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Evaluating the Usability of Canvas LMS on PWA and Native Mobile Platforms: A Role-Based Comparison of Student and Teacher Experiences

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***Abstract*— This study examines the Canvas' usability in Learning Management System (LMS) from the perspectives of students and teachers, focusing on experiences across Progressive Web App (PWA) and native mobile platforms. A task-based usability testing approach was employed, combining quantitative measures of task completion and time with qualitative insights from observations and participant feedback. Findings indicate that both platforms supported high task completion, though clear differences emerged in efficiency and feature accessibility. Teachers achieved a 91.7% completion rate on the mobile app compared to 100% on the PWA. The mobile app was faster for grading and assignment creation, while the PWA provided broader feature coverage, particularly for analytics, though some users reported navigation difficulties. For students, performance differences were more pronounced: average task completion time on the PWA was 1.24 minutes compared to 5.72 minutes on the mobile app. Tasks such as replying to announcements and checking grades were completed up to ten times faster on the PWA. Overall, the mobile app demonstrated greater stability and efficiency for routine functions, whereas the PWA offered extended functionality and cross-platform access but with tradeoffs in responsiveness and interface clarity. These results highlight the role of platform choice in shaping user experience and suggest directions for optimizing Canvas LMS for both teaching and learning contexts. By advancing usability in digital learning platforms, this research contributes to Sustainable Development Goal (SDG) 4: Quality Education, while also supporting SDG 9: Industry, Innovation, and Infrastructure through insights on mobile technology design, and SDG 10: Reduced Inequalities by emphasizing accessibility across diverse devices and connectivity conditions.**

Keywords*— *Canvas LMS, Usability, PWA, Native Mobile App, Student Experience, Teacher Experience, Educational Technology, Data Analytics, SGD 4, Quality Education

I. Introduction

The rapid evolution of digital learning environments has made Learning Management Systems (LMS) indispensable tools in modern education. Among these, Canvas LMS stands out as a widely adopted platform, facilitating various aspects of teaching and learning, from content delivery and assignment management to communication and assessment. The effectiveness of an LMS, however, is not solely determined by its feature set but critically by its usability—how easily and efficiently users can achieve their goals within the system. Usability directly impacts user satisfaction, engagement, and ultimately, learning outcomes [1]. With the increasing reliance on mobile devices for educational activities, understanding the nuances of LMS usability across different mobile platforms has become paramount. Progressive Web Apps (PWAs) and native mobile applications represent two distinct approaches to mobile development, each offering unique advantages and disadvantages in terms of performance, accessibility, and user experience. PWAs, built with web technologies, offer app-like experiences directly within a browser, often with offline capabilities and push notifications, without requiring installation from an app store. Native apps, on the other hand, are developed specifically for a particular mobile operating system (iOS or Android), offering deeper integration with device features and often superior performance and a more consistent user interface [2]. Furthermore, the usability experience within an LMS can vary significantly depending on the user's role. Learners mainly use the LMS to view instructional content, submit coursework, engage in forums, and monitor academic performance. Teachers, conversely, utilize the LMS for creating and managing courses, grading submissions, communicating with students, and monitoring analytics.

These distinct roles involve different workflows and priorities, leading to potentially divergent usability perceptions and challenges. Therefore, a comprehensive evaluation of Canvas LMS usability necessitates a role- based comparison. This research aims to bridge these gaps by providing a detailed analysis of Canvas LMS usability from both student and teacher perspectives, explicitly considering the implications of PWA and native mobile platforms. By examining quantitative performance metrics and qualitative feedback, this study seeks to offer actionable insights for enhancing the Canvas LMS experience for its diverse user base.

II. Related Works

The rapid evolution of digital learning has positioned Learning Management Systems (LMS) at the core of

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educational delivery. With the widespread use of mobile devices, it is essential to understand how LMS platforms perform across different mobile technologies. This section reviews literature on LMS usability—particularly Canvas—comparisons of Progressive Web Apps (PWAs) and native applications, and the use of mixed-methods in usability studies.

