus, AT has emerged as a strategy for education professionals to deal with the reality of inclusive education.

In the current social context, inclusion cannot be neglected and needs to be considered as a concrete and effective practice, going beyond the field of ideas and cold letters in a tangle of papers. There is clearly an urgent need for immediate action on the part of the public authorities to offer free, quality internet access to students from low-income families. This is essential to reduce the educational disparity between those with access to the Internet and those without access.

As for the theoretical contribution of the research, the results make it possible to expand knowledge in the areas of DE, assistive technologies, and teacher training. The practical contribution materialized in the possibility of awakening in the institution the need to promote continuing training for teachers in the use of technological resources applied to education (Lima, 2022).

With regard to the limitations of the survey, the partial participation of instructors who work in the institution's DE (9 instructors) contributed to a lower-than-expected response rate to the questionnaire (3 instructors). However, this did not jeopardize the results achieved or the achievement of the objective proposed in the research (Lima, 2022).

As a suggestion for future studies, we recommend analyzing the educational performance of students with disabilities who use AT in courses offered by vocational education institutions in the DE modality.

REFERENCES

ASSIS, M. S.; ABRANCHES, S. P. Modelos Pedagógicos para Educação a Distância: uma Revisão Sistemática. **EaD em Foco**, v. 11, n. 1, 26, 2021. DOI: 10.18264/eadf.v11i1.1581. Available at: https://eademfoco.cecierj.edu.br/index.php/Revista/article/view/1581. Accessed in: 2 Apr. 2024.

AURELIANO, F. E. B. S.; QUEIROZ, D. E. D. As Tecnologias Digitais como Recursos Pedagógicos no Ensino Remoto: Implicações na formação continuada e nas práticas docentes. **Educação Em Revista**, v. 39, n. 1, 2023. DOI: 10.1590/0102-469839080. Available at: https://www.scielo.br/j/edur/a/PDVy8ythhFbqLrMj6YBfxsm. Accessed in: 24 Mar. 2024.

BACICH, L.; MORAN, J. **Metodologias ativas para uma educação inovadora**: uma abordagem teórico-prática. Porto Alegre: Penso, 2018.

BARROS, M. M. C.; MARÇAL, E.; ARAUJO, K. M.; ANDRADE, F. A.; VASCONCELOS, J. G. Um estudo comparativo sobre os benefícios da educação a distância na vida dos egressos. **Observatório de la Economía Latinoamericana**, v. 21, n. 7, p. 6402-6418, 2023. DOI: 10.55905/oelv21n7-031. Available at: https://ojs.observatoriolatinoamericano.com/ojs/index.php/olel/article/view/866. Accessed in: 2 Apr. 2024.

BASSO, S. E. O.; SANTOS, R. O.; OLIVEIRA, D. H. I.; MERTZIG, P. L. L.; COSTA, M. L. F. EaD, Currículo e Hegemonia: o necessário debate. **EmRede**: Revista de Educação a Distância, v. 7, n. 1, p. 225-241, 2020. DOI: 10.53628/emrede.v7i1.559. Available at: https://www.aunirede.org.br/revista/index.php/emrede/article/view/559. Accessed in: 2 Apr. 2024.

BRAZIL. **Decreto nº 9.579, de 22 de novembro de 2018**. Dispõe sobre a temática do lactente, da criança e do adolescente e do aprendiz, e sobre o Conselho Nacional dos Direitos da Criança e do Adolescente, o Fundo Nacional para a Criança e o Adolescente e os programas federais da criança e do adolescente, e dá outras providências. Brasília: Presidência da República, 2018. Available at: https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2018/decreto/d9579.htm. Access in: 4 Apr. 2024.

BRAZIL. **Decreto n. 9.057, de 25 de maio de 2017**. Regulamenta o art. 80 da Lei nº 9.394, de 20 de dezembro de 1996, que estabelece as diretrizes e bases da educação nacional. Brasília: Presidência da República, 2017. Available at: https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2017/decreto/d9057.htm. Access in: 4 Apr. 2024.

