



Usability and Digital Accessibility for Older Adults: A Comparative Study between Moodle and Coursera

Karina Yukari Kimura, Universidade Estadual de Maringá (UEM),
kimurakarina23@gmail.com, ORCID: 0009-0004-8812-4653

Felippe Fernandes da Silva, Universidade Estadual de Maringá (UEM),
felippefernandes10@gmail.com, ORCID: 0009-0005-4576-2839

Gislaine Camila L. Leal, Universidade Estadual de Maringá (UEM),
gclleal@uem.br, ORCID: 0000-0001-8599-0776

Guilherme C. Guerino, Universidade Estadual do Paraná (UNESPAR),
guilherme.guerino@ies.unespar.edu.br, ORCID: 0000-0002-4979-5831

Renato Balancieri, Universidade Estadual de Maringá (UEM),
rbalancieri@uem.br, ORCID: 0000-0002-8532-2011

Abstract: This study investigates the usability and accessibility of online learning platforms used by older adults through a comparative analysis of Moodle and Coursera. Eleven participants from the Open University for Senior Citizens (UNATI) performed structured tasks and answered questionnaires based on Nielsen's heuristics and WCAG 2.0 guidelines, complemented by direct observation. Rather than merely comparing the platforms, this work validates a practical method for evaluating usability and accessibility, with a focus on older adults. The results indicate that, although both platforms received positive evaluations, Coursera presented significant barriers, such as navigation difficulties and inconsistent localization, whereas Moodle was perceived as more accessible and intuitive. The findings provide insights to support the development of more inclusive educational environments and the adoption of replicable assessment methodologies in diverse digital-learning contexts.

Keywords: usability, digital accessibility, older adults, inclusive education, Moodle, Coursera.

Usabilidade e Acessibilidade Digital para Pessoas Idosas: Um Estudo Comparativo entre Moodle e Coursera

Resumo: Este artigo investiga a usabilidade e a acessibilidade de plataformas de aprendizagem online utilizadas por pessoas idosas, com foco comparativo entre o Moodle e o Coursera. A pesquisa envolveu 11 participantes da Universidade Aberta à Terceira Idade (UNATI), que realizaram tarefas estruturadas e responderam a questionários baseados nas Heurísticas de Nielsen e nas diretrizes WCAG 2.0, complementados por observações diretas. O estudo não apenas compara as plataformas, mas também valida um método prático de avaliação de usabilidade e acessibilidade voltado à pessoa idosa. Os resultados indicam que, embora ambas tenham recebido avaliações positivas, o Coursera apresentou barreiras significativas, como dificuldades de navegação e inconsistências na tradução, enquanto o Moodle foi percebido como mais acessível e intuitivo. Os achados oferecem subsídios para o desenvolvimento de ambientes educacionais mais inclusivos e para a aplicação de metodologias de avaliação replicáveis em diferentes contextos de aprendizagem digital.

Palavras-chave: usabilidade, acessibilidade digital, pessoa idosa, educação inclusiva, Moodle, Coursera.

1. Introduction

With the growing awareness of social inclusion, digital accessibility has taken a central position in discussions about educational technologies. Digital platforms



and services must be designed to accommodate the diversity of their users, including individuals with visual, auditory, motor, and cognitive disabilities, as well as older adults, who often face similar challenges when interacting with digital interfaces (Sanchez-Gordon e Luján-Mora, 2013).

The COVID-19 pandemic reinforced this demand by exposing the limitations of many educational platforms in providing accessible experiences for diverse user profiles. In this context, guidelines such as the Web Content Accessibility Guidelines (WCAG) have become essential for promoting equity in access to online educational content (Zdravkova; Dalipi e Krasniqi, 2022).

The lack of accessibility reinforces the exclusion of already marginalized groups, such as people with disabilities and older adults, restricting their access to education, participation in the labor market, and social inclusion. Promoting digital inclusion is, therefore, an essential step toward ensuring the right to lifelong learning, especially in the context of the growing expansion of Distance Education (DE).

In recent decades, older adults have become increasingly connected but still face barriers in using educational technologies. These barriers are not limited to a lack of technical knowledge but also include aspects of design, language, and navigation that can hinder autonomy and reduce engagement in online learning. Thus, understanding how older adults interact with virtual learning environments is essential for promoting truly inclusive pedagogical practices and technological solutions.