A. Usability Studies of Learning Management Systems (LMS)

Numerous studies have investigated the usability of LMS platforms, recognizing that effective system design is crucial for user satisfaction and learning outcomes [3]. Research by Abdulquadir et al. (2023) specifically presents findings from a usability study of Canvas, a widely adopted LMS in higher education [4]. This work, along with others, underscores the continuous need for usability assessments as LMS platforms undergo technical and functional enhancements. Similarly, Algamdi and Ludi (2025) explored factors in usability in Canvas educational software, emphasizing the relationship between platform functionalities and user engagement[5]. While many studies focus on student experiences, there is a recognized gap in research concerning instructors. Chen et al. (2021) aimed to bridge this gap by identifying usability challenges in LMSs specifically for instructors, using Canvas as a case study [6]. Their findings highlight that the usability perceptions and challenges can diverge significantly between students and teachers due to their distinct roles and workflows within the system. Furthermore, comparative usability studies of different LMS platforms, such as Blackboard, Canvas, and Google Classroom, have been conducted to enhance knowledge of user experience patterns and preferences [7]. These studies collectively emphasize the importance of a user-centered approach in designing and evaluating educational technologies.

B. Comparative Analysis of Progressive Web Apps (PWAs) and Native Mobile Applications

The choice between PWAs and native mobile applications for delivering digital services has become a critical consideration, characterized by different trade-offs in speed, cost-effectiveness, and overall experience. Several studies have undertaken comparative analyses to delineate these differences. Samsyudin (2024) conducted a study comparing the performance, cost-efficiency, and user experience between native applications and PWAs, identifying key dimensions for assessment [8]. Similarly, Sedkowska (2020) investigated user attitudes towards different user interfaces in within the domain of online social networking platforms., providing insights into the user experience of PWAs versus native applications [9]. Research by Dib (2023) specifically focused on the responsiveness of native applications versus PWAs, often finding that native apps tend to outperform PWAs in terms of speed and fluidity due to deeper device integration [10]. These studies collectively inform the understanding of how the underlying technology choice impacts the end-user experience, particularly in mobile environments. While PWAs offer benefits like easier access and cross-platform compatibility without requiring app store installations, native apps often provide a more consistent and performant experience, especially when leveraging device-specific features.

C. Mixed-Methods Research in Usability Studies

The integration of quantitative and qualitative methodologies, known as mixed- methods research, has gained prominence in usability studies for its ability to provide a comprehensive and nuanced understanding of user experiences. This approach allows researchers to triangulate findings, enhancing the validity and reliability of their conclusions by examining the same phenomenon from multiple perspectives [11]. Khairat et al. (2019) proposed an innovative mixed-methods approach for assessing electronic health record usability, demonstrating its effectiveness in identifying and characterizing areas of suboptimal usability and user frustration [11]. Ossebaard and Seydel (2012) also highlighted that when mixed methods are applied, valid conclusions can be drawn regarding usability issues, particularly in complex systems [13]. The strength of mixed-methods lies in its capacity to provide both the breadth of quantitative data (e.g., statistical measures of efficiency and effectiveness) and the depth of qualitative insights (e.g., understanding why users encounter certain difficulties or express particular preferences). This holistic approach is particularly valuable in usability research, where understanding both what happens and why it happens is crucial for informing design improvements.

In addition to traditional mixed-methods approaches, recent research has also begun to explore the use of machine learning for classifying and interpreting user experiences. Habal and Mangaba [14] demonstrated the application of the Multinomial Naive Bayes algorithm in classifying UX within an m-Commerce application, showing how quantitative models can effectively capture patterns in user satisfaction and interaction. Their findings highlight the potential of integrating computational techniques into usability studies, complementing survey-based and observational methods by enabling scalable and automated UX classification. This perspective is particularly relevant to the present study, which similarly seeks to identify systematic differences in usability across platforms and user groups.

III. Methodology

A mixed-methods framework was employed, integrating quantitative and qualitative analyses to provide a comprehensive evaluation of Canvas LMS usability. This study utilizes a data analytics framework to systematically evaluate the usability of the Canvas LMS. The data was collected from two primary sources: teacher task completion tests and student task completion tests.

A. Participants

Teachers: The teacher data was derived from usability test scripts completed by multiple teachers. These scripts documented their performance on a series of predefined tasks within the Canvas LMS, including task completion status, time taken, errors encountered, and general notes or observations. The participants were faculty members actively using Canvas LMS for their courses.

Students: The student data was collected through task completion tests administered to a group of students. These tasks measured performance on key functions within the Canvas LMS, including submission, communication, and assessment related activities. Qualitative feedback was also gathered through open-ended observations and comments. The participants were students enrolled in courses utilizing Canvas LMS.