BRAZIL. **Resolução nº 510, de 7 de abril de 2016**. Dispõe sobre as normas aplicáveis a pesquisas em Ciências Humanas e Sociais. Brasília: Ministério da Saúde, 2016. Available at: https://bvsms.saude.gov.br/bvs/saudelegis/cns/2016/res0510_07_04_2016.html. Access in: 4 Apr. 2024.

BRAZIL. **Lei nº 13.146, de 6 de julho de 2015**. Institui a Lei BRAZILeira de Inclusão da Pessoa com Deficiência (Estatuto da Pessoa com Deficiência). Brasília: Presidência da República, 2015. Available at: https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2015/lei/l13146.htm. Access in: 4 Apr. 2024.

BRAZIL. **Lei nº 13.005, de 25 de junho de 2014**. Aprova o Plano Nacional de Educação (PNE) e dá outras providências. Brasília: Presidência da República, 2014. Available at: https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2014/lei/l13005.htm. Access in: 4 Apr. 2024.

BRAZIL. **Ensino Médio Integrado à Educação Profissional**. Brasília: Secretaria de Educação a Distância; Ministério da Educação, 2006. Available at: http://portal.mec.gov.br/setec/arquivos/pdf2/boletim_salto07.pdf. Access in: 4 Apr. 2024.

BRAZIL. **Lei nº 8.213, de 24 de julho de 1991**. Dispõe sobre os Planos de Benefícios da Previdência Social e dá outras providências. Brasília: Presidência da República, 1991. Available at: https://www.planalto.gov.br/ccivil_03/leis/l8213cons.htm. Access in: 4 Apr. 2024.

BRAZIL. **Lei nº 8.069, de 13 de julho de 1990**. Dispõe sobre o Estatuto da Criança e do Adolescente e dá outras providências. Brasília: Presidência da República, 1990. Available at: https://www.planalto.gov.br/ccivil_03/leis/l8069.htm. Access in: 4 Apr. 2024.

CARVALHO, C. B.; MARTINS, F. A.; MAISSIAT, J.; BARBOSA, J. C.; REIS, T. E. B. Ensino Remoto e Necessidades Específicas: o papel da escola e das famílias. **Brazilian Journal of Development**, Curitiba, v. 6, n. 10, p. 74871-74885, 2020.

CONSELHO NACIONAL DA EDUCAÇÃO. **Resolução nº 3, de 18 de dezembro**. Institui as Diretrizes Curriculares Nacionais Gerais para a organização e o funcionamento dos cursos superiores de tecnologia, 2002.

ESPÍRITO SANTO, E.; LIMA, T. P. P. Formação continuada para tecnologias digitais em tempos de pandemia: percepções docentes sobre o curso Google Sala de Aula. **Dialogia**, São Paulo, n. 36, p. 283-297, 2020.

FERREIRA, J. L.; CORREA, Y. Educação online e educação aberta: avanços, lacunas e desafios. **Revista Diálogo Educação**, v. 19, n. 60, p. 14-35, 2019. DOI: 10.7213/1981-416X.19.060.DS01. Available at: https://periodicos.pucpr.br/dialogoeducacional/article/view/24653. Accessed in: 2 Apr. 2024.

FIALHO, L. M. F.; SOUSA, F. G. A.; NASCIMENTO, K. A. S. Educação & Formação Journal: balance of scientific production (2016-2018). **Revista Tempos e Espaços em Educação**, v. 13, n. 32, e12926, 2020. DOI: 10.20952/revtee.v13i32.12926. Available at: https://periodicos.ufs.br/revtee/article/view/12926. Accessed in: 2 Apr. 2025.

