

ORIGINAL ARTICLE

USABILITY AND USER EXPERIENCE IN VIRTUAL LEARNING ENVIRONMENTS: HEURISTIC, EMPIRICAL, AND BEHAVIORAL EVIDENCE IN DISTANCE EDUCATION

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ABSTRACT

This article analyzes the usability of the Virtual Learning Environment (VLE) used in hybrid postgraduate courses at a private institution, aiming to understand how students navigate, interpret, and use the system, as well as how navigation, comprehension, and interaction issues affect the execution of academic activities. The study, qualitative, applied, and descriptive in nature, is structured as a case study developed in three phases: (i) an initial inspection, including a documentary analysis of the CPA report, use of the CSD Matrix, and a heuristic evaluation based on Nielsen's ten heuristics; (ii) moderated usability tests with three students, using screen recording and the Think Aloud protocol to identify performance, difficulties, and navigation strategies; and (iii) large-scale behavioral data analysis through Microsoft Clarity and Google Analytics, followed by triangulation of the findings. The results show that, although the VLE provides a consistent structure for content, Webclass, and academic tracking, systemic issues remain, such as limited visibility of status, unclear nomenclature, excessive scrolling, duplicated information, and slow performance on specific pages. Heatmaps, click patterns, and navigation trails indicate high cognitive effort, especially in assessment tasks and access to external materials, whereas pages such as Grades and Webclass demonstrate greater stability. The study concludes that the VLE partially meets the learning demands but requires improvements in information architecture, terminology standardization, feedback, and performance to reduce usability barriers and enhance the learning experience.

Keywords: Usability in VLEs; User Experience (UX); Distance Education.

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USABILIDADE E EXPERIÊNCIA DO USUÁRIO NO AVA: EVIDÊNCIAS HEURÍSTICAS, EMPÍRICAS E COMPORTAMENTAIS NA EDUCAÇÃO A DISTÂNCIA

RESUMO

Este artigo analisa a usabilidade do AVA utilizado em cursos híbridos de pós-graduação de uma instituição privada, buscando compreender como os estudantes navegam, interpretam e utilizam o sistema, bem como o impacto de problemas de navegação, compreensão e interação na realização das atividades acadêmicas. A pesquisa, qualitativa, aplicada e descritiva, organiza-se como estudo de caso em três fases: (i) inspeção inicial, incluindo análise documental do relatório da CPA, uso da Matriz CSD e avaliação heurística baseada nas dez heurísticas de Nielsen; (ii) testes moderados com três estudantes, utilizando gravação de tela e o protocolo *Think Aloud* para identificar desempenho, dificuldades e estratégias de navegação; e (iii) análise de dados comportamentais em larga escala por meio do *Microsoft Clarity* e *Google Analytics*, seguida de triangulação dos achados. Os resultados evidenciam que, embora o AVA ofereça estrutura consistente para conteúdos, *Webclass* e acompanhamento acadêmico, persistem problemas de visibilidade do status, nomenclatura pouco clara, excesso de rolagem, duplicidade de informações e lentidão em páginas específicas. Mapas de calor, padrões de clique e trilhas de navegação indicam esforço cognitivo elevado, especialmente em tarefas avaliativas e no acesso a materiais externos, enquanto páginas como Notas e *Webclass* apresentam maior estabilidade. Conclui-se que o AVA atende parcialmente às demandas formativas, no entanto, requer melhorias na arquitetura da informação, padronização terminológica, feedback e performance para reduzir barreiras de uso e qualificar a experiência de aprendizagem.

Palavras-chave: Usabilidade em AVA; Experiência do Usuário (UX); Educação a Distância.

USABILIDAD Y EXPERIENCIA DEL USUARIO EN EL AVA: EVIDENCIAS HEURÍSTICAS, EMPÍRICAS Y COMPORTAMENTALES EN LA EDUCACIÓN A DISTANCIA

RESUMEN

Este artículo analiza la usabilidad del AVA utilizado en cursos híbridos de posgrado de una institución privada, buscando comprender cómo los estudiantes navegan, interpretan y utilizan el sistema, así como el impacto de los problemas de navegación, comprensión e interacción en la realización de las actividades académicas. La investigación, de carácter cualitativo, aplicado y descriptivo, se organiza como un estudio de caso en tres fases: (i) inspección inicial, que incluye el análisis documental del informe de la CPA, el uso de la Matriz CSD y la evaluación heurística basada en las diez heurísticas de Nielsen; (ii) pruebas moderadas con tres estudiantes, mediante grabación de pantalla y el protocolo *Think Aloud*, con el propósito de identificar desempeño, dificultades y estrategias de navegación; y (iii) análisis de datos comportamentales a gran escala por medio de *Microsoft Clarity* y *Google Analytics*, seguido de la triangulación de los hallazgos. Los resultados evidencian que, aunque el AVA ofrece una estructura consistente para contenidos, *Webclass* y seguimiento académico, persisten problemas relacionados con la visibilidad del estado del sistema, nomenclatura poco clara, exceso de desplazamiento vertical, duplicidad de información y lentitud en páginas específicas. Los mapas de calor, los patrones de clics y las rutas de navegación indican un elevado esfuerzo cognitivo, especialmente en tareas evaluativas y en el acceso a materiales externos, mientras que páginas como Calificaciones y *Webclass* presentan mayor estabilidad. Se concluye que el AVA atiende parcialmente las demandas formativas; sin embargo, requiere mejoras en la arquitectura de la información, la estandarización terminológica, la retroalimentación y el rendimiento, con el fin de reducir las barreras de uso y cualificar la experiencia de aprendizaje.