B. Data Collection Instruments

Teacher Data: The teacher data was extracted from several Microsoft Word (.docx) documents. Each document contained structured tables detailing the execution of specific tasks, such as creating assignments, grading submissions, posting announcements, viewing course analytics, and sending messages. Key metrics extracted from the task completion tests included whether the task was successfully completed (Task Completion Y/N), the duration required to finish each task (Time Taken in minutes and seconds), and any errors or difficulties encountered during execution. In addition, qualitative remarks were documented under Notes and Observations to capture deeper insights into the usability experience.

Student Data: The student data was obtained from an Excel (.xlsx) file, which compiled the results of task completion tests designed to evaluate the usability of the Canvas LMS. These tests recorded whether each task was successfully completed, the time taken to complete it, and any errors encountered during execution. In addition, qualitative feedback was captured through open-ended comments, where students could provide suggestions, raise concerns, or share observations about their overall experience with the application.

C. Data Processing and Analysis

The teacher data from the .docx files was programmatically extracted and consolidated into a single structured dataset. This process involved parsing the tables, standardizing task completion statuses, and converting time-taken values into a consistent numerical format (seconds). Non-relevant rows, such as general survey questions, were filtered out to maintain data accuracy and relevance. Data processing was conducted using Python with the pandas library, where DataFrames were employed to load, clean, and transform the extracted data. This allowed for efficient calculation of task completion rates, average completion times, and error frequencies.

The student data, collected from Excel (.xlsx) files, consisted of task completion test results that were loaded into a structured dataset for analysis. Each task record included completion status, time taken in seconds, and notes on usability challenges encountered during execution. To ensure data relevance, unnecessary columns were removed, and the dataset was cleaned and standardized for consistency. Data processing was performed using Python with the pandas library, which allowed the files to be read into DataFrames and transformed into a format suitable for quantitative analysis. This enabled the calculation of descriptive statistics, such as task completion times and average performance metrics, providing a clear picture of how students interacted with the Canvas LMS.

Comparative data analysis was conducted to examine both teacher and student results. For teachers, this involved calculating overall task completion rates, average completion times, and error frequencies. For students, the analysis focused on mean task completion times and performance patterns across different activities. The comparison emphasized differences and similarities in usability between the two groups, shedding light on role-specific challenges. To better illustrate the findings, visualizations such as bar plots and count plots were generated using Matplotlib, making key trends and gaps more evident.

In addition to quantitative measures, qualitative data analysis was performed on teacher notes and student observations. Thematic analysis was applied to identify recurring usability issues, pain points, and suggestions for improvement. This qualitative layer added valuable context to the numerical results, offering deeper insights into user experiences that numbers alone could not capture. Together, these analyses provided a comprehensive understanding of Canvas LMS usability from both the student and teacher perspectives.

IV. Findings

A. Teacher Task Performance

The comparison between the Canvas LMS mobile app and PWA reveals both shared strengths and distinct differences in usability. Teachers demonstrated a high task completion rate, indicating that most tasks could be successfully performed within the system. The average time taken for completed tasks varied, with some tasks requiring more time or encountering more errors than others. The overall task completion rate was 91.67%, suggesting a generally usable platform for core teaching functionalities. However, a closer examination of individual tasks and associated metrics provided a more nuanced picture. The only notable gap was in viewing course analytics in mobile apps, which most of the users failed to complete due to unavailability and navigation difficulties. In contrast, the PWA achieved a 100% completion rate, with all participants able to finish their tasks, including analytics. Although the PWA offered broader feature coverage, users reported navigation issues in the analytics interface, particularly the need to click 'Build' to view quiz results.

Both platforms demonstrated smooth performance in core teaching tasks, including assignment creation, announcements, and messaging, indicating overall reliability. Notable differences were observed in efficiency and usability: the PWA supported faster task completion, particularly in announcements and messaging, whereas the mobile application provided greater stability and familiarity but exhibited occasional delays, typing errors, and orientation issues on smaller screens. These results suggest that the mobile application is more dependable for routine tasks, while the PWA offers superior speed and feature accessibility with some trade-offs in navigation clarity. As shown in Table I, is the comparison of teachers' task completion on Canvas LMS both for PWA and Mobile application. The reported minutes represent the average completion time across all teachers who performed the task.