GIRARDI, V. L.; RECHIA, S.; TSCHOKE, A. Acessibilidade formacional: a percepção profissional na inclusão da pessoa com deficiência intelectual no lazer. **Revista Educação e Formação, v**. 5, n. 13, p. 95-112, 2019. DOI: 10.25053/redufor.v5i13.1180. Available at: https://revistas.uece.br/index.php/redufor/article/view/1180. Accessed in: 2 Apr. 2025.

LIMA, L. A. A. **O (des)uso das tecnologias assistivas na educação a distância no contexto da educação profissional**. 2022. Dissertation (Master's Degree in Education and New Technologies) – Centro Universitário Internacional, Curitiba, 2022. Available at: https://repositorio.uninter.com/handle/1/1197. Accessed in: 25 Mar. 2025.

LIMA, L. A. A.; CAVAZZANI, A. L. M.; SILVA, M. V. G. Tecnologias Assistivas: recursos para pessoas com deficiência visual e auditiva. **Revista Práxis Educacional**, v. 19, n. 50, 2023. DOI: 10.22481/praxisedu.v19i50.11455. Available at: https://periodicos2.uesb.br/index.php/praxis/article/view/11455. Accessed in: 2 Apr. 2025.

LIMA, L. A. A.; PAGNONCELLI, V.; SILVA, SILVA, M. V. G. Assistant Technologies And Teaching Training: the case of schools of a federal public education network**. Cadernos de Educação Tecnologia e Sociedade**, v. 13, n. 2, p. 248–255, 2020. DOI: 10.14571/brajets.v13.n2.248-255. Available at: https://brajets.com/brajets/article/view/646. Accessed in: 2 Apr. 2025.

LIMA, T. M. Os desafios do Ensino à Distância (EaD). **Contribuciones a las Ciencias Sociales**, v. 17, n. 5, e6619, 2024.

LOMBA, M. L. D. R.; SCHUCHTER, L. H. Profissão Docente e Formação de Professores/As para a Educação Básica: reflexões e referenciais teóricos. **Educação em Revista**, v. 39, n. 1, 2023.

MARQUES, L. S.; GOMES, C. Concordâncias/Discordâncias acerca do processo inclusivo no ensino superior: um estudo exploratório. **Revista Educação Especial**, v. 27, n. 49, p. 313-326, 2014. DOI: 10.5902/1984686X8842. Available at: https://periodicos.ufsm.br/educacaoespecial/article/view/8842. Accessed in: 2 Apr. 2025.

MORAN, J. M. Contribuições para uma Pedagogia da Educação Online. *In*: SILVA, M. (org.). **Educação Online**: teorias, práticas, legislação e formação corporativa. 4th ed. São Paulo: Edições Loyola, 2012. p. 41-52.

MOURA, D. H. A formação de docentes para a educação profissional e tecnológica. **Revista BRAZILeira da Educação Profissional e Tecnológica**, v. 1, p. 23-38, 2008.

PAMPLONA, T. C. **Contribuições da tecnologia assistiva na aprendizagem on-line, de alunos da educação superior com deficiência física nos membros superiores**. 2016. Dissertation (Master's Degree in Education and New Technologies) – Centro Universitário

Internacional, Curitiba, 2016. Available at: https://repositorio.uninter.com/handle/1/77. Accessed in: 29 Mar. 2025.

RODRIGUES, K. C. O.; OLIVEIRA, I. A. Special education knowledge in productions of the Santa Maria postgraduate education program. **Revista Tempos e Espaços em Educação**, v. 15, n. 34, 2022. DOI: 10.20952/revtee.v15i34.17440. Available at: https://periodicos.ufs.br/revtee/article/view/17440. Accessed in: 29 Mar. 2025.

RODRÍGUEZ-LÓPEZ, M. Grupos de trabajo, un medio para mejorar los rendimientos en el área de CCSS en secundaria a través de las TIC. **Educação & Formação**, Fortaleza, v. 3, n. 7, p. 16-23, 2018.

