

THE CONTRIBUTIONS OF DOSVOX ASSISTIVE TECHNOLOGY FOR INITIAL TRAINING TEACHERS: INTERMEDIATING INCLUSIVE TECHNOLOGICAL PRACTICES

AS CONTRIBUIÇÕES DA TECNOLOGIA ASSISTIVA DOSVOX PARA PROFESSORES EM FORMAÇÃO INICIAL: INTERMEDIANDO PRÁTICAS TECNOLÓGICAS INCLUSIVAS

LAS CONTRIBUICIONES DE LA TECNOLOGÍA DE ASISTENCIA DOSVOX PARA MAESTROS EN FORMACIÓN INICIALES: PRÁCTICAS INCLUSIVAS INTERMEDIAS

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ABSTRACT: The study aims to contribute to the initial training of teachers in a Pedagogy course through Assistive Technology - Dosvox, in view of the concept of inclusive teaching and learning for students with visual impairments. For this study, a qualitative approach of an applied nature was used, having as a research strategy the case study. It was carried out in a public institution of higher education, located in the interior of the Paraná, and brings as participants twenty-five teachers in initial formation of a course of pedagogy and a blind teacher. The instruments used for data analysis were: audio and video recordings, photos and practical intervention on the use of Assistive Technology - Dosvox. The data were analyzed from the historical-cultural. The results reveal that the interventions carried out by the blind teacher to the teachers in the initial formation of a pedagogy course contributed to the acquisition of new conceptions about the inclusive teaching and learning process of Assistive Technology - Dosvox, allowing teachers to recognize and self-assess themselves pedagogically in the process of inclusive education for people with visual impairments, among them, in the way of teaching and learning with a blind teacher.

KEYWORDS: Initial teacher training. Dosvox Assistive Technology. Visual impairment. Inclusion. Higher education.

RESUMO: *O estudo tem como objetivo contribuir com a formação inicial de professores de um curso de Pedagogia por meio da Tecnologia Assistiva – Dosvox, tendo em vista a concepção de ensino e aprendizagem inclusiva para estudantes com deficiência visual. Utilizou-se da abordagem qualitativa de natureza aplicada, tendo como estratégia de pesquisa o estudo de caso. O estudo foi realizado em uma instituição pública de ensino*

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superior, localizada no interior do estado do Paraná, e traz como participantes vinte e cinco professores em formação inicial de um curso de Pedagogia e um professor cego. Os instrumentos utilizados para a análise dos dados foram: gravações em áudio e vídeo, fotos e intervenção prática sobre o uso da Tecnologia Assistiva – Dosvox. Os dados foram analisados a partir da teoria Histórico-Cultural. Os resultados revelam que as intervenções realizadas pelo professor cego aos professores em formação inicial de um curso de Pedagogia contribuíram com a aquisição de novas concepções sobre o processo de ensino e aprendizagem inclusivo da Tecnologia Assistiva – Dosvox, possibilitando aos professores reconhecerem-se e autoavaliarem-se pedagogicamente no processo de ensino inclusivo às pessoas com deficiência visual, dentre eles, no modo de ensinar e aprender com um professor cego.

PALAVRAS-CHAVE: Formação inicial de professores. Tecnologia Assistiva Dosvox. Deficiência visual. Inclusão. Ensino superior.

RESUMEN: El estudio tiene como objetivo contribuir a la formación inicial de los docentes en un curso de pedagogía a través de la tecnología de asistencia – Dosvox, en vista del concepto de enseñanza y aprendizaje inclusivo para estudiantes con discapacidad visual. Se utilizó un enfoque cualitativo de carácter aplicado, con el estudio de caso como estrategia de investigación. Se llevó a cabo en una Institución Pública de Educación Superior, ubicada en interior del estado de Paraná, y reúne como participantes a veinticinco maestros en capacitación inicial en un curso de pedagogía y uno maestro ciego. Los instrumentos utilizados para el análisis de datos fueron: grabaciones de audio y video, fotos e intervención práctica sobre el uso de la tecnología de asistencia – Dosvox. Los datos fueron analizados a partir de la teoría Histórico-Cultural. Los resultados revelan que las intervenciones realizadas por el maestro ciego a los maestros en la capacitación inicial de un curso de pedagogía contribuyeron a la adquisición de nuevos conceptos sobre el proceso inclusivo de enseñanza y aprendizaje de la tecnología de asistencia – Dosvox, permitiendo a los maestros reconocerse y autoevaluarse pedagógicamente en el proceso de educación inclusiva para personas con discapacidad visual, entre ellos, en la forma de enseñar y aprender con un maestro ciego.