Previous studies have shown that educational approaches tailored to older adults can positively impact cognitive engagement and learning outcomes, reinforcing the importance of inclusive pedagogical strategies for this audience (Esperança *et al.*, 2024).

Among DE initiatives, Massive Open Online Courses (MOOCs) stand out as promising instruments for democratizing knowledge. Coursera is one of the most recognized platforms in this format, offering open courses to diverse audiences. Moodle, in turn, is not a MOOC platform but rather a widely used learning management system adopted by educational institutions, which can also host open courses.

Despite the popularity of these environments, recent studies indicate that online educational platforms still present significant usability and accessibility barriers (Rodriguez-Ascaso *et al.*, 2024). These limitations particularly affect vulnerable groups, including older adults, who tend to experience greater difficulties in navigation, comprehension, and autonomy within digital environments.

Although the literature on digital accessibility has advanced, there is still a scarcity of studies that systematically analyze the experience of older adults across different learning platforms. This study seeks to fill this gap through an empirical analysis based on real navigation tasks, focusing on usability and accessibility, using WCAG 2.0 guidelines and Nielsen's heuristics as references.

The main objective is to evaluate and validate a practical method for analyzing usability and accessibility for older adults, comparing their experience in Moodle and Coursera platforms. This user-centered approach enables the precise identification of barriers and allows the formulation of recommendations aligned with the real needs of this audience.

The results provide valuable insights for developers, researchers, and educators interested in making virtual learning environments more accessible. It is expected that the findings will contribute not only to improving the analyzed platforms but also to applying replicable methodologies in digital accessibility studies, thereby strengthening more inclusive educational practices.

This paper is organized as follows: Section 2 presents the Related Work; Section 3



describes the Research Method, detailing the Planning, Execution, and Analysis; Section 4 presents the Results, covering the Quantitative Assessment and the Observational and Qualitative Analysis; Section 5 discusses the Threats to Validity; and Section 6 presents the Conclusions and Future Work.

2. Related Work

This section presents studies addressing accessibility in MOOC platforms, focusing on different target audiences and methodological approaches.

The study by (Lara *et al.*, 2010) proposed adapting the WCAG 2.0 guidelines to improve web accessibility for older adults. Based on usability tests with users over 40 years old, the research identified the need for improvements in aspects such as navigability, visual contrast, menu organization, and more intuitive interactions. The suggestions were incorporated into the principles of WCAG 2.0, focusing on the specific needs of this audience.

(Bong e Chen, 2016) evaluated the accessibility of a demonstrative edX course designed for older adults. The analysis combined automated tests using the AChecker tool and practical tests with six participants. The main barriers identified included unintuitive buttons, navigation difficulties, and information overload. Nevertheless, participants showed a positive perception of the platform's usability. The study reinforces the importance of simplified interfaces and accessible content to promote more inclusive learning experiences.

(Nurhudatiana e Caesarion, 2020) investigated the experiences of 77 users on the Udemy and Coursera platforms through semi-structured interviews, informal feedback, and a questionnaire with 19 items addressing usability and accessibility criteria. The results indicated that both platforms provided satisfactory experiences, with distinct emphases: Coursera stood out for institutional reliability, while Udemy was better evaluated regarding accessibility and course diversity. The study also identified challenges faced by novice users and those in contexts of low connectivity.

(Cinquin; Guitton e Sauzéon, 2021) conducted a participatory study with people with cognitive disabilities to understand their needs when using a MOOC prototype. The process involved four stages: requirements elicitation, design alternatives, prototyping, and user evaluation. The results revealed positive impacts on accessibility and led to the proposal of an integrative framework based on flexibility and interface personalization.

(Królak e Zajac, 2022) analyzed the accessibility of the Coursera platform based on the WCAG 2.1 guidelines through a qualitative assessment with ten users with different types of disabilities, including one expert. The main barriers identified were the absence of alternative descriptions, inadequate contrast, and difficulty focusing on interactive elements. Although acknowledging improvements in the platform, the study highlights the need for continuous enhancement to meet the needs of users with specific requirements.