SALES, Z. N.; MISSIAS-MOREIRA, R.; COUTO, E. S. O convívio acadêmico: representações sociais de alunos com Necessidades Educacionais Especiais. **Revista Educação Especial**, v. 29, n. 55, 295-308, 2016. DOI: 10.5902/1984686X14275. Available at: https://periodicos.ufsm.br/educacaoespecial/article/view/14275. Accessed in: 2 Apr. 2025.

SAMPAIO, V. B. P.; SOUSA, G. A. F.; OLIVEIRA, D. V.; FERNANDES, O. B. O.; RÊGO, V. A. P.; SANDOVAL, A. G. M.; MARQUES, G. P.; SANTOS, H. C.; MUNDIM, R. R. Impacto das tecnologias digitais no desenvolvimento cognitivo, social e emocional infantil: revisão de literatura. **Brazilian Journal of Health Review**, v. 7, n. 5, p. e73837, 2024.

SCHLÜNZEN JUNIOR, K. Construção de ambientes digitais de aprendizagem: contribuições para a formação do professor. *In*: GIROTO, C. R. M., POKER, R. B., OMOTE, S. (org.). **As tecnologias nas práticas pedagógicas inclusivas**. Marília: Oficina Universitária; São Paulo: Cultura Acadêmica, 2012. p. 121-136.

SINDICATO NACIONAL DOS AUDITORES FISCAIS DO TRABALHO. **Manual de Aprendizagem Profissional**: o que é preciso saber para contratar o aprendiz. Brasília, 2019.

SOUZA, M. M. O Papel do Tutor na Educação a Distância. **Trajetória Multicursos**, v. 14, n. 1, 2021.

TARDIN, H. P.; ROMERO, L. R. Formação prática na Residência Pedagógica em tempos de pandemia: reflexões sobre contribuições e aperfeiçoamento. **Revista Educação e Formação**, Fortaleza, v. 7, n. 1, p. 1-19, 2022. DOI: 10.25053/redufor.v7.e7342. Available at: https://revistas.uece.br/index.php/redufor/article/view/7342. Accessed in: 2 Apr. 2025.

TURCI, E. B. S. **Sala de Aula Invertida na Educação Remota**: uma investigação metodológica no ensino médio em São Miguel do Guaporé-RO. 2022. Dissertation (Master's Degree in Education and New Technologies) – Universidade Federal de Rondônia, Rolim de Moura, 2022. Available at: https://pgecn.unir.br/uploads/76256557/arquivos/eliani_turci_dissertacao_78240426.pdf. Accessed in: 29 Mar. 2025.

VIO, N. L.; PASCOAL, I. O.; CAMARGO, M. L.; FEIJÓ, M. R. COVID-19 e o trabalho de docente: a potencialização de aspectos precários. **Brazilian Journal of Development**, Curitiba, v. 6, n. 10, p. 78717-78728, 2020.

CRediT Author Statement

- **Acknowledgements**: To the faculty of the Graduate Program in Education and New Technologies at the International University Center (UNINTER), as well as to the editorial team and reviewers of the journal Nuances: Studies on Education, who contributed to the improvement of the article.
- **Funding**: Not applicable.
- **Conflicts of interest**: Not applicable.
- **Ethical approval**: Yes.
- **Availability of Data and Materials:** Yes.
- **Author Contributions:** The study is derived from the Master's thesis in Education and New Technologies at the International University Center (UNINTER), entitled The (Mis)use of Assistive Technologies in Distance Education in the Context of Vocational Education, by Letícia Aparecida Alves de Lima (1st author). The thesis was supervised by André Luiz Moscaleski Cavazzani (2nd author). The visual presentation of the data, the editing of the article, as well as the final revisions and adjustments were the responsibility of Marcus Vinícius Gonçalves da Silva (3rd author).

Processing and editing: Editora Ibero-Americana de Educação
Proofreading, formatting, standardization and translation