PALABRAS CLAVE: Formación inicial del maestro. Tecnología de Asistencia Dosvox. Discapacidad visual. Inclusión. Enseñanza superior.

Introduction

Proposals on the use of Assistive Technology - AT in classrooms have been much discussed by education professionals, given that it raises prospects for improvements in the inclusive learning process of students with disabilities, global developmental disorders and high abilities /giftedness, included in the National Policy on Special Education from the Perspective of Inclusive Education (BRAZIL, 2008).

In this way, accessibility is considered a right of any and all citizens with any type of disability, provided for in federal law nº 10.098, of December 19, 2000, as well as in

(BRAZIL, 1988; DECLARATION OF SALAMANCA; BRAZIL, 1996; 2008; 2015). Therefore, it is essential that new reflections and new proposals on the use of AT in classrooms be reviewed as a means of access for communication and interaction with digital culture in educational teaching environments in a more inclusive way.

Given the importance of AT, Alves *et al.* (2009) conceptualize AT as resources, methodologies, strategies and practices that allow students with disabilities greater autonomy, quality of life and social inclusion.

In this direction, this study sought to emphasize the AT – Dosvox. Considered a programming system that communicates with users through voice synthesis, that is, the computer, through a voice synthesizer, reads the screen to the user. AT – Dosvox is totally national, considered the first commercial system to vocally synthesize generic texts for the Portuguese language, enabling the use of computers by people with visual impairments, and enabling greater technological accessibility, communication and interaction (SOUZA; SANTAROSA, 2003).

AT – Dosvox has been developed since 1993, by the Federal University of Rio de Janeiro – UFRJ. Thus, some studies (DIAS; FRANÇA; BORGES, 2014; MAZZILLO, 2010; BORGES, 2009) highlight the importance of making use of this technology in the classroom with students with visual impairments, as it allows for better learning and greater inclusive perspectives.

According to Galvão Filho (2009), despite the AT – Dosvox enabling accessibility for people with visual impairments, there is a need for teachers to seek greater training on the functionality and use of the technology programming system, since the quality of teaching is essential in the classroom, mainly in the initial process of students with visual impairment, in the initial years of elementary school.

According to Prais and Rosa (2017), the issue of teacher training has generated many discussions in view of the emerging need to implement inclusive education for people with disabilities in the classroom. The authors portray a lack in the pedagogical training of teachers. In order to provide pedagogical assistance to people with disabilities with quality in the teaching and learning process, regular schools need to carry out curricular flexibility/adaptations and pedagogical strategies that basically consist of the decision-making of teachers together with the pedagogical team, seeking to provide an active school education that meets the peculiarities of students with disabilities, thus enabling a more dynamic, changeable and expandable curriculum that meets all students, without loss of content (BRAZIL, 2003).

Thus, this study aims to contribute to the initial training of teachers of a Pedagogy course through TA - Dosvox, with a view to designing a teaching and learning process that is inclusive of students with visual impairments, thinking about the teaching process in a more comprehensive, inclusive way.

The contribution of Dosvox Assistive Technology for visually impaired people

AT- Dosvox is considered one of the technological didactic resources used for the teaching and learning process of students with visual impairments in classrooms. This technology provides the possibility of digital and inclusive accessibility for these students. In this direction, Sonza and Santarosa (2003) show in their studies the accessibility that AT – Dosvox can promote, and emphasize that both Software and Hardware are original and low-complexity projects, suitable for the reality of students with visual impairments, as well as as it details the changes that the system has been undergoing in its versions, the latest being version 5.0c (BORGES, 2009).

The AT – Dosvox programming system is a screen reader that uses voice synthesizers, allowing the user to read and provide information on the computer screen. It is available for people with visual impairments and others who are interested in using it. The program is distributed in versions for Windows.

Figure 1 presents some of the programs contained in version 5.0c of AT – Dosvox.

Figure 1 – Dosvox System Screen version 5.0c



Source: Collection of researchers (2019)

Borges (2002), together with the Electronic Computing Nucleus – ECN, point out that the development of AT – Dosvox enables greater computing technology, breaking barriers and enabling visually impaired people to write and read what others write, because even so the Braille system was used only by people who knew about it, that is, a minority.