Palabras clave: Usabilidad en AVA; Experiencia de Usuario (UX); Educación a Distancia.

1 Introduction

The advance of Digital Information and Communication Technologies, especially after the consolidation of the internet as an infrastructure for distributed educational practices, enabled the development of Learning Management Systems (LMS), systems designed for the management, mediation, and monitoring of online courses. These systems were responsible for structuring contemporary Distance Education (DE), offering integrated resources for navigation, content organization, assessment, communication, and student monitoring (Mattar, 2013). In the Brazilian context, the expression Virtual Learning Environments (VLEs) became established to designate such systems, maintaining functional equivalence with the international categories LMS, *Course Management System* (CMS), and Learning Content Management System (LCMS), whose conceptual distinctions involve nuances related to course management or the management of educational content.

LMS functionalities can be grouped into three main dimensions, which complement one another in the structure and operation of these environments. The coordination dimension comprises mechanisms aimed at organizing and supporting educational actions, ensuring the coherent flow of teaching and learning activities. The administrative dimension involves tools that support educators, such as the management of users, enrollments, schedules, access, and language settings, ensuring control and customization of the environment according to course needs. Finally, the communication dimension integrates resources intended for interaction and the visibility of participants' work, including forums, emails, noticeboards, portfolios, logbooks, and chat rooms, elements that foster the collaborative construction of knowledge and the maintenance of pedagogical dynamics (Filatro, 2015).

Although LMSs remain one of the main structural milestones of DE, emerging debates in the literature on educational design and technological innovation have questioned their limitations regarding learning personalization, interface flexibility, and integration with other emerging systems. These discussions, grounded in perspectives such as adaptive learning, the use of artificial intelligence, and user-centered design, point to the need to rethink virtual environments from a more dynamic perspective, capable of articulating multiple media, data, and forms of interaction. In this sense, a transition can be observed from traditional LMSs to more open and intelligent architectures, in which user experience and pedagogical mediation become central to the learning process (Mattar, 2013; Filatro, 2015).

This scenario has stimulated scientific interest in usability evaluation methodologies applied to VLEs, as new demands emerge from the expansion of online higher education, the intensification of technology-mediated interactions, and the expansion of digital architectures based on artificial intelligence and educational data. According to ISO 9241-11 (2021, p. 2), usability corresponds to the 'extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.' This concept assumes that the ease of use of a system depends on the combination of who uses it, what they intend to accomplish, and the conditions under which the interaction occurs, encompassing technical, cognitive, and contextual aspects.

From this perspective, the term user refers to the person who effectively interacts with the system, while the context of use encompasses the set of conditions that shape this interaction, including the tasks performed, the equipment used (*hardware*, *software*, and materials), and the physical and social environment in which the activity takes place. Usability, therefore, is manifested in the relationship among these elements: effectiveness, expressed by the accuracy and completeness with which

objectives are achieved; efficiency, defined by the resources required to perform tasks; and satisfaction, linked to comfort, acceptability, and the subjective experience of use (ABNT, 2021).

Considering usability in the educational context implies understanding how elements of design, information architecture, cognitive load, system performance, and clarity of instructions influence the student's educational path. In this context, usability problems are considered capable of causing delays in submitting activities, dropout, loss of engagement, and the need for additional pedagogical support, effects observed both in traditional environments and on more modern platforms (Cybis, 2003; Rocha & Baranauskas, 2003; Freitas, Farias & Pacheco, 2022).

In this context, the present study integrates classical usability evaluation methods, such as heuristic analysis and moderated user testing, with behavioral evidence obtained through tools for analyzing flow, heat, and interaction (*Microsoft Clarity* and *Google Analytics*), applied to the LMS used in hybrid postgraduate courses at a private higher education institution. This investigation responds to an institutional demand to understand systematically how students navigate, interpret, use, and perceive the VLE, as well as how these behaviors affect the fluidity and effectiveness of digitally mediated learning experiences.

Accordingly, this article aims to evaluate the usability of the VLE by identifying navigation, comprehension, and interaction problems faced by students while carrying out academic tasks. In doing so, the study seeks to support recommendations for improving the quality of the learning experience, contributing to the optimization of pedagogical flows and student interaction with digital technologies.