(Rodriguez-Ascaso *et al.*, 2024) examined the performance of students with different accessibility needs in MOOCs under the "Design for All" principle, identifying that structural barriers such as cognitive overload and low visual clarity continue to impact learning even in platforms that have implemented accessibility guidelines. The study reinforces the relevance of research targeting vulnerable groups, such as older adults, in online learning environments.

(Sato *et al.*, 2025) compared the accessibility of the Moodle and Coursera platforms based on WCAG 2.0 guidelines, Nielsen's Heuristics, and the WAVE tool, considering three distinct user groups: older adults, visually impaired



users, and hearing-impaired users. The study adopts a quantitative and technical compliance-verification approach, showing that Moodle achieves better overall performance and that both platforms still lack full compliance with accessibility standards. Unlike the present work, the focus was on the comparative evaluation of the platforms rather than on applying a method aimed explicitly at assessing usability and accessibility for older adults.

Although significant progress has been made in the literature, few studies simultaneously analyze different platforms from the perspective of older adults, combining quantitative and observational instruments. Most research focuses on users with disabilities, automated analyses, or specific course contexts. Thus, this study differs by validating a practical method for evaluating usability and accessibility for older adults, applying it to two widely used environments — Coursera and Moodle.

3. Research Method

This section describes the method adopted to conduct the study, structured into three main stages: **Planning, Execution, and Data Analysis**, ensuring transparency and reproducibility of the process.

3.1. Planning

The target audience of this study consisted of older adults affiliated with the Universidade Aberta à Terceira Idade (UNATI – Open University for Older Adults). Participants were between 63 and 78 years old (mean = 69.4), according to the legal definition of “older adult” established by the Statute of the Elderly (Law No. 10.741/2003)*, which considers individuals aged 60 or older as elderly. The selection of this group was based on availability and the number of potential participants. To evaluate how this audience interacts with online learning platforms, observation and recording criteria were established to capture participants’ actions, responses, and difficulties while using the interfaces.

The platforms selected for analysis were **Moodle** and **Coursera**, and a specific protocol was designed to observe participants’ interactions within these environments. The planning phase included structured observations and the registration of significant difficulties encountered, aiming to understand the user experience and identify accessibility barriers.

A **standardized navigation script** was developed to guide participants and prevent fatigue. In Coursera, the free course “Work Smarter with Microsoft Word” by Microsoft was used. In Moodle, a customized course on the same topic was created to maintain equivalence in content and structure. A **user evaluation questionnaire** was also developed, considering both the relevance and the number of questions as well as the response format. Efforts were made to balance completeness with participant comfort to prevent fatigue and maintain motivation. Likert scales of 4 and 5 points were used, combined with open-ended questions. Demographic questions were structured in a multiple-choice format. The instrument was aligned with **WCAG 2.0 guidelines** and **Nielsen’s Heuristics**, focusing on aspects such as visual accessibility, motor coordination, hearing, and memory, key factors for older adults. Table 1 presents the general structure of the evaluation instrument, relating item groups, examples of evaluated criteria, and their respective theoretical references.

The script was adapted from the study by (Iniesto e Rodrigo, 2024), which

* Available at: https://www.planalto.gov.br/ccivil_03/leis/2003/110.741.htm . Accessed on October 17, 2025.



Table 1. Structure of the usability and accessibility evaluation instrument.

Item Group	Example of Evaluated Criterion	Theoretical Reference
Nielsen's Heuristics	Consistency and standards; system status visibility; error prevention.	(Nielsen, 1994)
WCAG 2.0	Color contrast; keyboard navigation; text readability.	(World Wide Web Consortium, 2008)
Open-ended questions	Comments on difficulties and improvement suggestions.	Developed by the authors (no direct theoretical reference).

Source: Prepared by the authors (2025).

evaluated the application of WCAG guidelines in MOOCs with students from the National Distance Education University (UNED) in Spain. The adaptation considered the profile of participants in this study, older adults with basic computer experience, and the specific characteristics of the analyzed platforms.

Distinct navigation scripts were created for Coursera and Moodle, respecting their respective structures and navigation patterns. Initially, printed instructions were planned; however, during the pilot phase, it was observed that alternating between the printed script and the platform was confusing. As a solution, **verbal delivery of instructions** was adopted, reducing the duration of each session and minimizing stress without compromising the task content.