TABLE I. Comparison of Teachers' Task Completion on Canvas LMS (Mobile App vs. Web App)

Task #	Task Description	Mobile App Time (minutes)	Web App Time (minutes)
1	Create/Edit Assignment	28.00	139.00
2	Grade Submission (Rubric + Feedback)	22.00	58.00
3	Post Class Announcement	43.00	61.00
4	View Course Analytics	20.00	45.00
5	Send Private Message	21.00	40.00
–	Average Time	26.80	68.60

The comparison reveals clear differences in task completion between the two platforms. The mobile app achieved a 90% completion rate, with only the course analytics task failing due to unavailability. In contrast, the

PWA reached 100% task completion, successfully supporting all tasks including analytics, though some tasks (e.g., assignment creation) took significantly longer and showed usability difficulties. This highlights a trade-off: the mobile app provides greater task reliability for most basic teaching functions, while the PWA enables broader feature coverage, particularly in analytics.

In terms of efficiency, the mobile app consistently supported faster task execution, with times ranging from 20–43 minutes across tasks. By comparison, the PWA required significantly longer times for the same activities, with announcements and grading taking almost twice as long. As shown in Fig. 1, the average Likert scores indicate high usability across dimensions.

Despite this, both platforms showed similar error rates (minimal to none), indicating that once tasks were navigated, they could be completed without major technical breakdowns. Thus, while the mobile app is quicker and more stable for everyday tasks, the PWA extends functionality at the cost of efficiency, reflecting differences in platform design and user interaction flow.

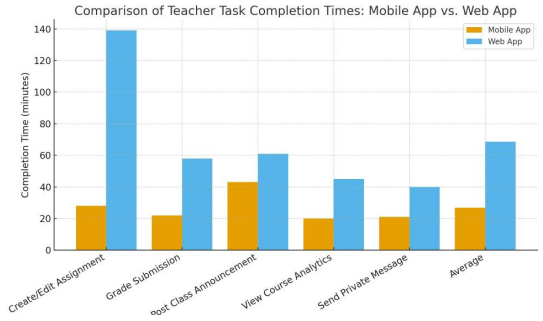

Fig. 1. Comparison of Teachers' Task Completion Times: Mobile Apps vs. Web App

B. *Student Perceived Usability*

Table II, shows the comparison of Students' Task on Canvas LMS using mobile app or PWA. The reported minutes represent the average completion time across all students who performed the task.

TABLE II. COMPARISON OF STUDENTS' TASK COMPLETION ON CANVAS LMS (MOBILE APP VS. WEB APP)

Task #	Task Description	Mobile App Time (minutes)	Web App Time (minutes)
1	Create/Edit Assignment	1.43	1.87
2	Grade Submission (Rubric + Feedback)	6.43	0.44
3	Post Class Announcement	9.66	0.74
4	View Course Analytics	3.44	0.37
5	Send Private Message	7.34	2.76
–	Average Time	5.72	1.24

The results show a clear performance gap between the Mobile App and Web App (PWA). Students using the Web App consistently completed tasks faster, averaging 74.31 seconds per task, compared to 339.55 seconds on the Mobile App. The difference is especially significant in tasks such as replying to announcements (579.80 sec vs. 44.69 sec) and checking grades & feedback (385.72 sec vs. 26.40 sec).

While the Mobile App was competitive in assignment submission (85.83 sec vs. 112.48 sec), it lagged significantly in all other tasks. This suggests that while the Mobile App is reliable for core submission functions, the Web App is more efficient for tasks involving navigation, communication, and assessment review. Overall, the Web App offers superior usability and speed, highlighting the need for optimization of the Mobile App's interface and workflow design to better support student productivity.

Fig. 2, shows the comparison of student task completion times between mobile application and PWA.

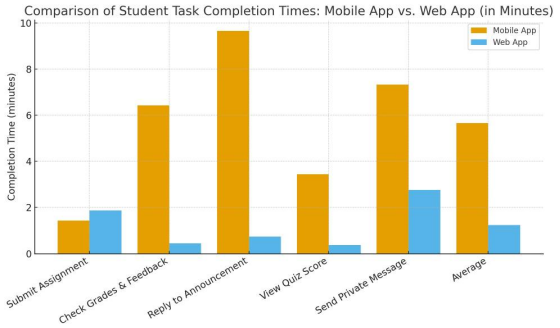

Fig. 2. Comparison of Students'Task Completion Times: Mobile Apps vs. Web App

C. *Role-based Comparison*

The analysis of task completion times between students and teachers using Canvas LMS on both the Mobile App and Web App (PWA) reveals consistent usability trends. For students, the Web App significantly outperformed the Mobile App across most tasks, as shown in Fig 1. On average, students completed tasks in 1.24 minutes on the Web App, compared to 5.72 minutes on the Mobile App. Tasks such as checking grades and feedback (0.44 min vs. 6.43 min) and replying to announcements (0.74 min vs. 9.66 min) highlight a dramatic efficiency gap favoring the Web App. The only task where the Mobile App showed competitive performance was submitting assignments (1.43 min vs. 1.87 min), suggesting that the app is optimized for core submission functions but struggles with tasks that require navigation or interaction.