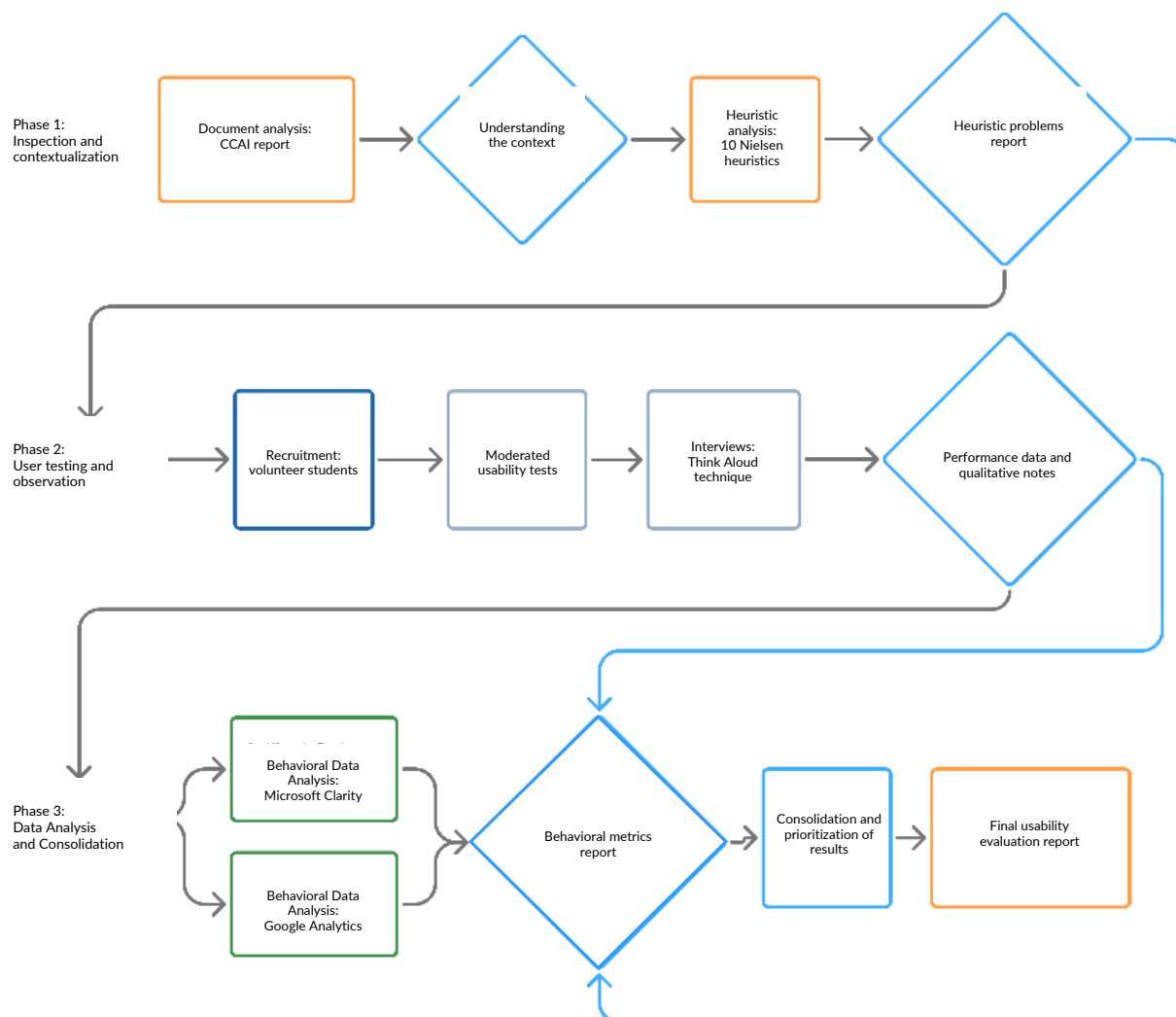
2 Methodology

This research was developed by adopting a qualitative approach, based on the understanding that this type of investigation seeks to interpret phenomena in depth, valuing participants' meanings, perceptions, and experiences in their real context. From this perspective, the researcher does not seek numerical representativeness or intend to frame phenomena within universal models, but rather to understand the specificities that emerge from a given social group or situation, recognizing the interpretive and contextual nature of knowledge production (Gerhardt; Silveira, 2009).

From the standpoint of its objectives, this is descriptive research, as it seeks to characterize systematically facts, actions, and perceptions related to the use of the VLE. Descriptive studies aim to record and analyze phenomena as they manifest themselves, without manipulating variables, allowing the researcher to describe behaviors and experiences based on techniques such as interviews, observations, or document analysis. In addition, the study takes the form of a case study, since it makes it possible to examine a specific unit in depth, in this case, postgraduate students' experience with the VLE, in order to reveal its characteristics, challenges, and particularities in the context of use (Gerhardt; Silveira, 2009; Gil, 2022).

The flowchart (Figure 1) summarizes the usability evaluation process carried out, integrating inspection methods, empirical tests, and large-scale behavioral data analysis. This methodological organization sought to ensure data triangulation, a central principle in *User Experience* (UX) research, by combining expert diagnoses, evidence obtained in real-use situations, and quantitative metrics derived from user behavior. This articulation strengthened the study's ecological validity because it enabled the findings to be corroborated by sources of evidence, converging toward a more consistent and comprehensive diagnosis of users' interaction experience on the platform.

Figure 1 - Usability evaluation flow



Source: prepared by the authors, 2025.

Considering this methodological flow, the process was organized into three main and interconnected phases. The first consists of the initial inspection of the platform, including document analysis and heuristic evaluation¹ intended to identify preliminary interface and navigation problems. The second phase encompasses direct observation of users through moderated tests and *Think Aloud* interviews, proposed by K. Ericsson and H. Simon (1984), making it possible to record behaviors, difficulties, and perceptions that emerged during actual use of the system. Finally, the third phase integrates large-scale behavioral data analysis and the subsequent consolidation of the findings, culminating in a final diagnosis that brings together evidence from multiple sources to guide recommendations for usability improvements.