The chosen theme — Microsoft Word — was selected to ensure familiarity and practical relevance, providing a realistic navigation scenario without instructional intent.

Based on studies such as (Zdravkova; Dalipi e Krasniqi, 2022) and (Iniesto e Rodrigo, 2024), which highlight challenges in applying WCAG guidelines, the questionnaire employed general guidelines rather than specific success criteria (Levels A, AA, or AAA). This decision aimed to simplify the evaluation for the target audience, avoiding the need for technical knowledge.

The final questionnaire consisted of: (i) demographic data: six mandatory multiple-choice questions; (ii) Nielsen's Heuristics: ten mandatory questions and one optional open-ended question per platform; (iii) WCAG 2.0: eight mandatory questions and one optional open-ended question per platform.

The project was approved by a Research Ethics Committee, as required by national regulations, ensuring compliance with ethical principles for studies involving human participants. All materials used — navigation scripts, Google Forms, session notes, and anonymized responses — are available in the Zenodo repository (<https://zenodo.org/records/17381967>), ensuring transparency and reproducibility.

3.2. Execution

Data collection was carried out between November 12 and 25, 2024, through individual interventions with the participants.

Initially, a **pilot test** was conducted with two volunteers selected for convenience who met the defined criteria. The objective was to validate the navigation script and the questionnaire, identifying potential adjustments before the final application. This stage was conducted remotely via the Google Meet platform and allowed the refinement of the procedures for the subsequent sessions.

After the pilot, **individual sessions** were organized with the remaining participants. In total, eleven interventions were conducted: nine remotely and two in person, due to access difficulties faced by some volunteers. The individual application



aimed to provide personalized support, considering the technical limitations already observed in the pilot phase.

The **remote format** was prioritized to ensure greater flexibility and comfort for participants, allowing them to follow the navigation script and respond to the questionnaire at their own pace, without time pressure.

The small sample size (eleven participants) was defined based on voluntary participation and the availability of time and resources for the study's execution. Although this approach enabled a more qualitative and user-centered data collection, it is acknowledged that the limited number of participants constrains the generalization of the results.

3.3. Analysis

The data analysis aimed to identify patterns, trends, and discrepancies in perceptions of usability and accessibility, considering the specific needs of older adults.

The quantitative approach focused on the frequency of positive responses to the Likert scale items. Percentages of agreement were calculated for each question and compared between platforms. A descriptive analysis was chosen, without the use of inferential statistical tests, due to the exploratory nature of the study and the limited sample size.

Complementarily, open-ended responses and observations collected during the sessions were analyzed qualitatively. The analysis procedure adopted a triangulation between quantitative and qualitative data, seeking to associate participants' comments and observed behaviors with the categories of Nielsen's heuristics and WCAG guidelines. This strategy allowed a deeper understanding of the barriers encountered and helped validate the inferences drawn from the questionnaires.

4. Results and Discussion

This section presents and discusses the results obtained from the application of the evaluation instruments and the observations made during the experimental sessions. The analysis was conducted along two complementary axes: (i) the **quantitative assessment**, based on responses to the usability and accessibility questionnaires; and (ii) the **observational and qualitative analysis**, which interprets participants' interactions and behaviors throughout their use of the platforms.

4.1. Quantitative Assessment

The quantitative results were obtained from the Likert scales associated with Nielsen's Heuristics (usability) and the WCAG 2.0 guidelines (accessibility). For each question, the percentage of agreement among participants was calculated, considering the responses "Agree" and "Strongly agree."

Figures 1 and 2 present the heatmaps of responses for the Coursera platform. For visual clarity, the following color scheme was adopted: **blue** for *usability* items and **orange** for *accessibility* items. This color differentiation allows for a quick identification of response patterns and facilitates the comparison between dimensions. Figures 3 and 4 reinforce this response pattern, highlighting a higher uniformity of positive evaluations in Moodle.

