Visually impaired students and online education: the potential of inclusion from usability and user-experience (UX) approach

Juliana Gueths, Claudia Mont'Alvão

Experiência do usuário, graduação, deficiência visual.

A educação online se tornou uma discussão considerável durante a pandemia COVID-19 de 2020, mas tem sido um tópico bem conhecido pelos alunos há anos. No Brasil, a falta de acessibilidade online e alunos com deficiência visual estão em constante discussão. O crescimento da educação online geralmente está relacionado ao desenvolvimento tecnológico, visto que as plataformas de aprendizagem online são projetadas para proporcionar interação entre todos os interessados. Às vezes, esse sentimento de pertencer a uma turma, a um grupo ou a uma Universidade não é exato, logo essa interatividade e colaboração oferecida no ambiente virtual pode ser difícil para ambos: alunos e professores. Não se trata apenas de conteúdo e aprendizado, mas também de solidão. Este artigo tem como objetivo discutir a interação de cursos e plataformas online na perspectiva de alunos com deficiência visual visuais (cegos e baixa visão), parte de uma pesquisa mais ampla, e tecnologias assistivas, com foco na usabilidade e experiência do usuário.

User experience, higher education, visual impairment.

Online education became a considerable discussion during the 2020 COVID-19 pandemic, but it has been a well-known topic by students for years. In Brazil, the lack of online accessibility and students with visual impairment are in constant discussion. The growth in online education is usually related to technological development, given that the online learning platforms are designed to provide interaction among all stakeholders. Sometimes, this feeling of belonging to a class, a group, or a University is not exact; hence this interactivity and collaboration offered in the virtual environment can be complex for both: students and teachers. It is not only about content and learning but also about loneliness. This paper aims to discuss online courses and platforms' interaction from the perspective of visually impaired students (blind and low vision), a part of broader research, and assistive technologies, focusing on usability and user experience.
.

1 Introduction

This work analyzes issues related to the learning of students with visual impairments in Higher Education and the role of UX and usability in mediating these disadvantages, mainly in the context of the COVID-19 pandemic event. In this teaching modality, technological resources are critical in mediating the challenges faced by students with disabilities and conventional technologies, assistive technologies, and support services, which translate into the support these students receive.

The permanence of visually impaired students in the courses is also another point to be studied, reiterating the importance of adapting the teaching materials and making them available as well as the platform of the digital environment used. In addition, professionals (reader/transcriber, audio-descriptor, monitor, and others) dedicated to human assistance and other needs of these students are also essential to ensure their access to education and permanence in educational institutions in conditions of adequate monitoring. In this sense, many institutions do not offer sufficient and satisfactory human resources or technological resources to meet the needs of students with visual impairments.

The main objective of this paper is to discuss the interaction of platforms and online courses from the perspective of visually impaired students (blind and low vision) as part of broader research and assistive technologies, with a focus on usability and user experience.

2 Accessibility in online learning: Brazil' scenario

In Brazil, online education and visually impaired students are under constant discussion. Unfortunately, however, the numbers in Brazil have not been updated since 2010, when 45.6 million people (about 3.0% of the population) declared to be visually impaired. Until 2017, accessibility was not discussed as a major issue for online education in this country. Data from 2018 (ABED, 2019) highlighted that only 7.4% of online courses offer transcription, and only 3% offer audio descriptions. Even considering the technological resources, they do not include all students since 52.5% have adapted tests/exams and only 28.2% access magnifying glasses. Since then, the most recent Distance Learning Census (ABED, 2020), regarding data from 2019, has been released, featuring some worrying updates. The entire section dedicated to presenting the percentage of accessibility features available, present in the last Census, has been removed. Instead, the authors released the following statement:

> Unfortunately, not enough data has yet been collected to know how many people with disabilities can complete a degree or other level of formal education. This is already a serious symptom that accessibility has not been a priority in education for a long time. Something that frightens us when we remember that at least 20% of the entire population of Brazil has some type of disability (ABED, 2020, p. 28, author's translation).

The concept of inclusive education based on the Universal Right to Education has been treated as a concern in accessibility projects, supported by legislation and public policies. The

International Conference on Special Education (UNESCO, 1998), held between July 7 and 10, 1994 in Salamanca, is considered a milestone in social inclusion by emphasizing the right to education for people with disabilities, in addition to including children who are unable to participate in school activities for several other reasons, such as social vulnerability. As a result of this conference, the Salamanca Declaration documents guidelines, policies, and practices to be followed by the participating nations, including Brazil, to restructure the educational system and the social inclusion movement.