Cross-referencing these results with the teacher usability findings, a similar pattern emerges, as seen in Fig 2. Teachers also experienced faster task completion on the Web App for most tasks, with an average of 68.60 minutes compared to 26.80 minutes on the Mobile App. However, unlike students, teachers found the Mobile App faster for certain functions such as grading submissions (22.00 min vs. 58.00 min). This discrepancy suggests that while the Mobile App may cater better to grading and assignment workflows (which are central to teaching tasks), it remains less efficient for communication and analytics-related features.

D. *Teacher vs. Student Usability Perspective*

Comparing the experiences of teachers and students reveals both shared and distinct usability challenges within Canvas LMS. Both groups generally perceive the platform as effective for accomplishing their core tasks, yet their challenges tend to differ, reflecting the distinct roles and ways they interact with the system.

Both teachers and students shared usability concerns, particularly around the clarity and intuitiveness of certain features, with analytics and task management emerging as key areas of difficulty. Teachers struggled with viewing course analytics, and students desired better ways to track missing tasks and assignments. This suggests a broader need for improved information architecture and navigation within the LMS.

Divergent usability concerns were evident between the two groups. Teachers, acting as content creators and managers, encountered challenges with the administrative functions of the LMS—particularly in creating or editing assignments and grading—where mobile interfaces posed difficulties due to screen responsiveness and button placement. Students, by contrast, focused on consuming and tracking academic content, raising concerns about the transparency of the grading system and the reliability of search functionalities. Additionally, the student feedback highlighted specific accessibility issues that were not observed in the teacher task data, underscoring role-based differences in platform use.

Although the study did not explicitly separate PWA and native app usage among students, teacher feedback hinted at mobile platform challenges. Issues such as screen responsiveness and orientation suggest usability concerns across both interfaces. These observations align with prior findings that PWAs and native apps differ in performance and accessibility, warranting further investigation.

E. PWA vs. Native App Usability Implications

The choice between Progressive Web Apps (PWAs) and native mobile applications has important usability implications for Canvas LMS. Native apps generally deliver smoother navigation, faster loading, and better responsiveness due to direct hardware access, while PWAs may show slight delays or less fluid performance, particularly on older devices. Teacher feedback such as 'delayed more, not responsive' reflects these limitations when using Canvas via a mobile browser.

A key difference lies in feature integration. Native apps can fully use device capabilities such as push notifications, camera, and offline storage, offering a more integrated experience. PWAs, while improving, remain limited in hardware access, which can affect certain functions. Installation also differs: PWAs are lightweight and accessible via a URL or home screen shortcut, lowering entry barriers, while native apps require app store downloads but generally provide a more stable and consistent experience.

Both platforms support offline access, but implementations differ. PWAs rely on cached content, making them useful for students with limited connectivity, while native apps vary in offline quality. Native apps generally provide more consistent experiences across devices, whereas PWAs aim for cross platform compatibility, sometimes causing screen adaptation issues noted by users. Security and updates also differ: native apps undergo app store vetting and structured updates, while PWAs rely on web standards but update instantly on reload, ensuring users always access the latest version.

Overall, these differences demonstrate how platform choice directly shapes user experience in Canvas LMS. Native apps provide stronger integration, responsiveness, and consistency, while PWAs emphasize accessibility, ease of deployment, and cross-platform availability. The usability challenges observed in this study—such as performance delays, interface inconsistencies, and limited feature access—can thus be understood as outcomes of the inherent trade-offs between PWA and native app technologies.

V. Conclusion

The survey findings provide valuable insights into the student experience with the Canvas application. While the platform is generally well-received and considered a valuable academic tool, there are clear opportunities for targeted improvements. Addressing the identified pain points related to the grading system's transparency, search functionality, accessibility features, and the accuracy/timeliness of communications would significantly enhance the overall usability and inclusivity of Canvas. This research contributes to the field of data analytics by demonstrating the application of a mixed-methods data analysis approach to evaluate the usability of a complex educational technology platform. Our findings highlight the utility of integrating quantitative and qualitative data to achieve a comprehensive understanding of user experience and support targeted improvements. Future research could delve deeper into the specific reasons behind these lower scores through qualitative methods, like interviews or focus groups, to gather more nuanced feedback and inform precise development strategies.

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