The questionnaires included 18 closed-ended items — 10 based on Nielsen's Heuristics (usability) and eight on WCAG 2.0 guidelines (accessibility). For synthesis and comparison between platforms, the results were grouped into ten consolidated criteria, representing recurring usability and accessibility dimensions observed across

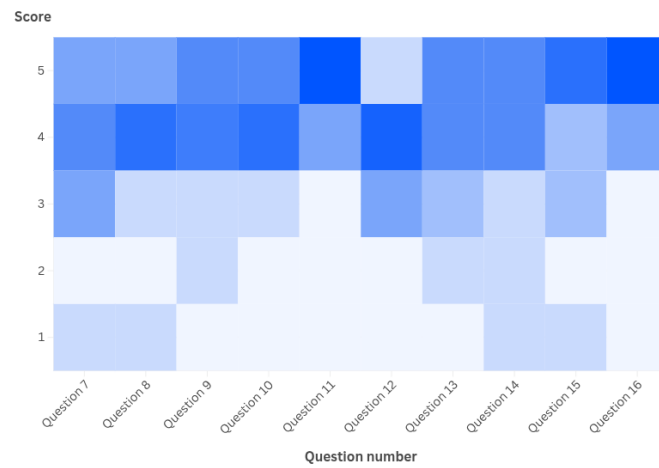


Figure 1. Heatmap of responses to Coursera usability questions.

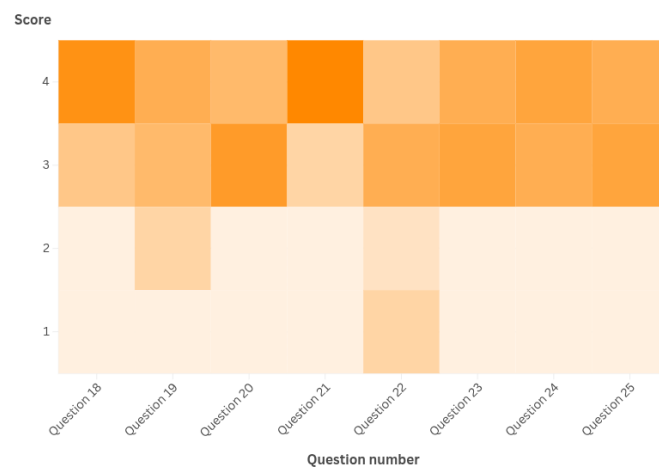


Figure 2. Heatmap of responses to Coursera accessibility questions.

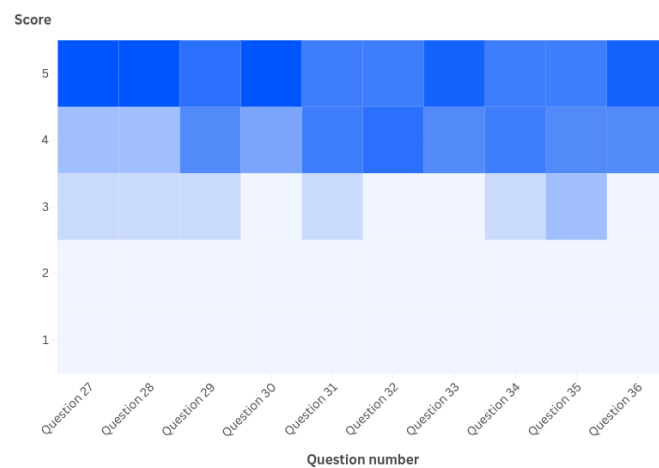


Figure 3. Heatmap of responses to Moodle usability questions.

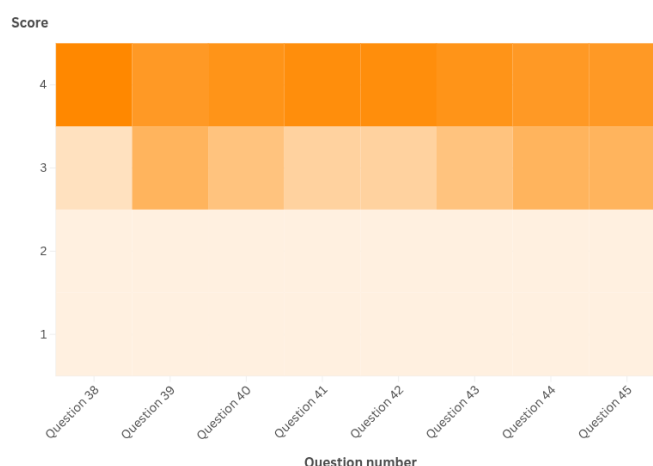


Figure 4. Heatmap of responses to Moodle accessibility questions.

both environments. Table 2 presents the average agreement percentage for each criterion, considering the proportion of positive responses (“Agree” or “Strongly agree”) obtained for Moodle and Coursera.

