Comparative Evaluation of Accessibility and Learnability of Learning Management Systems: Case of Fronter and Canvas

Faizan Ahmad, Wondwossen Beyene, and George Anthony Giannoumis
Oslo Metropolitan University, Oslo, Norway
s310222@stud.hioa.no, wondwossen.beyene@hioa.no, gagian@hioa.no

Abstract. Learning Management systems (LMSs) are becoming integral parts of the teaching and learning process in higher learning institutions. As they are supposed to be used by students who are diverse in terms of ability/disability, gender, learning style, experience, and other factors, they must be designed to be accessible and learnable to all to the extent possible. Several studies have looked into accessibility and usability of LMSs employing different techniques. This study aims to contribute to the existing body of knowledge by providing the user's perspective. The Oslo Metropolitan University is in the process of replacing the LMS Fronter with Canvas. In this study, eighteen students at who have access to the two LMSs have been contacted to evaluate the learnability and accessibility of both LMSs though task-based interviews and justify whether Canvas was the better choice. The findings show that there are aspects where one LMS is better than the other. The paper thus concludes by providing pointers that could be important to ensure accessibility and learnability of LMSs during their implementation.

Keywords: Learning Management Systems, Accessibility, Learnability, eLearning, Universal Design

1. Introduction

Learning management systems (LMSs) are employed to facilitate the teaching-learning process in higher learning institutions. They enable teachers and students to access learning materials at anytime and anywhere, serve as a common source of learning for everyone; and extend students' channel of communication and thus help them to learn in a quicker and efficient manner [1]. To make LMSs more effective, it is important to make them accessible and learnable to all users, which are diverse terms of experience, ability/disability, language, and many other factors.

It is estimated that 15-20% of the Norwegian people live with different forms of disabilities and two out of three students receive special education outside their class [2].There are some who argue that special education could instill a sense of otherness [3]. Nevertheless, LMSs create opportunities for students to learn at their own paces and, at the same time, share the same classroom with other fellow students.

Countries which ratified the U.N. convention on the rights of people with disabilities should ensure accessibility of information and communication technology (ICT) systems. Advances in accessibility and universal design provide the tools and the means

to design accessible LMSs. LMSs should also be designed to be easily understandable by incoming students which can have different levels of ICT skills.

The Oslo Metropolitan University has been using the Fronter[1] (see Fig 1) for years and is now in the process of replacing it with Canvas[2] (see Fig. 2). The process is expected to be completed in May 2018. According to personnel overseeing the project, the university is switching to Canvas because it is more flexible, and it has more features when compared with other LMSs. For instance, she said that peer-to-peer review is possible on Canvas but not on Fronter. She also added that Canvas provides more 'space' to the teachers to use different techniques. These were among the main qualities that made Canvas more appealing.

This research aims to evaluate the learnability and accessibility of both LMSs from the students' perspective. It also provides some recommendations on what should be considered in future implementation of LMSs.

Fig. 1. User interface of Fronter

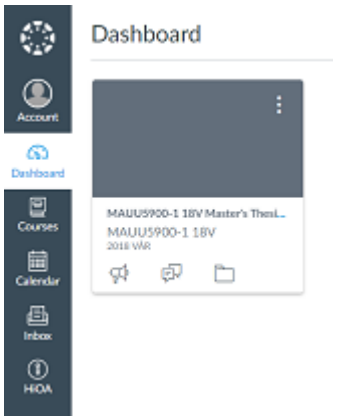

Fig. 2. User interface of Canvas

[1] https://itslearning.com/global/Fronter/Fronter-home/

[2] https://www.Canvaslms.com/?lead_source_description=instructure.com_

2. Related Work

Usability refers to the concept of "user friendliness", explaining for how easy is a system to use [4]. Learnability is component of usability which specifically refers to a quality of a system to be easily understandable by first time users without any special training in a shortest possible period [4] [5]. Accessibility, on the other hand, means that people with disability can perceive, understand, navigate, and interact with web-based systems without barriers.

LMSs present different learning environments and features unique to each of them. Therefore, Rangin et al [6] believe that the purpose of LMSs evaluation should not be to rank them but to remind content and product developers on features that would affect user's experience. The comparative evaluation they conducted on four different LMSs identified accessibility and learnability issues such as lack of sufficient headings, lack of labels at some areas of the LMSs, lack of shortcuts and 'skip' buttons which would affect screen reader users, lack of icon links in some areas, and other related issues.

Pretorius and Biljon [7] investigated the effect of ICT skills in learnability and usability of LMSs. Their study found that the clarity of language for displaying error messages or in describing basic tasks affects the learnability of LMSs. The study by Al - Khalifa [8] showed that even students well-acquainted with computers and web systems would struggle to easily understand an LMS.