According to Sá, Campos e Silva, (2007, p. 23), the Braille system “[...] is composed of six (6) dots combined with each other, with a total of 63 possibilities. Created by Louis Braille as a form of written language for people with visual impairments”.

Before the development of AT – Dosvox, Borges (2009, p. 99) points out that “[...] blind people lived in a cultural ghetto, where a blind person only wrote for another blind person to read”, however, in this current context everything is different, blind people can communicate and enjoy technology like any other sighted person, they have access to various information and knowledge. It is considered that the advent of the computer is a source for the digital inclusion of people with visual impairments.

Moran (2013) shows that ATs are considered an innovation for the educational context of teaching and are essential for the development of students, as they enable communication and interaction, being fundamental to the teaching process, since they are integrated , complete and combine. Therefore, it is important to emphasize that the AT – Dosvox is an important resource for the accessibility of students with visual impairments.

It is important to highlight that there are other ATs that can be used as teaching resources in classrooms by students with visual impairments, which also enable digital inclusion and communication, among them, Virtual Vision, Jaws and NVDA. However, this study sought to address the AT – Dosvox due to its free access and ease of access for any visually impaired user. For Borges (2002), the biggest difference between Dosvox and other computer programs that are available to help visually impaired students resides in the fact that Dosvox is not just “[...] an interface shell placed on top of the conventional programs, but a fully designed operational environment with communication characteristics consistent with those of the blind” (BORGES, 2002, p. 23). These communication characteristics aim to consider the particularities of people with visual impairments, to enable greater social, cultural and digital accessibility interaction.

According to Borges (2002), the AT – Dosvox expands the communication process and the social relationship. This sheds light on the theory of Vygotsky (1997), physician, professor and psychologist, considered as one of the pioneers in studies on the development of people with disabilities. The author developed the Historical-Cultural theory, which discusses the relationship between learning and child development based on social and cultural mediations and relationships. According to Vygotsky (1997), the means applied in the learning process of blind people often begin with their culture, proposing:

[...] peculiar cultural forms, especially created for the cultural development of children with disabilities. Science knows a number of artificial cultural systems that offer theoretical interest. Along with the visual alphabet, which is used by all mankind, a special tactile alphabet of dotted characters was created for the blind [...] the processes of mastery and use of these auxiliary cultural systems are distinguished by their profound peculiarity in comparison with the use of usual culture media (VYGOTSKY, 1997, p. 27, our translation)³.

Faced with technological advances and the new laws that govern the right to education of people with visual impairments, AT – Dosvox makes it possible, in addition to reading with the hands, and indicates new paths aimed at transforming digital inclusion and with equity of social, cultural and technological rights. For Vygotsky (1997), the term cultural and social must be contextualized with the reality of people with visual impairments so that the effect of interrelation becomes constitutive.

Methodology

This study is of an applied nature and aims to “[...] generate knowledge for practical application, aimed at solving specific problems” (GERHARDT; SILVEIRA, 2009, p. 35).

It presents a qualitative approach. The strategy that meets the proposed objectives is the case study, as it deals with the contributions and challenges that will be faced by teachers in initial training of a Pedagogy course in the classroom. For Lüdke and André (1996), the central point of the case study focuses on its particularities, even if, later, similarities with other cases or situations are evidenced. The case study aims at discovery, it happens in a contextualized way, portraying reality in a complex and profound way.

This study was developed in a public institution of Higher Education, located in the interior of the state of Paraná, with the participation of twenty-five teachers in initial training of a Pedagogy course and a blind teacher, who called himself Joaquim, fictitious name in order to maintain its identity and integrity. Professor Joaquim works as a computer and AT teacher in an elementary school in the special education modality. Participants agreed to participate in the study, signed the Free and Informed Consent Term (FICT).

³ [...] formas culturales peculiares, creadas especialmente para que se realice el desarrollo cultural del niño deficiente. La ciencia conoce una cantidad de sistemas culturales artificiales que ofrecen interés teórico. A la par con el alfabeto visual, que es utilizado por toda la humanidad, se ha creado para los ciegos un alfabeto especial táctil, de caracteres punteados [...] los procesos de dominio y utilización de estos sistemas culturales auxiliares se distinguen por su profunda peculiaridad en comparación con el uso de los medios habituales de la cultura (VYGOTSKY, 1997, p. 27).