Table 2. Average agreement percentage for usability and accessibility questions.

Evaluated Criterion	Moodle (%)	Coursera (%)
System status visibility	91	75
Consistency and standards	87	70
Error prevention	83	68
Text readability	94	77
Color contrast	89	73
Keyboard navigability	86	65
Page loading time	92	79
Access to multimedia resources	84	72
Clarity of instructions	88	69
Action feedback	90	71

Source: Prepared by the authors (2025).

A consistent trend of higher evaluations for Moodle was observed across all criteria. The most significant differences occurred in “keyboard navigability” (86% vs. 65%) and “clarity of instructions” (88% vs. 69%), indicating that Moodle offers a more predictable structure and more familiar interfaces for older adults.

Although most responses were positive, the analysis of disagreement patterns revealed relevant insights. Questions related to the location of help elements and the translation of labels showed greater variability in responses, which may reflect both actual comprehension barriers and the **courtesy bias** - a typical behavior among older adults, who tend to respond positively to avoid contradicting the evaluator. This finding reinforces the importance of combining objective instruments with direct observation to capture behavioral and emotional nuances not evident through standardized scales.

In Coursera, some participants reported difficulties locating the “Back” button and understanding progress icons, which affected their sense of control and predictability. In Moodle, only minor issues were observed in tasks involving drop-down menus and selection boxes.



In summary, the quantitative analysis indicates that both environments were perceived as usable. Still, Moodle demonstrated superior performance in visual clarity, structural consistency, and predictability, attributes that are essential for older adults.

4.2. Observational and Qualitative Analysis

In addition to the questionnaire responses, the behavioral observations conducted during the sessions provided a deeper understanding of the difficulties faced by participants. The observational analysis complemented the numerical results and revealed patterns of behavior and perception.

During navigation on Coursera, recurring expressions of uncertainty were observed, such as *“I don’t know where to click now”* or *“What does this arrow mean?”*. These difficulties were associated with ambiguous icons and collapsible menus without textual labels, which increased cognitive load. One participant commented: *“The screen is beautiful, but there’s too much going on... I get a bit lost...”* highlighting the visual overload also reported in previous studies (Rodríguez-Ascaso *et al.*, 2024).

In Moodle, interactions were smoother. Participants positively emphasized the presence of buttons with textual descriptions and the clarity of section titles. A representative statement was: *“It’s easier to find things here... it feels simpler.”* Minor issues were observed with scrolling on long pages and in response fields that required manual mouse rotation, indicating opportunities for improvement.

The cross-analysis of quantitative and qualitative data confirmed that the main barriers in Coursera were related to **command location** and **cognitive overload**. In contrast, in Moodle, difficulties were primarily associated with **linear navigation** and **visual adequacy**. Table 3 summarizes the observed barriers and corresponding recommendations.

Table 3. Observed barriers and improvement recommendations.

Type of Barrier	Description/Observed Example	Recommendation
Confusing navigation	Difficulty locating the “Back” button and understanding icons without text (Coursera).	Add textual labels and visible breadcrumbs.
Cognitive overload	Excessive graphical elements and collapsed menus (Coursera).	Simplify the layout and reduce non-essential elements.
Visual focus and contrast	Difficulty distinguishing clickable areas (Moodle and Coursera).	Apply adequate contrast and reinforce interactive borders.
Scrolling and motor control	Long page scrolling and small buttons (Moodle).	Increase button size and provide step-by-step navigation.
Insufficient feedback	Lack of confirmation after submitting responses (Coursera).	Display confirmation messages and immediate feedback.

Source: Prepared by the authors (2025).

These recommendations, by reducing cognitive load and increasing action predictability, enhance the autonomy of older learners and encourage their continued participation in online courses.