Chen, et al. [9] conducted heuristic evaluation of two LMSs such as Fronter and Sakai to see how the systems help teachers to create accessible content. The Authoring Tool Accessibility Guidelines (ATAG) 2.0. were adopted to design the heuristic evaluations. The study found low-level conformance to ATAG guidelines. That includes missing possibility to add text descriptions for audio and video files, limited capabilities for keyboard navigation, inaccessibility of status indicators for screen readers and other related issues.

The papers presented above show that the accessibility of LMSs is affected not only the design of the interfaces but also the capability of the content management systems in helping content creators provide accessible content. Moreover, vocabularies and expressions used could affect learnability of LMSs even to those who are well acquainted with ICT.

3. Methodology

3.1. Selection of Participants

Eighteen students who have access to both LMSs were purposefully selected to take part in this study. Six of them were first degree students while twelve of them were master's students including two visually impaired students. Their age ranged from Twenty to forty-five. Seven of them were female and eleven of them were male participants. . Moreover, the project manager overseeing the transition from Fronter to Canvas was interviewed to understand the motive behind choosing a new LMS.

3.2. Method of Data Collection and Analyses

Task-based evaluation (interview) method was main method of data collection. The students were asked to perform eight different tasks relating to their normal use of the LMSs. The tasks included logging in, searching files, uploading files, downloading files, checking 'news', checking notifications, checking user guides, and connecting to others. The two visually impaired participants were given the extra task of changing the color contrast, and check the LMSs with the Narrator, an accessibility tool included with Windows operating system. During the execution of the tasks, they were asked to provide their opinions on the features they checked and functions they performed. That was accompanied by a heuristic evaluation informed by Web Content Accessibility Guidelines (WCAG 2.0)[3] and usability guidelines. The data was analyzed thematically.

4. Results

4.1. Features

Toolbar. Both LMSs have toolbars that provide tools for accessing different functionalities of the systems. Fronter's toolbar contains icons for 'Rooms', tools, search, My portfolio, email, and a shortcut to the users Microsoft OneDrive account. Canvas toolbar contains icons such as account, dashboard, courses, calendar, inbox, and a link to university information pages and the user manual. Twelve participants judged icons used in Fronter as more self-explanatory and easy to understand. Only six participants chose icons used in Canvas. Fronter supports the mouseover functionality to provide hints on the item being hovered over. Currently, Canvas lack that capability.

Dashboard. Fronter's first page labeled as 'Today' contains toolbar, notification bell and a news section and shortcuts to recently uploaded documents. Canvas's first page labeled as 'Dashboard' contains a toolbar, calendar, and "Recent Activity'. The project manager said that, unlike Fronter, Canvas's 'notifications' section doesn't provide notifications which are not relevant to a user. fourteen participants said that Canvas's dashboard is more understandable than Fronter's. For instance, Canvas displays deadlines at the top whereas, on Fronter, one has to scroll down to find them. Four participants including the visually impaired said they are comfortable with Fronter. the visually-impaired participants said that Fronter is easier to use with screen magnifiers. However, Canvas's user guide states that the LMS is compliant to web accessibility guidelines.

Rooms/Courses. Fronter's 'Rooms' and Canvas's 'Courses' lead to list of courses and course materials available on the LMSs. Fourteen participants said that Canvas's 'courses' is a more understandable label than 'rooms'. Moreover, it is easier to browse

[3] https://www.w3.org/TR/WCAG20/

through subsections of the courses such as grades, files, syllabus, discussion and others. The participants also indicated that the vocabulary used in Fronter's rooms such as 'hand-in' and 'forum' could be difficult to understand for first time users.

Profile/ Account. Fronter's 'my profile' does not allow editing user information by the user. On the other hand, Canvas's 'account' allows the user to change or add preferences such as language settings, notification preferences, and adding a secondary email. Moreover, users can see and access documents uploaded by them and their instructors. All the participants said Canvas is better.

User Guide. All the participants mentioned that Canvas user guide is better than Fronter's because it provides all the information in three different ways (Text, Pictures, and videos). The video tutorials are not accompanied by transcripts or captions, which could potentially impact users with hearing impairment.

Accessibility. Twelve students were comfortable with the color scheme used on Canvas while the rest of them said that it doesn't matter. The students with low vision impairment said that Canvas provides better color contrast. This could be important to those users with color blindness. The icons and labels on Fronter become less visible in high contrast. Canvas does better but, in high contrast, the toolbar becomes brighter which could make it uncomfortable to some users with visual difficulties (see Fig 3 and 4).

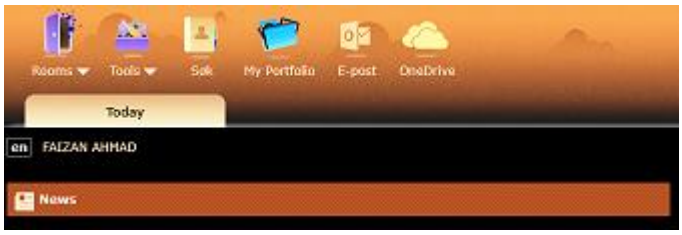

Fig 3. Fronter user interface in high contrast.