¹ A set of principles formulated by Jakob Nielsen to guide interface evaluation, offering clear criteria for identifying problems that impair user interaction, such as lack of feedback, inconsistencies, excessive complexity, or low visibility of system actions.

The materials used in the research included platforms that supported data collection and analysis, such as *Microsoft Teams*® for conducting and recording the moderated interviews, *Microsoft Clarity*® for generating heat maps, recording sessions, and identifying friction points, and *Google Analytics*® for monitoring traffic and users' navigation flows. In addition to these resources, interview scripts, consent forms, guidelines for observers, and operational *checklists* were used, prepared in advance in

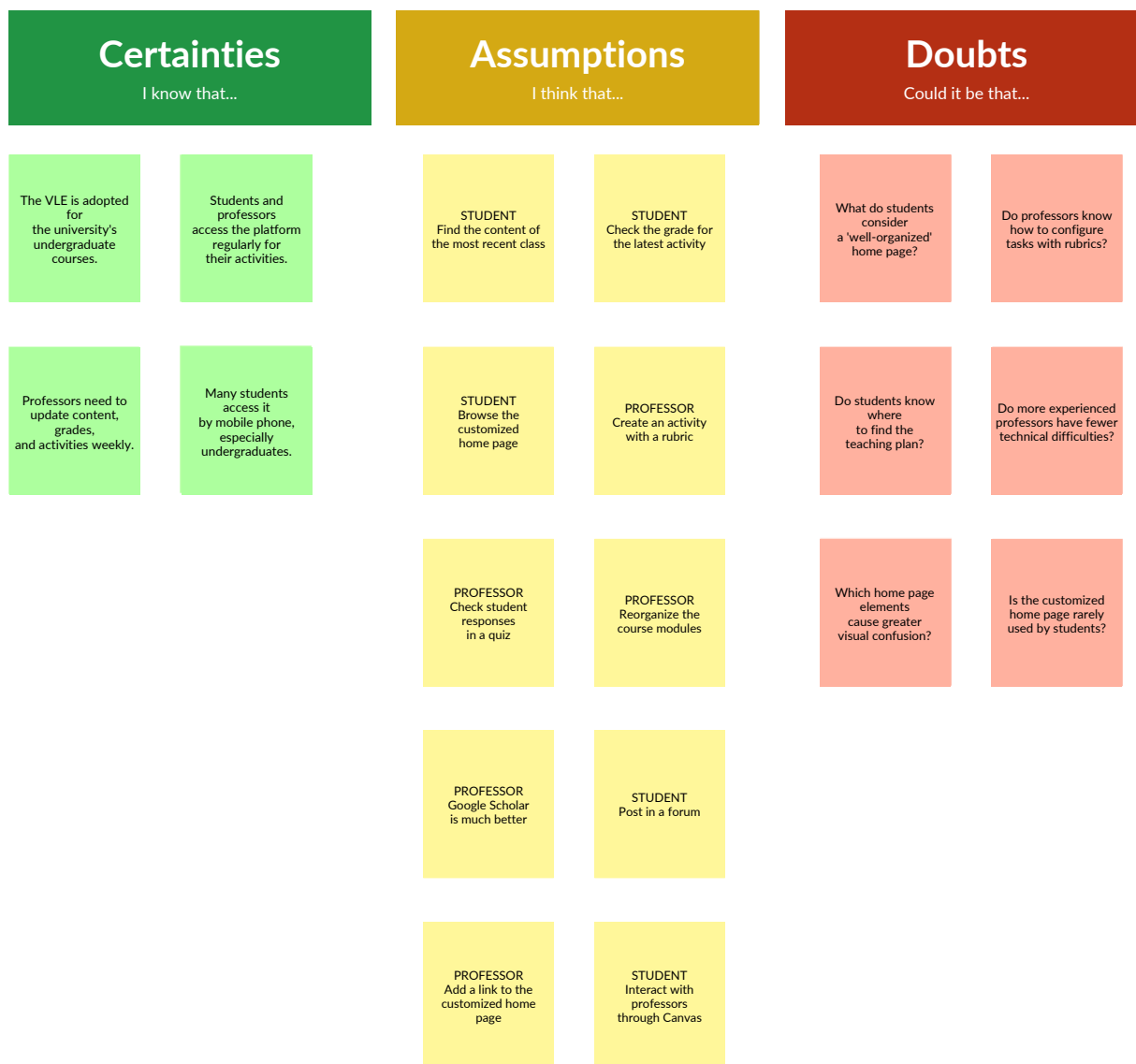
collaborative environments such as Miro® and Google Drive®, seeking standardization and methodological rigor in the investigative process.