Discussion on inclusive education was featured at the World Conference on Special Educational Needs: Access and Quality, emphasizing the right to education from the context of the person with a disability, reaffirmed at the World Education Forum, and supported by the Basic Rules of the United Nations in Equal Opportunities for People with Disabilities (FAVERO et. al, 2009). Aiming to include people with disabilities in the social sphere and citizenship, Law No. 13,146, of July 6, 2015 was instituted in Brazil, widely known as the Brazilian Inclusion Law, or LBI (BRASIL, 2015). This law aimed to ensure and promote the exercise of fundamental rights and freedoms by people with disabilities on equal terms. According to Law No. 13, disability should be seen as a responsibility of State and Society overall and not restricted to a person. Article 27 of this Law provides as follows:

> According to their characteristics, interests and learning, education is a right of people with disabilities, ensured an inclusive educational system at all levels and lifelong learning to achieve the maximum possible development of their physical, sensory, intellectual and social talents and abilities needs. It is the duty of the State, the family, the school community, and society to ensure quality education to people with disabilities, keeping them safe from all forms of violence, negligence, and discrimination (BRASIL, 2015, author's translation).

As a result of the LBI, in December 2016, Law No. 13,409 (BRASIL, 2016) was enacted, which provides for the reservation of places for people with disabilities in technical courses at secondary and higher levels of Federal Education Institutions. Indeed, these two Laws constituted a framework to ensure the rights and achievements of students with disabilities; it is a welcoming initiative. However, these are still very recent measures, and it is possible to recognize that, in this scenario, there are several obstacles from the admission process to the permanence of such people in an educational institution. The real challenge is to ensure quality education.

Since the pandemic, students from the classroom teaching have had to adapt to the online format, adding to this already complex issue of digital accessibility and inequality that is often forgotten. The data collected show that usability and user experience can meet the needs of visually impaired students who are part of this online educational system. During social distancing, the maintenance of the bond is, given the other suggested actions mentioned, a fundamental factor for the return to school of students with disabilities and autism spectrum

disorder. It is noteworthy that the feeling of participation and belonging are principles of school inclusion, as stated by Cury et al. (2020, p. 6, author's translation):

> Inclusive education is not limited to the inclusion of people with disabilities in school. It is an education for each and every student. After all, everyone is different. The world is heterogeneous, so inclusion implies recognizing the differences of each individual and building society and school for everyone, regardless of their characteristics.

3 The right to education during the pandemic

The global emergency situation resulting from the coronavirus pandemic (COVID-19) has imposed a series of implications for the right to education worldwide. New problems arose around the educational crisis faced by many countries. In Brazil, the pandemic highlighted the need for investment and emergency remodeling of educational systems and practices to strengthen rights and reduce educational inequalities at all levels of education.

The COVID-19 pandemic changed the way we teach and learn. Among the various social impacts resulting from the pandemic, the repercussions of social distancing on the activities of teachers and students can be pointed out. Educational institutions at different levels (primary, higher, and technological) faced the suspension of classroom activities because of the health crisis in Brazil. In this way, different scenarios of public and private education institutions were highlighted regarding their ability to respond to this urgent demand.

Despite the pandemic, the right to education must be ensured, having its premise and framework as the right to life and health. In fact, the Constitution of the Federative Republic of Brazil establishes in its article 227 (BRASIL, 1988, author's translation):

> Art. 227. It is the duty of the family, society, and the State to ensure children, adolescents, and young people, with absolute priority, the right to life, health, food, education, leisure, professionalization, culture, to dignity, respect, freedom, and family and community coexistence, in addition to keeping them safe from all forms of negligence, discrimination, exploitation, violence, cruelty, and oppression. (Wording given by Constitutional Amendment No. 65 of 2010)

Due to the COVID-19 pandemic and the fundamental right to preserve the lives and health of students, teachers, and other professionals involved in the educational process, there was a suspension of in-person academic activities at all levels, from Elementary School to Higher Education. The Ministry of Education (MEC) ratified Technical Report No. 19 of the National Education Council (CNE), which authorizes remote activities in basic and higher education until December 31, 2021, throughout the country (BRASIL, 2020). This resulted in an expansion of activities using technological resources, highlighting inequalities in possession of the electronic equipment needed to monitor academic activities at a distance and access to the internet (HAMID, 2020).