The qualitative evidence reinforces that the **identified barriers go beyond purely technical aspects**, encompassing cognitive, cultural, and technological familiarity factors. Many participants expressed insecurity when confronted with English terminology or unconventional icons. These findings confirm the need for design guidelines that are more sensitive to differences in digital experience and cognitive preferences among older adults.

Similar findings have been reported in studies with older adults, indicating that learning experiences designed to reduce cognitive load and increase predictability contribute to confidence, engagement, and cognitive stimulation (Esperança *et al.*, 2024).

From a pedagogical perspective, the observations indicate that improving accessibility not only facilitates navigation but also fosters self-confidence and learner engagement. Thus, usability and accessibility should be understood as integral components of digital educational inclusion.

Finally, the results obtained contribute to validating the proposed method, which combines direct observation with structured evaluation instruments. This approach proved effective in identifying specific barriers and proposing applicable recommendations for different online learning platforms, thereby strengthening the empirical foundation for future studies focused on older adults.

5. Threats to Validity

As this is an exploratory study, its main objective is the **validation of the proposed evaluation method** rather than the generalization of results. The small number of participants (eleven older adults) limits the statistical extrapolation of the findings, although it is appropriate for qualitative investigations centered on user experience.

Another limitation concerns the **participants' profile**, as they already had a minimum level of familiarity with digital technologies, which may have influenced task performance. In addition, the remote data collection format reduced control over contextual factors such as the environment and the type of device used.

The possibility of a **courtesy bias** is also recognized, a common phenomenon among older adults, in which respondents tend to adopt more positive attitudes. This risk was mitigated through the triangulation of questionnaires, observations, and open-ended comments, ensuring greater consistency in interpretations.

Despite these constraints, the results support the applicability of the proposed method for identifying usability and accessibility barriers, demonstrating its potential for use in future investigations with larger samples and diverse educational contexts.

6. Conclusions and Future Work

This study presented and validated a method for evaluating usability and accessibility focused on the interaction of older adults with online learning platforms. In addition to the comparative analysis of Moodle and Coursera, this study empirically validates the proposed evaluation method, whose application with older adults provides the basis for the refinements suggested as future work. The combined application of structured questionnaires and observational analysis made it possible to identify specific barriers related to navigation, readability, and comprehension, as well as the strengths of the analyzed interfaces.

The results indicate that, although both Moodle and Coursera are considered usable, the former showed superior performance in aspects such as visual clarity, predictability, and structural consistency, key factors for the engagement and autonomy of older adults in digital contexts. It was also observed that the difficulties extend beyond



technical aspects, involving cognitive and cultural dimensions that influence how this audience interprets and reacts to digital interfaces.

As a practical contribution, the study offers a replicable, inclusive evaluation procedure applicable to different educational platforms and adaptable to other user profiles with specific needs. From a theoretical perspective, the research reinforces the importance of incorporating principles of universal design and cognitive accessibility in the conception of online learning environments.

Based on the findings, it is recommended that:

- **Developers** improve interface elements such as visible menus, standardized layouts, clear messages, and full translations, including footers, tutorials, and error messages;
- **Teachers and instructional designers** provide accessible support materials, such as tutorial videos and step-by-step guides, promoting autonomy and reducing cognitive barriers;
- **Public institutions and extension programs** use the results to guide digital inclusion policies aimed at older adults, strengthening initiatives such as open universities for senior learners;
- **Researchers** replicate and adapt the method across different platforms and contexts, expanding the evidence base for future recommendations.

Among the main limitations are the small number of participants and the homogeneous sample profile, which restrict the generalization of the findings. Nevertheless, the proposed method proved sensitive to identifying real usability and accessibility barriers and effective in triangulating quantitative and qualitative data.

As **future work**, the method is expected to be applied to larger and more diverse samples, including older adults with different levels of digital literacy and socioeconomic conditions. In addition, it is proposed to integrate automated accessibility metrics into observational evaluations and to explore the adaptation of the method to other educational technologies, such as mobile applications and virtual reality environments for lifelong learning.

In summary, the results reinforce the relevance of evaluative approaches that combine methodological rigor with social sensitivity, contributing to the development of digital environments that are more accessible, inclusive, and responsive to age diversity.