The instruments used for data collection were: audio and video recordings, which were fully transcribed; photos; practical intervention for initial teacher training. The intervention lasted eight (8) classes. The space and time for carrying out the intervention were made available by a teacher responsible for the discipline of New Technologies Applied to Education at the Institution. This discipline is included in the grid of the second year (2nd) of the Pedagogy course. According to the Institution's Political Pedagogical Project (PPP), the course aims to provide guidance on computerized learning environments; the role of the school and the teacher in the teaching and learning process, and in the organization of activities for the pedagogical practice using the computer.

Thus, the intervention that was conducted by Professor Joaquim was structured in three moments: at first, the teachers in initial training were blindfolded during the initial presentation of the AT – Dosvox. In the second moment, the teachers did not use the blindfolds during the intervention process on AT – Dosvox. Joaquim taught the teachers step by step about the Dosvox programming system. In the third moment, the teachers were invited to pair up, one of them was blindfolded. One teacher played the blind student and the other played the role of mediator teacher. This action aimed to show teachers through practice what it is like to teach visually impaired students in the use of AT – Dosvox. At all times of the intervention, the participants used the computer/laptop.

The activities developed with the teachers during the intervention were carried out from the following question: how can the teacher start teaching about AT – Dosvox in an inclusive way for students with visual impairments?

Table 1 presents the activities developed for the intervention carried out with teachers in initial training of a Pedagogy course.

Table 1 – Activities developed in the pedagogical intervention

CONTENT TA – DOSVOX	MATERIAL USED	PROGRAMS	OBJECTIVES
Historical Context	Laptop computer Multimedia projector	_____	To present AT – <i>Dosvox</i>
Program set up	Flash drive	TA – <i>Dosvox</i>	To teach how easy it is to install the program
Keyboard recognition through speech synthesizer	Laptop and blindfolds	Testing keyboard	To identify keys to analyze usage on the system
AT-Dosvox Programs	Laptop Blindfolds Multimedia projector	Edivox Jogavox Internet access	To introduce and explore each program and its use
AT-Dosvox Programs	Laptop	TA – <i>Dosvox</i>	To understand the AT system – <i>Dosvox</i> in general

AT-Dosvox Programs	Laptop Blindfolds	TA – <i>Dosvox</i>	Seeking to emphasize the initial teaching-learning process in the use of inclusive AT
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Source: Collection of researchers (2019)

The proposal for the teaching intervention on the inclusive use of AT – Dosvox was elaborated from the conception of the Cultural Historical theory (VYGOTSKY, 1991; 1997).

Results and discussion

The practical intervention was carried out by Professor Joaquim for twenty-five teachers in initial training of a Pedagogy course on AT – Dosvox. It was structured in three moments, in all moments the computer/laptop was used.

In the first moment, teachers were provided with teaching experiences about AT – Dosvox with their eyes closed, so that they could temporarily perceive how people with visual impairments learn and relate to each other. It is important to highlight that the teachers participating in the study felt uncomfortable in the first contact with Professor Joaquim. The experience showed two circumstances: the first corresponds to the fact that the teacher is blind. The second leads us to reflect on the fact that teachers in initial training did not have any blind teachers in the university spaces.

In this context, it is worth noting that regardless of disability, all people have the same rights to education without any discrimination (BRAZIL 2015). In this way, the practical intervention aimed to impress teachers in initial training, so that they could understand that it is possible for a visually impaired person to teach and learn in the same educational teaching environments as other students. In this perspective, Kassar (2011) emphasizes that, little by little, public policies are implemented and conducted in teacher training, thus avoiding situations that can be generated by lack of information about the inclusive process.

However, after some interactions and information between teachers in initial training and teacher Joaquim, the first approximations occurred. Several questions were raised by the teachers. What caught our attention was when a teacher asked Professor Joaquim: “[...] if you were born blind, how did you study when the teacher wrote something on the board to copy? Did anyone help you in the classroom?” (TEACHER IN INITIAL TRAINING, 2019). Professor Joaquim replied:

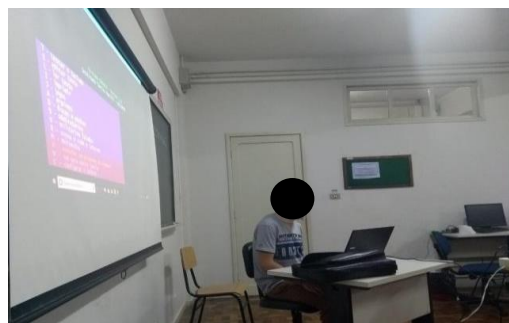
[...] before the emergence of AT – Dosvox I used Braille, but after the development of this technology, the state made a laptop available, which

made my development very possible. The help I had in the teaching-learning process came from the special education school for people with visual impairments, where teachers specialized in the area supported the regular education teachers I studied. This specialized school that helped me is the same one that I work as a teacher today (PROFESSOR JOAQUIM, 2019).