New problems and discussions continue to arise around the educational crisis faced by many countries. Implementing classes in the online format, a real challenge for Universities, particularly for public ones, has caused discussions and impasses for professors and students,

as many do not have the necessary preparation and knowledge to use the platforms that enable online academic activities. Distance learning in this format requires technological competence and material resources, such as internet access and quality equipment, and an adequate environment that favors learning, which is not consistent with the reality of many students of these Institutions. Such is the reality of visually impaired students, who are already in an unequal condition, concerning sighted students, in the face-to-face teaching modality (LEITE et al., 2020).

It is necessary to evaluate and reflect on the impacts of the pandemic on the educational system to understand the implications for students with visual impairment. It can be considered that inequalities will be reproduced in online education, given the difficulties that remote learning presents in the Brazilian reality. Some simple implementation actions can make a big difference for students with visual impairments. For example, the availability of class planning for better organization and adaptation of these students is crucial at this time. The social distance imposed on society during the COVID-19 pandemic is reflected in the online learning process, as Junior and Monteiro (2020, p. 11, author's translation) pointed out.

> Given this situation, it is important that teachers also understand their role in the educational process, not only using technologies but allowing the resource used to include all students, in order to meet the specific educational needs of each one.

In addition to these material resources, visually impaired students face additional challenges, as platforms and digital content are not always accessible (RAAD, 2020). Also, Virtual Learning Environments (VLE) such as Moodle (Modular Object-Oriented Dynamic Learning Environment) and Google Classroom have been widely used to conduct classes in the context of remote learning and which application became popular during the pandemic (RODRIGUES, 2020). Such assistive technologies are the primary means of inclusion, as they can be a mediating instrument in students' learning process with visual impairment. These tools aim to promote the autonomy and independence of these students and, thus, provide the possibility of acquiring the necessary knowledge to carry out educational tasks. Still, instant messaging applications such as WhatsApp and Telegram (HAMID, 2020) are part of the technological resources used in remote learning activities. All of this put the readiness of Universities to deal with a health crisis to the test since it requires the help of advanced technology, including hardware and software, to enable effective online learning.

It is imperative to consider the need to provide education for all, whether in the face-to-face or remote modalities, permanently for students with visual impairments, as legislation during the

pandemic for Higher Education does not discuss the accessibility of people with disabilities. Leite et al. (2020, p. 11, author's translation) include that:

> Educational inclusion in the online academic environment should be covered in government legislative decisions taken in the current context through provisional measures and ordinances that guarantee equal access for this audience.

In addition, it is important to think about training teachers in technological resources' usage and promoting educational discussions so they will be prepared to deal with the challenges of the new Brazilian educational reality and the new demands to continue teaching classes with the due adaptations to remote learning. In this way, the practical improvement of accessibility in the VLE requires both the qualification of teachers and the offer of adapted hardware and software available to all university students.

4 User experience and usability as allies for inclusion

Usability has great potential to meet the needs of students with disabilities, as it has established itself for many years as a strong ally in making accessible systems viable (ARRAES, 2018). As defined by the International Organization for Standardization (ISO), usability is the measure by which particular users can use a product to achieve their goals with effectiveness, efficiency, and satisfaction in a specific use context (ISO 9241-11). Good usability is fundamental for the user experience to be positive, but it does not guarantee it by itself. Norman (2013) argues that design project developers know too much about their products to objectively judge them, as it is not the end-users who will use them. Thus, it began to be noted the need to prioritize design principles centered on the user and their experiences with the product, giving rise to the term User Experience (UX), or User Experience. The term UX was popularized by Donald Norman while working at the Apple company in the 1990s and is based on fundamentals of behavioral sciences such as ergonomics, psychology, and human factors.

Despite being a widely used term, there is no concrete definition of UX accepted globally. However, it is understood that UX is broader than usability, supported by Hassenzahl (2008) through his hedonic-pragmatic model. Contributing to the evolution of UX, it is agreed that it is necessary "to have mutual recognition of the value of objective measures and subjective reports of the user experience, which is a way to increase the maturity of this area" (MELO, DARIAN, 2019, p. 9). For this article, UX is considered based on the definition of Hassenzahl and Tractinsky (2006, p. 6), which contains the following:

> The user experience is a consequence of the users' internal State (predispositions, expectations, needs, motivations, mood, etc.) and the characteristics of the designed system (for example, organization / social environment, the importance of the activity, voluntary use, etc.).