3 Discussion and Results

The research participants were identified as P1, P2, and P3. The group presented different profiles of familiarity with the VLE, which made it possible to explore different levels of interaction, navigation, and adaptation to the system. P1 demonstrated high familiarity with Canvas, already having previous experience with other educational platforms, predominantly using a *desktop* and accessing the environment two to three times a week. P2, in turn, presented an intermediate level of experience, without indicating prior mastery of the VLE, but accessed it frequently, three to four times a week, using a *desktop* and *tablet*. P3 represented the least experienced profile, using the VLE for the first time, with no history of using other educational platforms and a lower access frequency, one to two times a week, mainly via *notebook*. This diversity of profiles was relevant to the research because it made it possible to identify usability nuances arising from both familiarity and inexperience in initial contact with the digital environment.

The first phase focused on inspection and contextualization of the platform, combining institutional document analysis with heuristic evaluation of the interface. The systematic reading of the report issued by the Institutional Evaluation Committee (CPA) made it possible to situate the study within the quality goals and expectations of the educational environment, providing the initial elements for defining the evaluation criteria. From this basis, the CSD Matrix - Certainties, Assumptions, and Doubts (Livework Brasil, 2010), Figure 2, was used as an instrument for conceptual alignment and risk management, systematizing the team's prior knowledge and distinguishing already validated facts, hypotheses to be tested, and points of uncertainty that required empirical investigation.

Figure 2 - CSD Matrix



Source: prepared by the authors, 2025.

By directing attention to the assumptions and doubts with the greatest impact, the CSD Matrix guided the preparation of the usability test script and the tasks applied, ensuring that the empirical stage focused on validating or refuting the most critical aspects of the user experience, subsequently refined on the basis of the data collected.

Next, the heuristic analysis conducted on the basis of Nielsen's ten heuristics (1994), presented in Figure 3, made it possible to identify initial problems related to navigation, information organization, interface consistency, and feedback provided by the system. These findings offered a preliminary diagnosis that strategically guided the subsequent empirical stages of the research by revealing critical points that directly interfere with users' experience in the VLE.

Figure 3 - Usability heuristics

Visibility of system status	User control and freedom	Match between the system and the real world	Consistency and standards	Error prevention	Recognition rather than recall	Help and documentation	Flexibility and efficiency of use	Aesthetic and minimalist design	Help users recognize, diagnose, and recover from errors
The system should keep the user informed about what is happening, with appropriate and timely feedback.	It should be possible to undo actions, exit unwanted states, and regain control easily.	The interface should use language, conventions, and structures familiar to the user.	Elements and behaviors should follow coherent patterns and remain familiar across screens and features.	The interface should prevent errors before they occur by guiding actions and reducing ambiguities.	Essential information should be visible in the interface, reducing the need for memorization.	Provide accessible instructions and support to help the user perform tasks when necessary.	Offer shortcuts and optimized paths for experienced users without harming beginners.	The interface should present only relevant information, avoiding cognitive overload.	Error messages should be clear, instructive, and free of technical codes.

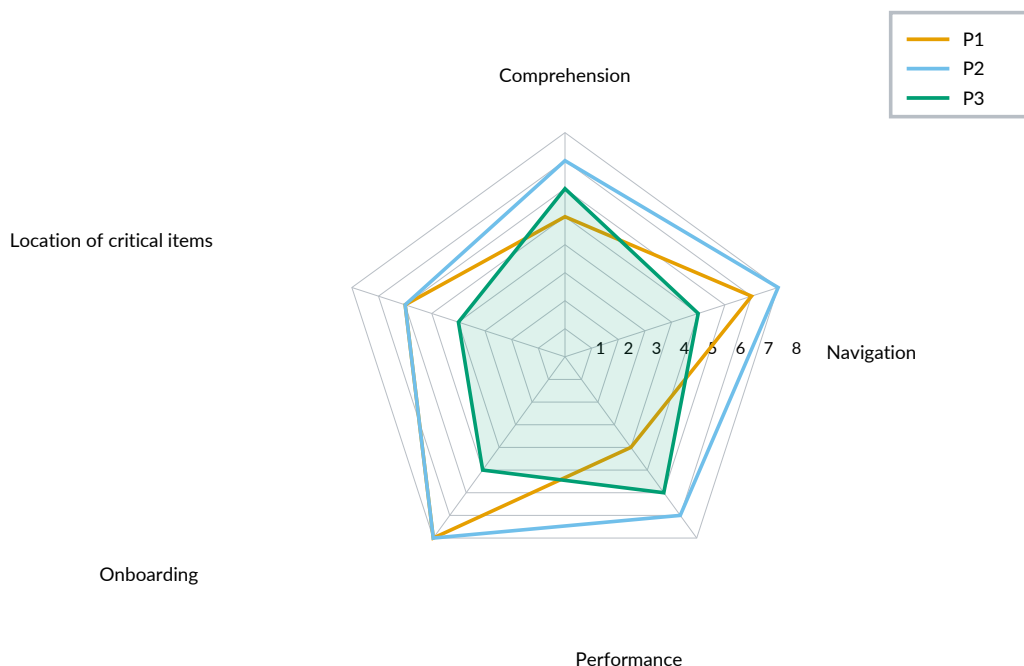
Source: adapted from Nielsen, 1994.

The application of the heuristics proved relevant in light of the findings of the Technical Usability Report, which identified navigation difficulties, inconsistencies in the organization of information, limitations in the visibility of system status, and comprehension problems related to the flow of activities. Among the points observed were recurring difficulty marking content as completed, limited clarity of the progress bar, excessive scrolling, and friction in accessing external materials, indicating violations of different Nielsen heuristics. These results reinforce the usefulness of heuristic evaluation as an initial stage for guiding adjustments to the VLE and supporting interventions aligned with users' needs.