It was found in Professor Joaquim's response that it is possible to perceive the need for greater training of teachers who work in the regular school system for the inclusion process. According to Dorziat (2014), this process has also been aggravated by the overcrowding of students in the classroom, which ends up overloading the work of teachers. In this conception, the author clarifies that even today we have not overcome the process of discrimination in classrooms. With this, there is a lot of work ahead to reach an inclusive process that can impact pedagogical practices.

Faced with some questions raised by the teachers during the practical intervention, they seemed to be involved with the proposals of the activities on AT – Dosvox and, throughout the process, the teachers began to realize that people with visual impairments can stand out as much as any other sighted person (who sees) in the teaching process for teaching. After the mediations carried out between the participants, the practical intervention began, Professor Joaquim presented to the teachers some historical contextualizations about the emergence of AT - Dosvox (BORGES, 2009; 2002). For greater theoretical and practical subsidies, the teacher used the laptop and a multimedia projector as teaching resources, as shown in Figure 2:

Figure 2 – Professor Joaquim presenting the AT – Dosvox to teachers in initial training



Source: Collection of researchers (2019)

Professor Joaquim, before his intervention, clarifies to teachers that technology makes the lives of people with visual impairments easier, as it allows new sources of communication, among them, accessibility for more information to other cultural means, scientific knowledge and entertainment.

After the teacher finished on the historical contextualization, the teaching and access process began for the installation of the Dosvox Program on the teachers' laptops. For the installation, Professor Joaquim used a flash drive as a way of making the most of his time.

However, Borges (2009) highlights that the official program provides the installation directly from the internet network. During the installation, instructed by Professor Joaquim, the teachers learned how to change the voice synthesizers in the Dosvox program.

In the meantime of the installation process, it was possible to observe that the teachers demonstrated difficulties in concluding the set up process. Thus, they needed the individual intervention of Professor Joaquim to carry out the process. This moment was essential for the teachers to reflect on how important it is to look at the other without prejudice. For Nunes and Lomônaco (2010, p. 59), visually impaired people are seen as having characteristics and stereotypes historically constructed by society, therefore, there is a need to break with this conception, because “[...] this prejudice prevents that the blind person is perceived as a human being”.

With the installation of the AT – Dosvox program completed, the teachers were invited to get to know the program in a way that attempted to get closer to putting themselves in the place of a visually impaired person, “blindfolded”. According to Professor Joaquim, the didactics used were intended to allow teachers to immerse themselves in their world, in the sense of how they see, feel and learn, not using vision, but other senses.

In this teaching concept and after all the teachers were blindfolded, Professor Joaquim started the presentation on AT – Dosvox from the activity in the Testing Keyboard Program. This program aims to provide blind students with keyboard recognition. Thus, blindfolded teachers had to identify the keys to analyze what each one performs on the system. It started with the letters of the alphabet contained in the computer/laptop keyboard from touch and hearing.

Figure 3 shows the moment of the intervention carried out with the blindfolded teachers.

Figure 3 – Practical intervention: activity testing the keyboard



Source: Collection of researchers (2019)

In view of the practice carried out, a parallel is made to what Vygotsky (1997) indicates about what the lack of vision can cause. The theorist considers that blindness, by creating a new and peculiar configuration of personality in people, originates “[...] new forces, modifies the normal directions of functions, restructures and molds creatively and organically the psyche of man. Therefore, blindness is not only a defect, a deficiency, but also a source of revealing abilities, an advantage, a strength” (VYGOTSKY, 1997, p. 99, our translation)⁴.

It is worth noting that Professor Joaquim, several times during the intervention process, shows that the moment provided to the blindfolded teachers makes them place themselves in his world, understanding through practical means how things can be seen. Thus, Vygotsky (1997) emphasizes that the visually impaired person uses other senses to learn and engage in social spaces, therefore, it is important that knowledge mediators engage with practices necessary for new changes in seeing, thinking and rethinking their actions.