Visually impaired students face many barriers when using technological resources in academic activities. Seale et al. (2020) showed the opinions of 17 students with disabilities regarding the use of technology in their learning in Higher Education Institutions from different

countries (Canada, Germany, Israel, United Kingdom, and the United States) reported their experiences. The disabilities of these students are physical, auditory, visual, mental, and multiple. The authors wanted to analyze, more precisely, what are the disadvantages of students with disabilities in Higher Education. They questioned what is the role of technological resources in mediating these disadvantages, the implications of the universal design of conventional technologies and of assistive technologies and support services, which translate into the support that students with disabilities receive to use these technologies. By technological resources, the authors included online learning (distance and hybrid learning), assistive technologies, conventional technologies (computers, notebooks, tablets and smartphones), applications and social networks. Regarding the positive aspects of the use of technology, students with disabilities highlighted six aspects, mainly:

1) technology was critical to ensuring your success as a student, otherwise, you would have dropped out;

2) technology helped in the studies, allowing access and reading course materials as well as finding references and information quickly;

3) improved study efficiency by helping them read or write faster, resulting in less fatigue and time savings;

4) the technology provided the attainment of qualification or approval in a specific task;

5) students were able to participate from home or watch the recorded class as many times as they wanted and

6) for many students, a key consequence of pursuing their studies and succeeding was independence and, therefore, not feeling a burden on others.

Regarding the negative aspects, the students pointed out four main difficulties:

1) difficulties in accessing technology;

2) the inexistence or insufficiency of training;

3) the inappropriate design of the technology; and

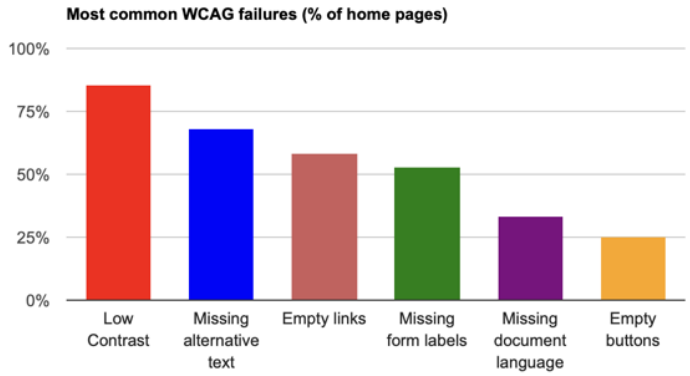
4) lack of support from teachers, student support services and peers.

Power et al. (2012) showed that the WCAG 2 guidelines solve only half of the problems that blind people face when browsing the internet. In other words, a website may conform to the guidelines and still not be accessible to users. Aizpurua et al. (2013) reported their experiences from a series of studies with blind participants. They highlighted that a site (with a significant number of violations of the WCAG 2.0 success criteria) can be considered accessible by users. On the contrary, a site that complies with the guidelines may not always be perceived as accessible. Having a better understanding of the subjective experience of blind users on the web cannot be dissociated from an analysis of how this experience affects perceived accessibility. Interaction with websites should be explored more holistically, as user behavior results from their objective and subjective experiences.

According to WebAIM (Web Accessibility In Mind group, 2021) the accessibility assessment of hundreds of thousands of web pages highlighted the existence of six types of errors that can make websites inaccessible to the visually impaired, shown in Figure 1. WebAIM is a non-profit

organization based at the Utah State University Center for People with Disabilities. The six types of errors evaluated were: text with low contrast, absent alternative text for images, lack of tags on links, empty links, absence of document languages, and empty buttons. Of these six main errors researched in visiting web pages, in Figure 1a, four had an occurrence frequency more significant than 50% of the pages. The most frequent mistake, found in 85% of the pages visited, was lack of contrast, very critical for people with low vision. The second most frequent type of error was the lack of text description of the images. The description of images is essential for blind people, as screen readers do not read pictures, photos, drawings, graphics, etc., in image format. There needs to be a text description of these images to give screen readers the information contained in these images to users. Figure 1b shows the changes, over three years, of these six types of errors, with results obtained in February 2019, 2020, and 2021. It is noted that there was an improvement in the accessibility of the pages visited concerning three types of errors. This improvement was superior to the setback observing the other three types of errors, considering the percentage of pages visited. Specifically, it is noted that, concerning the error of absence of alternative texts for images, from 68%, this error was observed in 60% of the visited sites, followed by improvements in errors with empty links and missing document languages. However, the empty button error increased by 1.9% of pages visited, followed by the already high error for missing links tags and low contrast text.