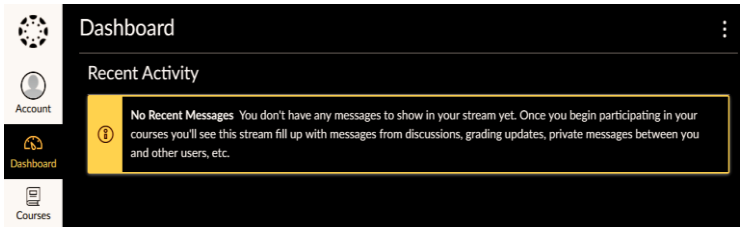

Fig 4. Canvas user interface in high contrast

4.2. Functions

Search. Fifteen participants said that it is difficult to find files using the search tool on Fronter. Canvas offers a search functionality to search files within a specific course and, according to the students, Canvas is better for searching course materials.

Upload/ download. Canvas provides the chance of previewing files before downloading them. That functionality is missing with Fronter.

4.3. Summary: Learnability and accessibility of the LMSs.

The overall evaluation showed that Canvas could be more understandable to first-time users when compared with Fronter. However, there were some features in which Fronter does better. Table 1 and 2 summarize the accessibility and learnability issues of the two LMSs as explored mainly through the perspective of users included in this study.

Table 1. Summary of Learnability Features in both LMSs

Learnability Features	Fronter	Canvas
Mouseover hints	Yes	No
Tutorials	No	Yes
Understandability of vocabulary (of tasks, features)for first time users	Partial	Yes
Icons (understandability)	Yes	partial

Table 2. Summary of Accessibility Features in Both LMSs

Accessibility Features	Fronter	Canvas
Screen magnifier	Yes	Yes
High contrast	Partial(less visual acuity)	Partial (but better)
Keyboard navigation	Partial	Yes
Alterative text to images	No	Yes (allows entry of alternative texts)
Accessiblity to screen readers	Yes	Yes
Video captions	No	No

5. Discussion and conclusion.

In this study, we tried to evaluate the learnability and accessibility of two LMSs mainly from users' perspective. Learnability is a very important trait for an LMS as it is important for new students to start using the system with minimal or no training. Moreover, the diversity of uses in terms of dis/ability, experience, and other features makes accessibility an important attribute to an LMS.

Higher learning institutions would have different motivations for switching from one LMS to the other. However, as shown in this study, one LMS could have features which are better learnable and accessible than the other. For instance, this study implies that Canvas is more accessible and learnable than Fronter. However, it also showed that Fronter is better in some aspects according to the participants. That could be the result of many factors including experience. Nevertheless, it is important to incorporate concerns of accessibility and learnability like those discussed here: ensure that icons and buttons are self-explanatory, provide mouseover hints on icons, provide captions for images and videos, enable searching through a course or the whole LMS, and follow other recommendations in the available accessibility and usability guidelines.

6. References

1. Center for Educational Innovation: University of Buffalo. : Trends and the Future of Learning Management Systems (LMSs) in Higher Education, https://www.buffalo.edu/content/dam/www/ubcei/publications-white-papers/CEI-White-Paper-Trends-of-Online-Learning-in-Higher-Education.pdf.
2. The Norwegian Directorate for Children, Youth and Family Affairs.: Statistics on disabilities in Norway, https://www.bufdir.no/en/English_start_page/Disabilities_in_Norway/Statistics_on_disabilities_in_Norway/, last accessed 2018/02/20.
3. Lalvani, P.: Disability, Stigma and Otherness: Perspectives of Parents and Teachers. International Journal of Disability, Development and Education, 62(4), 379–393 (2015).
4. Nielsen, J.: Usability 101: Introduction to Usability, https://www.nngroup.com/articles/usability-101-introduction-to-usability/, last accessed 2018/03/11.
5. Lazar, J., Jones, A., Shneiderman, B.: Workplace user frustration with computers: an exploratory investigation of the causes and severity. Behavior & Information Technology, 25(3), 239–251(2006).
6. Rangin, et al.: A comparison of learning management system accessibility. http://presentations.cita.illinois.edu/2011-03-csun-lms/, last accessed 2018/02/20.
7. Pretorius,M., Judy van Biljon.: Learning management systems: ICT skills, usability and learnability", Interactive Technology and Smart Education, 7(1), 30-43(2010).
8. Al-Khalifa, H. S.: A first step in evaluating the usability of Jusur learning management system. In: 3rd Annual Forum on e-Learning Excellence in the Middle East, pp (2010).
9. Chen, W., Sanderson, N. C., Kessel, S., Królak, A.: Heuristic evaluations of the accessibility of learning management systems (LMSs) as authoring tools for teachers. First Monday, 20(9), Article 6 (2015).