During the practice of the activity testing the keyboard, the teachers showed some difficulties, among them: concentrating to carry out the activity, considering that it was a large group, and they needed to make use of hearing to hear what the computer was saying via voice synthesizer. Touch was also one of the senses that the teachers had difficulties because they were people who could see. Typing on the keyboard without the use of vision was the greatest difficulty presented by teachers.

In this sense, Silva et al. (2018) demonstrate that it is necessary to put oneself in the other's shoes and observe that the overcoming that the blind person needs to understand themselves in society often lacks unprejudiced views, understanding how they see the world from use of the senses such as touch, hearing, taste and smell. Through the practical

⁴ [...] nuevas fuerzas, modifica las direcciones normales de las funciones, reestructura y forma creativa y orgánicamente la psique del hombre. Por consiguiente, la ceguera es no solo un defecto, una deficiencia, sino también, una fuente de revelación de aptitudes, una ventaja, una fuerza (VYGOTSKY, 1997, p. 99).

intervention, it was possible to perceive that the teachers in initial formation were understanding better about the inclusive process, in the sense of how people with visual impairment learn and interrelate in the spaces of society.

After carrying out the activity to test the keyboard, the teachers, still blindfolded, were invited to explore each program and its usability, such as: edivox, games, Jogovox, internet access, among others. The twenty-five teachers participating in the study were unable to complete the activities proposed in the Dosvox program blindfolded. In this context, some studies (PADILHA; OLIVEIRA, 2016; NUNES; LOMÔNACO, 2010; VYGOTSKY, 1997) show the need for the teachers to put themselves in the place of the student and to know the ways in which people with visual impairments learn in different ways. spaces, whether educational, social or cultural.

To finish the first moment of the practical intervention, Professor Joaquim asked the professors to remove their blindfolds and look at the computer/laptop screen to analyze and reflect on what they wrote in the Edivox program, which can be considered as the Microsoft Word used by sighted people. All the teachers were surprised, as they were unable to complete the activities, one of which was writing the name in the program. Therefore, one of the teachers reports:

[...] this moment was important, I had never put on a blindfold and been unable to see for so long, it really is very difficult, from today, I see how a visually impaired person actually lives, I know I was unable to see for only a short time, but I changed my conception! I want to learn more about the use of AT – Dosvox so that I can use it in the classroom with my future students, in case they have any with visual impairments, as well as other possible resources aimed at their inclusive process (TEACHER IN INICIAL TRAINING, 2019).

The practical intervention carried out by Professor Joaquim to teachers in initial Pedagogy training started from Vygotsky's (1991) conception, in the sense of seeking mediation between them and also the human-environment interaction through the use of language. For the theorist, “[...] speech as such becomes an essential part of cognitive development” (VYGOTSKY, 1991, p. 25). From the use of language, Professor Joaquim was noticing the shortcomings exposed by the professors about AT. So, he was mediating the use of AT – Dosvox, involving the inclusive process from his practices and his experiences during the intervention.

Then, Joaquim raises a question to the teachers: “[...] do you consider yourself prepared to receive a visually impaired person in the classroom?”. In general, the teachers

answered that they are not prepared, but that they would do their best to provide means that are guided by the inclusive process for the knowledge of people with this disability.

In general terms, Prais and Rosa (2017, p. 131) emphasize that “[...] teacher training is one of the critical points that can influence the qualitative implementation of inclusive policies and consolidation of school inclusion”. With the intention of demystifying this thought, this study aimed to contribute to the initial training of teachers, thinking about the inclusive process in the classroom. The difficulties encountered are known, but including and teaching is the fundamental role of a teacher.

In the second moment, the intervention was mediated to teachers without the use of blindfolds. The intervention had the same directions as the previous intervention, which also made use of AT programming activities – Dosvox, edivox, games, Jogovox, internet access, among other programs. This intervention sought to explain the actions of teacher Joaquim in relation to the teaching and learning process of other teachers. In this sense, Professor Joaquim used mediation through language and commanded the actions of teachers in the use of the computer from the voice synthesizers of the Dosvox program, that is, through hearing.

Regarding the use of language, Nunes; Lomonâco (2010, p. 56) emphasize its importance for human development, highlighting that it is unquestionable for the blind, because “[...] language assumes an even greater role, because the visual information to which he does not have access can be partially verbalized. This accessibility was perceived throughout the intervention.