The analytical product resulting from the first phase consisted of the consolidation of a robust initial diagnosis derived from the articulation between document analysis of the CPA report and heuristic evaluation of the VLE interface. The institutional reading made it possible to map demands, quality goals, and user expectations, while the application of the heuristics enabled the identification of systemic problems in navigation, nomenclature, status visibility, and the fluidity of interactions. These findings were organized into a Heuristic Problems Report, which summarizes critical failures, such as ambiguities in marking completion, limited clarity of the progress bar, and friction in accessing external materials, and served as a strategic guide for formulating the tasks, hypotheses, and observation focuses in the subsequent moderated tests. It is, therefore, a consolidated result that structures the empirical stage and delimits the priority points for validation during the investigation.

In the second phase, dedicated to direct observation of users, moderated usability tests were conducted with students P1, P2, and P3, recording task performance, the occurrence of recurring errors, and interface exploration patterns (Chart 1). These tests included screen recording and moderated monitoring and were complemented by the *Think Aloud* protocol, a technique in which the user verbalizes, in real time, their thoughts, doubts, and decisions while performing an activity. This procedure made it possible to follow participants' reasoning in greater detail, revealing expectations, understandings, and difficulties that would not be accessible solely through behavioral observation. The combination of behavioral evidence and spontaneous verbalizations expanded the explanatory capacity of the analysis, revealing the underlying reasons for the obstacles faced by users during interaction.

Chart 1 - Comparative analysis of students' friction points



Source: prepared by the authors, 2025.

The five categories analyzed correspond to foundational axes for understanding the quality of interaction in the VLE. Navigation refers to the ease with which the user moved through *menus*, pages, and system flows, identifying paths and performing actions without excessive effort. Comprehension involved the clarity with which labels, instructions, icons, and other interface elements communicate their purpose, making it possible to anticipate results and correctly interpret functionalities. Location of critical items concerns the speed and accuracy of searching for resources such as grades, assessments, required materials, and communication tools, reflecting the organization and hierarchy of content. *Onboarding* evaluated the initial familiarization process, considering the time and support needed for the user to understand the platform's general logic and perform basic tasks independently. Finally, performance encompassed the system's loading speed, stability, and responsiveness, elements that directly affect the fluidity of interactions and the continuity of academic activities.

Participant P2 obtained the highest scores in the five dimensions evaluated, indicating high familiarity with digital educational environments and rapid adaptation to the internal logic of the VLE. Their usage path shows that the platform more adequately meets the expectations of experienced users, enabling efficient navigation flows and a clear understanding of the actions required to complete academic tasks.

Participant P1, in turn, showed intermediate performance, with greater competence in navigation, comprehension, and *onboarding*, but a marked decline in the performance dimension. This reduction is consistent with the reported problems of slowness and excessive loading, which directly affect the efficiency and continuity of activities. Despite previous experience with other LMSs, structural aspects of the platform, especially those related to information organization and system *feedback*, increase the cognitive effort required to complete tasks and reduce predictability of use.

Participant P3 obtained the lowest scores among those evaluated, revealing pronounced challenges in navigation and in locating critical items. Their difficulties with essential resources, such as

grades and assessments, reflect both the perceived complexity of the interface and failures in matching labels to the user's mental model. The low *onboarding* result reinforces the need for explicit guidance for new users, indicating that familiarization with the VLE requires more time than desirable to promote autonomy.

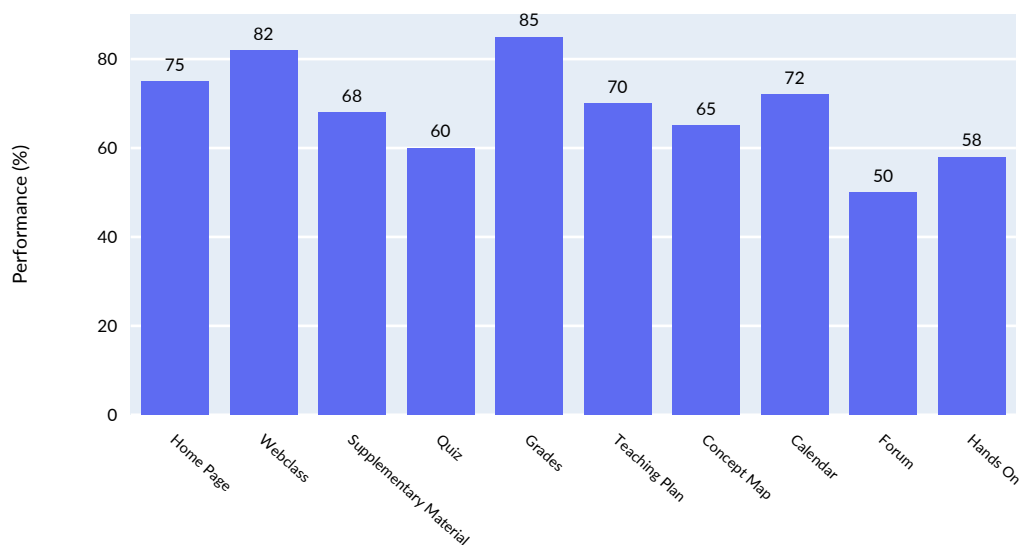
In this scenario, although there are relevant differences arising from previous experience and technological familiarity, the three participants converge on structural problems of the platform, especially regarding status visibility, clarity of nomenclature, and efficiency of navigation flows. These findings point to the need for systemic interventions that benefit both novice and experienced users, such as improving the progress bar with more explicit information about completion requirements, standardizing labels and categories to reduce ambiguities (for example, unifying terminology such as 'Quiz,' 'Assessment,' and 'Graded Activity'), and reorganizing the flow of access to essential content to reduce unnecessary steps. Such adjustments would help reduce friction in use, make interaction more intuitive, and strengthen the overall usability of the VLE.