References

- Bong, W. K.; Chen, W. How accessible are moocs to the elderly? In: Miesenberger, K.; Bühler, C.; Penaz, P. (Ed.). **Computers Helping People with Special Needs**. Cham: Springer International Publishing, 2016. p. 437–444. ISBN 978-3-319-41264-1.
- Cinquin, P.-A.; Guitton, P.; Sauzéon, H. Designing accessible moocs to expand educational opportunities for persons with cognitive impairments. **Behaviour & Information Technology**, Taylor & Francis, v. 40, n. 11, p. 1101–1119, 2021.
- Esperança, F.; Silva, F.; Leal, G.; Balancieri, R. Desplugando para aprender: Desenvolvendo o pensamento computacional entre idosos. In: **Anais do XXXV Simpósio Brasileiro de Informática na Educação**. Porto Alegre, RS, Brasil: SBC, 2024. p. 2136–2148. ISSN 0000-0000. Disponível em: <https://sol.sbc.org.br/index.php/sbie/article/view/31384>.
- Inierto, F.; Rodrigo, C. The use of wcag and automatic tools by computer science students: a case study evaluating mooc accessibility. **JUCS - Journal of Universal Computer Science**, v. 30, p. 85–105, 01 2024.



- Królak, A.; Zajac, P. Analysis of the accessibility of selected massive open online courses (moocs) for users with disabilities. **Univers. Access Inf. Soc.**, Springer-Verlag, Berlin, Heidelberg, v. 23, n. 1, p. 191–202, oct 2022. ISSN 1615-5289. Disponível em: <https://doi.org/10.1007/s10209-022-00927-2>.
- Lara, S. M. Affonso de; Watanabe, W. M.; Santos, E. P. B. dos; Fortes, R. P. M. Improving wcag for elderly web accessibility. In: **Proceedings of the 28th ACM International Conference on Design of Communication**. New York, NY, USA: Association for Computing Machinery, 2010. (SIGDOC '10), p. 175–182. ISBN 9781450304030. Disponível em: <https://doi.org/10.1145/1878450.1878480>.
- Nielsen, J. **10 Usability Heuristics for User Interface Design**. 1994. Disponível em: <https://www.nngroup.com/articles/ten-usability-heuristics/>.
- Nurhudatiana, A.; Caesarion, A. S. Exploring user experience of massive open online courses (moocs): A case study of millennial learners in jakarta, indonesia. In: **Proceedings of the 2020 9th International Conference on Educational and Information Technology**. New York, NY, USA: Association for Computing Machinery, 2020. (ICEIT 2020), p. 44–49. ISBN 9781450375085. Disponível em: <https://doi.org/10.1145/3383923.3383968>.
- Rodriguez-Ascaso, A.; Molanes-López, E. M.; Pérez-Martín, J.; Letón, E. Performance of students with different accessibility needs and preferences in “design for all” moocs. **PLOS ONE**, Public Library of Science, v. 19, n. 3, p. 1–22, 03 2024. Disponível em: <https://doi.org/10.1371/journal.pone.0299090>.
- Sanchez-Gordon, S.; Luján-Mora, S. Web accessibility of moocs for elderly students. In: **2013 12th International Conference on Information Technology Based Higher Education and Training (ITHET)**. [S.l.: s.n.], 2013. p. 1–6.
- Sato, M. *et al.* Assessing accessibility in moocs: A comparison of moodle and coursera for users with hearing impairments, visual impairments, and the elderly. In: **Anais do XXXIII Workshop sobre Educação em Computação**. Porto Alegre, RS, Brasil: SBC, 2025. p. 722–733. ISSN 2595-6175. Disponível em: <https://sol.sbc.org.br/index.php/wei/article/view/36211>.
- World Wide Web Consortium. **Diretrizes de Acessibilidade para Conteúdo Web (WCAG) 2.0**. 2008. Disponível em: <https://www.w3.org/Translations/WCAG20-pt-br/>.
- Zdravkova, K.; Dalipi, F.; Krasniqi, V. Remote education trajectories for learners with special needs during the covid-19 outbreak: An accessibility analysis of the learning platforms. **International Journal of Emerging Technologies in Learning (IJET)**, v. 17, n. 21, p. pp. 89–122, Nov. 2022. Disponível em: <https://online-journals.org/index.php/i-jet/article/view/32401>.