During the presentation of AT – Dosvox in which the teachers did not use the blindfolds, they were very impressed with Professor Joaquim's skill and knowledge in the use of AT, they understood the importance of putting themselves in the other's shoes. In this sense, it is worth highlighting that during the intervention process a teacher reports to Professor Joaquim:

[...] Professor, when I was blindfolded I had a lot of difficulties manipulating the computer keyboard and understanding the sounds and commands that the machine and you transmitted. Well, I was challenged to remove the sense I use most from my vision. Now that I'm not blindfolded, I still have some difficulties, but the way you teach is surprising, how can you not see anything, and help us, showing our mistakes, we who are seeing? I am very happy to have this opportunity to learn from you, because you showed me a teaching process that I would never understand, but the experience you gave me and my colleagues made me see the world in another way, that is, as you see, by sounds, touch, smell, in a more inclusive way (TEACHER IN INITIAL TRAINING, 2019)

A Figura 4 apresenta o momento da intervenção sobre a TA – *Dosvox* para os professores sem o uso das vendas:

Figure 4 – Shows the moment of intervention on AT – *Dosvox* for teachers without the use of blindfolds



Source: Collection of researchers (2019)

In general, the teachers had some initial difficulties in the AT - *Dosvox* learning process, but, at the end of the intervention, they were already closer to the reality experienced by people with visual impairments, in the way they learn and make use of AT .

It is important to emphasize that teachers need to develop practices that contextualize inclusive education, in the sense of enabling the student to have equal conditions for knowledge. Vygotsky (1997) emphasizes that the development of the particularities of a blind person must be respected.

In the third moment of the intervention, Professor Joaquim suggested that the teachers put into action what they had learned in the first and second moments of the intervention on AT – *Dosvox*. The actions were intended to enable teachers to simulate practices with students with visual impairments in the classroom. Therefore, teachers should, based on what they had learned, develop methodologies and didactics aimed at the teaching and learning process of these students.

To consolidate these practices, the teachers used the computer/laptop as didactic resources during the teaching process of AT – *Dosvox*.

The teachers paired up for the intervention, one of them represented the blind student, being blindfolded, and the other teacher played the role of (mediator) in order to teach AT from the programs contained in *Dosvox*, that is, the basic knowledge and initial to the teaching process.

During the intervention, this study considered some actions carried out by the teachers, among them: the teachers who represented the (mediators) of knowledge, showed little

patience at the time of the intervention, because, according to them, the teachers who represented the (blind students) were not carrying out the proposed activity. On the other hand, the (blind students) pointed out that they were unable to understand the actions commanded by the teachers (mediators), as they were blindfolded and were not listening to the commands assigned to them, as there were many people talking at the same time.

In this context, the absence of the use of instruments and language between teachers (mediators) and the teachers who represented the (blind students) is observed. According to Vygotsky (1991), the situation of interrelation is essential for the development of actions for the externalization of language. Thus, and due to the practices presented by teachers in initial training, it is necessary that they review and reflect on their actions during the inclusive teaching and learning process, and it is essential that the teacher understands how visually impaired students learn. For Vygotsky (1997), blind people have a greater memory development than in sighted people, however, this does not eliminate the need to qualify the teacher for teaching with these students.

Some studies addressed by Vygotsky (1997) regarding the development of people with visual impairments stand out:

[...] the last comparative study by E. Kretschmer (1928) showed that the blind have better verbal, mechanical and rational memory. A. Petzeld cites exactly this fact, established by a series of investigations (A. Petzeld, 1925). Biirklen has compiled the opinions of many authors who agree on one thing: they claim that memory develops in the blind with particular strength, which generally surpasses the memory of sighted people (VYGOSTSKY, 1997, p. 105, our translation)⁵.

Faced with the practices mediated by teachers in initial training, it was possible to observe that because they were only used to the visual sense, at the moment they were blindfolded, they were emotionally disrupted. Some teachers who represented the (mediators) during the intervention began to speak very loudly with the other teachers who represented the (blind students). The mediating teachers ended up taking the hands of the blind students and performing the actions mechanically, several actions in this sense were emerging during the intervention. However, these actions should be carried out by blind students, so that they

⁵ [...] el ultimo estudio comparativo de E. Kretschmer (1928) demostró que los ciegos poseen una mejor memoria verbal, mecanica y racional. A. Petzeld cita ese mismo hecho, establecido por una serie de investigaciones (A. Petzeld, 1925). Biirklen compilo opiniones de muchos autores que coinciden en una cosa: afirman que en lo ciegos la memoria se desarrolla con particular fuerza, que supera por lo general la memoria de los videntes (VYGOSTSKY, 1997, p. 105).

could initiate the appropriation of the teaching of AT – Dosvox. This intervention shows the importance of working more with inclusive education in initial teacher training.