Figure 1 – List of the most common types of WCAG 2.0 faults. (a) Number and percentage of pages visited, (b) percentage of pages visited in February 2019, 2020, and 2021. (Source: WebAIM, 2021)



Most common types of WCAG 2 failures

WCAG Failure Type	# of home pages	% of home pages
Low contrast text	852,868	85.3%
Missing alternative text for images	679,964	68%
Empty links	581,408	58.1%
Missing form input labels	528,482	52.8%
Missing document language	329,612	33.1%
Empty buttons	250,367	25%

(a)

Most common types of WCAG 2 failures

WCAG Failure Type	% of home pages in February 2021	% of home pages in February 2020	% of home pages in February 2019
Low contrast text	86.4%	86.3%	85.3%
Missing alternative text for images	60.6%	66.0%	68.0%
Missing form input labels	54.4%	53.8%	52.8%
Empty links	51.3%	59.9%	58.1%
Missing document language	28.9%	28.0%	33.1%
Empty buttons	26.9%	28.7%	25.0%

(b)

In addition to describing images, it is important to add the need for describing videos. As Das Chagas Lemos et al. (2020) study showed, errors in the source code, empty links, and contrasts are related. All these factors constitute considerable difficulties in accessing didactic materials adapted and accessible to students with visual impairment and impose difficulties in accessibility and permanence in the on-site teaching modality. In online education, these difficulties can be even more critical, considering that access to the contents can be even more complicated if there is no support from the professors and administration of the University.

5 Concluding remarks

From the experiences in technology listed in this paper, it can be inferred that some attitudes should be assumed as essential for students with disabilities to have accessibility to platforms and content in online education, including a) encourage collaborative work among students with disabilities and technology designers and developers, promoting active user involvement at all stages of research and development; b) promote improved communication between different stakeholders, so that together they can find solutions to accessibility problems; c) encourage the connection between academic activity (learning) with the labor market (application); d) encourage collaborative actions between different Universities to share knowledge and practices.

The promotion of actions to involve the direct work of designers with students with disabilities (participatory design) constitutes an excellent practice for the search for solutions to problems perceived by users themselves, who use technology in their daily lives. Encouraging these students to participate early and continuously in projects adds a wide range of insights.

Finally, it is fundamental for the users with visual impairments to survey their needs and explore solutions, taking into account their experiences and preferences. Although there has been progress on issues in the legal sphere to facilitate people with disabilities in social activities, there are still many difficulties to overcome.

Acknowledgment

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

References

ABED (2020). **Censo EAD 2019: Relatório analítico da aprendizagem a distância no Brasil**. In: <http://abed.org.br/arquivos/CENSO_DIGITAL_EAD_2019_PORTUGUES.pdf>. Retrieved April 5, 2021.

ABED (2019). **Censo EAD 2018: Relatório analítico da aprendizagem a distância no Brasil**. In: <http://abed.org.br/arquivos/CENSO_DIGITAL_EAD_2018_PORTUGUES.pdf>. Retrieved March 20, 2020.

AIZPURUA, A.; HARPER, S.; VIGO, M (2016). Exploring the relationship between web accessibility and user experience. **International Journal of Human-Computer Studies**, v. 91, p. 13-23.

AIZPURUA, A., ARRUE, M., VIGO, M (2013). Uncovering the role of expectations on perceived web accessibility. In: International ACM SIGACCESS, 15; Conference on Computers and Accessibility ASSETS, 13, p. 74:1-74:2. **Anais do…** New York, NY, USA: ACM. URL: http://doi.acm.org/10. 1145/2513383.2513411.

ARRAES, I. C. dos S. O (2018). **Acolhimento de Pessoas com Deficiência Visual em Instituições de Ensino Superior do Rio de Janeiro: avaliação sobre a acessibilidade**

nos processos de interação humana relacionados. 226f. Thesis (Masters in Design). Pontifícia Universidade Católica do Rio de Janeiro.

BRASIL (2020). **Technical Report No. 19**. In: <http://portal.mec.gov.br/index.php?option=com_docman&view=download&alias=167131-pcp019-20&category_slug=dezembro-2020-pdf&Itemid=30192>. Retrieved July 2 2021.

_____ (2016). **Law No. 13,409 of December 28, 2016**. Brasília, DF, 29 ago. 2012. In: <http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2016/lei/l13409.htm>. Retrieved April 18 2021.

_____ (2015). **Law No. 13,146, of July 6, 2015.** Brasília, DF, June 6 2015. In: <http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2015/lei/l13146.htm>. Retrieved April 20 2021.