From the interactions recorded in the second phase, an analytical set was developed that integrates participants' performance, their friction patterns, and the cognitive interpretations expressed during the tasks. This material brings together the comparative data from the five categories evaluated and the qualitative evidence revealed by the *Think Aloud* protocol. Together, this information made it possible to identify common difficulties as well as differences arising from participants' technological familiarity, establishing an overview of how different user profiles experience the VLE. The consolidated result of this stage therefore provides an interpretive basis capable of guiding the large-scale behavioral analysis phase and supporting the prioritization of problems that require structural interventions on the platform.

The third phase integrated behavioral data from *web analytics* tools, making it possible to validate the frequency and distribution of the problems identified in the previous phases. *Google Analytics*® contributed traffic metrics, navigation flows, and abandonment points, while *Microsoft Clarity*® provided heat maps and session recordings that revealed aggregated interaction patterns, such as decreases in scrolling, recurring clicks, and ignored areas of the interface. Triangulation among inspection, empirical tests, and behavioral analysis guided the consolidation and prioritization of the findings, resulting in recommendations grounded in the observed severity, impact, and recurrence.

Performance by page (Chart 2) shows relevant differences in the efficiency of user interactions across VLE sections: pages such as Grades (85%), Webclass (82%), and Home Page (75%) present the best results, suggesting good predictability, clear organization, and flows already assimilated by users. In contrast, Quiz (60%), Forum (50%), and Hands On (58%) show lower performance, indicating greater cognitive effort, difficulty locating relevant actions, and possible information architecture failures. Intermediate pages, such as Supplementary Material (68%), Teaching Plan (70%), and Calendar (72%), demonstrate stable use, but still with room for improvement. These data suggest that assessment tasks and pages with multiple action options concentrate the greatest usability barriers.

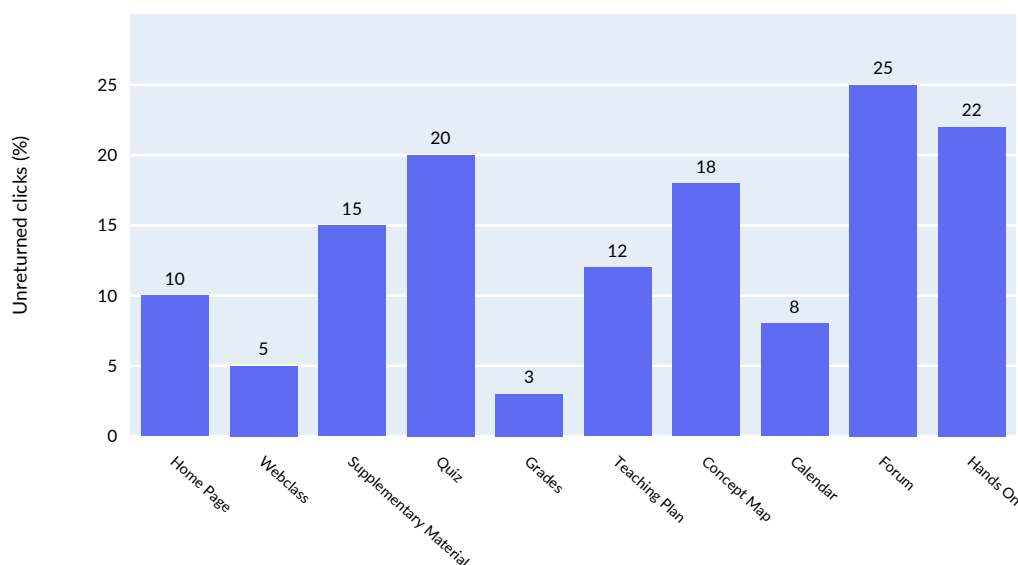
Chart 2 - Performance by page



Source: prepared by the authors, 2025.

Regarding unreturned clicks by page, an inversely proportional pattern is observed: pages with greater difficulty also present the highest percentages of ineffective clicks. As shown in Chart 3, Forum (25%), Hands On (22%), and Quiz (20%) are the points of greatest cognitive tension, indicating labeling inconsistencies, a lack of clear *affordances*, and failures of immediate *feedback*. In contrast, sections such as Grades (3%), Webclass (5%), and Calendar (8%) present a very low incidence of unreturned clicks, which reinforces their functional maturity and alignment with users' mental models. The pronounced discrepancy among pages shows that the platform does not present a homogeneous interaction pattern, which tends to cause confusion, especially for novice users.