Considering the actions of teachers, both those who represented the mediators and those who represented the blind students, there is a need to reflect on the four essential thoughts for the development and learning of the child portrayed by Vygotsky (1991): interaction, internalization, mediation and the zone of proximal development. These thoughts reveal the teaching and learning process, which, when not mediated, ends up determining the lack of structure in students' thinking and language. Therefore, “[...] the development of children's memory must be studied not only with respect to the changes that occur within the memory system itself, but also with respect to the relationship between memory and other functions” (VYGOTSKY, 1991, p. 37).

According to the theorist, it is necessary for the teacher and students to learn to interact based on the social and cultural relationships in which they are inserted. This interaction takes place through language, and it was not possible to observe during the practical intervention carried out among the teachers. In this context, Alvaristo (2019, p. 28) emphasized that the teacher “[...] is of great importance in the development of the child, as he is responsible for mediating knowledge, encouraging him to overcome himself and to appropriate new concepts for learning”. In this sense, Professor Joaquim points out to teachers in the face of the requested teaching proposal:

[...] I noticed that you had many difficulties in interacting with each other at the time of teaching AT – Dosvox I want to tell you that this difficulty in the interaction presented by you must be overcome, as it is the first step for the execution of the teaching visually impaired students. Because students, blind like me, need language to learn, this requires patience from both the teacher and the student. Touch plays a great role in this process, it is no use taking the student's hand and doing it for him, you need to teach him how to do it, and you can do this using some instruments and the necessary language until the student appropriates the AT – Dosvox (PROFESSOR JOAQUIM, 2019).

In view of the support raised by Professor Joaquim, a parallel with Vygotsky's perspective (1991, p. 23) is in order, which shows that language “[...] enables children to provide auxiliary instruments in the solution of difficult tasks, the to overcome impulsive action, to plan a solution to a problem in advance of its execution, and to control their own behavior”. Therefore, it is extremely important that the teacher, in the process of his initial training and after completing it, looks for new specializations that can contemplate his practices in the classroom.

Final considerations

The study aimed to contribute to the initial training of teachers of a Pedagogy course through Assistive Technology - Dosvox. In order to do so, this study had the participation of twenty-five teachers of a Pedagogy course of a Public Institution of Higher Education and a blind teacher, named Joaquim. In view of the proposal, the study mediated practical interventions aimed at the teaching process on the use of AT – Dosvox, in view of the conception of inclusive teaching and learning for students with visual impairments. The interventions were mediated in three moments by Professor Joaquim to teachers in initial training; each moment was designed with the aim of contributing to the training of these teachers in an inclusive way to digital culture, specifically in the use of AT – Dosvox.

AT – Dosvox has been developed since 1993 by the Electronic Computing Nucleus – ECN, of the Federal University of Rio de Janeiro – UFRJ. It has a technology of easy access in its system, totally national, considered the first commercial system to vocally synthesize generic texts for the Portuguese language; these texts are produced by means of a voice synthesizer, programmed to read the computer screen to blind people, and aims to enable accessibility and inclusion of people with visual impairments to the use of digital technology, demystifying paradigms that the blind cannot make use of the computer, thus providing visually impaired people with greater access to communication and interaction through digital means.

In this context and based on the interventions carried out to teachers in initial training of a Pedagogy course, it was possible to verify that teachers had difficulties in the process of installing the AT – Dosvox program; in the deprivation of eyes and, at times, hearing during the performance and tactile manipulation of the computer to carry out the activities; in the use of language; in the interrelationship with colleagues, among others. Due to the practices and actions presented by teachers in initial training, it is necessary to review and reflect on these actions during the inclusive educational process.

The results revealed that the interventions carried out by Professor Joaquim to teachers in initial training contributed to the acquisition of new conceptions about the inclusive teaching and learning process of AT - Dosvox, as well as to pedagogically recognizing and self-evaluating themselves in the inclusive teaching process for visually impaired people, especially in the way of teaching and learning with a blind teacher, as well as the importance of alterity during mediation in classrooms.

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