_____ (1988). **Constitution of the Federative Republic of Brazil 1988**. Brasília, DF: Centro Gráfico, 1988. In: < http://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm>. Retrieved May 27 2021.

DAS CHAGAS LEMOS, E.; CAVALCANTE, I. F.; DE ALMEIDA, R. P. B (2020). Análise e diagnóstico da acessibilidade no Moodle para deficientes visuais. **Holos,** v. 4, p. 1-23.

CURY, C. R.; FERREIRA, L. A. M.; FABRIS FERREIRA, L. G.; REZENDE, M. S. S (2020). O Aluno com Deficiência e a Pandemia. **Instituto Fabris Ferreira**, p. 1-15.

HAMID, Sitti Maryam (2020). Online digital platforms during covid-19 in EFL classes: Visual impairment student'perception. **ETERNAL (English, Teaching, Learning, and Research Journal)**, v. 6, n. 2, p. 328-339.

HASSENZAHL, Marc (2008). User experience (UX): towards an experiential perspective on product quality. In Proceedings of the 20th Conference on l'Interaction Homme-Machine (IHM '08). ACM, New York, NY, USA, p. 11-15. DOI: https://doi.org/10.1145/1512714.1512717

HASSENZAHL, Marc; TRACTINSKY, Noam (2006). User experience - a research agenda. **Behavior & information technology**. 25, 2. p. 91 – 97. DOI: 10.1080/01449290500330331

ISO 9241-11 (1998). **Ergonomic requirements for office work with visual display terminals** (vdts). part 11: Guidance on usability.

JUNIOR, V. B. S.; MONTEIRO, J. C. S (2020). Educação e COVID-19: As tecnologias digitais mediando a aprendizagem em tempos de pandemia. **Revista Encantar - Educação, Cultura e Sociedade**, v. 2, p. 01-15.

LEITE, L., SILVA, M. C. R., SIMÕES, T. M. S., SILVA, A. C. S., PEREIRA, M (2020). Impactos da Covid-19 na graduação da pessoa com deficiência visual. **Revista Encantar-Educação, Cultura e Sociedade**, v. 2, p. 01-14.

MELO, B.; DARIN, T (2019). Scope and definition of user experience in Brazil: a survey to explore community's perspectives. In: Proceedings of the 18th Brazilian Symposium on Human Factors in Computing Systems, p. 1-11. 2019.

NORMAN, Donald (2013). **The design of everyday things: Revised and expanded edition**. Basic books, Inc. New York, NY. 2 ed. 347p.

POWER, C., FREIRE, A., PETRIE, H., SWALLOW, D (2012). Guidelines are only half of the story: Accessibility problems encountered by blind users on the web. In: SIGCHI Conference

on Human Factors in Computing Systems CHI, 12. pp. 433-442. **Anais do…** New York, NY, USA: ACM. URL: http://doi.acm.org/10.1145/2207676.2207736.

RAAD, B (2020). The Role of E-Learning in Covid-19. **International Journal of Creative Research Thought**, v. 8, n.3, p. 3135-3138.

RODRIGUES, Alessandra (2020). Ensino remoto na educação superior: desafios e conquistas em tempos de pandemia. **Horizontes**. In: <http://horizontes.sbc.org.br/index.php/2020/06/ensino-remoto-na-educacao-superior/>.Retrieved June 5 2021.

SEALE, J.; COLWELL, C.; COUGHLAN, T.; HEIMAN, T.; KASPI-TSAHOR, D.; OLENIK-SHEMESH, D (2021). 'Dreaming in colour': disabled higher education students' perspectives on improving design practices that would enable them to benefit from their use of technologies. **Education and Information Technologies**, v. 26, n. 2, p. 1687-1719.

UNESCO (1998). **Declaração sobre Princípios, Política e Práticas na Área das Necessidades Educativas Especiais, Salamanca, 1994**. Brasília: UNESCO. Disponível em: <http://unesdoc.unesco.org/images/0013/001393/139394por.pdf>. Retrieved June 15 2020.

WebAIM (2021). **Web Accessibility In Mind**. Disponível em: <https://webaim.org/projects/million/> Retrieved June 28 2021.

About the authors

Juliana, GUETHS, Bach., PUC-Rio, Brasil, ju.gueths@gmail.com.

Claudia, MONT'ALVÃO, D.Sc., PUC-Rio, Brasil, cmontalvao@puc-rio.br.