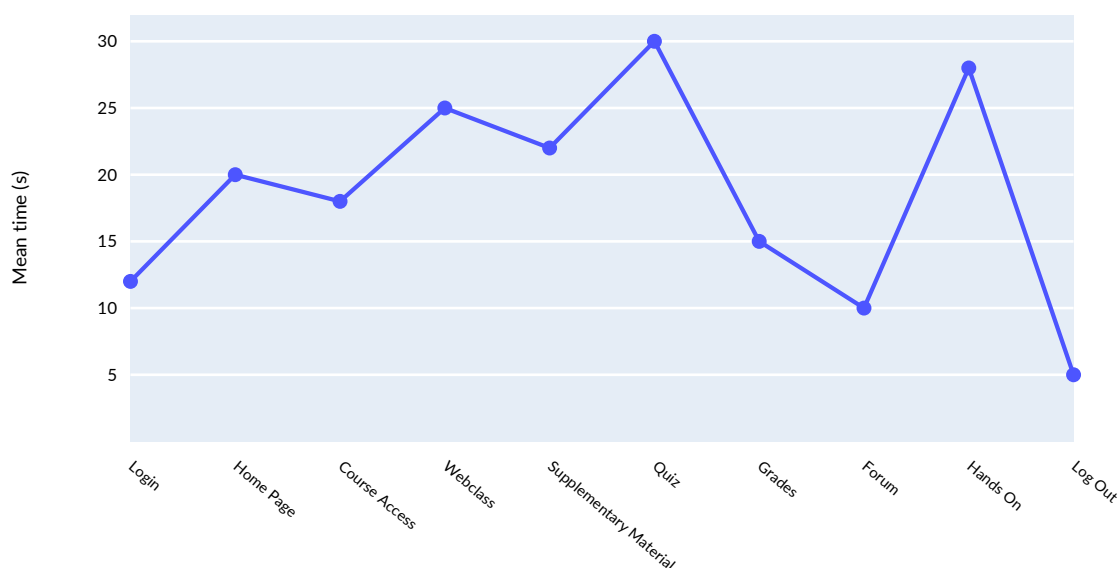
Chart 3 - Unreturned clicks by page



Source: prepared by the authors, 2025.

Regarding the user journey, the temporal dynamics of interactions reveal critical moments along the flow. The analysis in Chart 4 shows that the Quiz (30s), Hands On (28s), and Course Access (25s) stages concentrate the longest average times, indicating that they demand more complex interpretation, involve multiple steps, or lack explicit instructions. Conversely, stages such as Grades (15s), Forum (10s), and Logout (5s) present shorter times, indicating clarity and high predictability of the path. The drop in engagement after the middle of the page (confirmed by *Clarity* reports, which show a decrease in scrolling after 50%) suggests that essential content should not be positioned in lower regions. Thus, the journey reveals specific bottlenecks associated with cognitive load and navigation effort, demonstrating the need to improve flows involving assessment activities and access to supplementary materials.

Chart 4 - User journey



Source: prepared by the authors, 2025.

The final stage of Phase 3 consisted of consolidating and prioritizing the findings, at which point the behavioral data were integrated with evidence from the heuristic inspection and moderated tests. Cross-analysis showed that problems identified qualitatively, such as labeling ambiguities, feedback failures, and difficulty locating critical items, also manifest at scale, reflected in high rates of ineffective clicks, low permanence in key sections, and long times in assessment stages. From this triangulation, an agenda of actionable recommendations was structured and organized by criticality level, including adjustments to information architecture, improvement of assessment flows, standardization of nomenclature, and performance improvements, constituting the central output of Phase 3 and underpinning the Final Usability Evaluation Report.

4 Final Considerations

The results of this research show that, although functional in essential aspects, the experience of using the VLE presents structural limitations that directly influence how postgraduate students perceive, understand, and interact with the environment. The methodological triangulation adopted demonstrated that system usability is affected by aspects that go beyond users' technological familiarity, involving above all elements of information architecture, system *feedback*, and clarity of nomenclature. Thus, even experienced users encounter barriers related to the predictability of actions, visibility of status, and organization of assessment flows, revealing critical points that affect the fluidity of the learning journey.

In general, the findings make it possible to state that the proposed VLE partially meets students' educational needs, offering a robust structure for navigation, access to content, and academic monitoring. However, the recurrence of problems such as difficulty locating critical items, labeling inconsistencies, high cognitive effort in assessment stages, and dependence on external instructions for simple actions indicates that the system does not yet support a fully intuitive experience. These elements affect user autonomy and may compromise the efficiency of activities, especially for students in the initial stage of adapting to the virtual environment.

In response to the proposed objective, this study identified which aspects of the interface facilitate or hinder the performance of academic tasks and how these elements can be improved. The recommendations derived from the analysis, including the reorganization of assessment flows, terminology standardization, optimization of progress visibility, reduction of ineffective clicks, and performance improvement, constitute feasible guidelines for enhancing the quality of the learning experience mediated by digital technologies. It is therefore concluded that strengthening the usability of the VLE not only reduces operational barriers but also increases the clarity of interactions, promotes student engagement, and contributes to the consolidation of more accessible, consistent virtual environments aligned with the demands of higher education.

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