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INVESTIGATION OF INSTRUCTORS' LEARNING ANALYTICS INDICATOR PREFERENCES IN SMART MOOC DASHBOARD: AN EYE-TRACKING STUDY

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Abstract

The use of dashboards in e-learning environments is becoming increasingly common. In these dashboards, necessary data can be analyzed and monitored for students, teachers and administrators. However, when the literature is examined, it is understood that more research is needed on which indicators and metrics should be included in dashboards. Within the scope of this study, the indicators and metrics in the teacher dashboard of the Smart MOOC system were analyzed from the perspective of the instructor. In other words, it was evaluated which of the indicators and metrics related to the class on the dashboard the instructors examined more and which ones they examined less. The research was conducted using an eye-tracking method. The research was conducted with 5 instructors who actively use the Smart MOOC environment and have taught courses in this environment. The results of the research show that the instructors focus more on the following metrics on the dashboard; the instructors look at the student's performance in the course, successful and unsuccessful subjects, and the duration of students' use of the system and its components. In line with the findings of the study, several suggestions were made for future research and dashboard design.

Keywords: dashboard, Smart MOOC, instructor, eye-tracking

Introduction

Dashboards are software interfaces in which certain data, statistics or information are presented to the user in the software environment as visuals such as graphs, tables. Dashboards can be used for various purposes in different fields. For example, it can be used for purposes such as examining customer behavior in business life, managing business entries and exits. Dashboards are especially used for analyzing and monitoring data suitable for the purpose. For example, in a workplace, a manager can track financial data, sales figures and other important metrics about her/his company through a dashboard and take necessary actions (Gounder et al., 2016; Gowthami & Kumar, 2017).

With the widespread use of e-learning, e-learning tools and environments have started to be used frequently in recent years. In e-learning environments, dashboards can be used to monitor, evaluate

and manage the educational process of students, instructors and administrators. With dashboards in e-learning environments, students' level of participation in the course, their progress and achievements in the course can be monitored (Kokoc & Altun, 2021). This can enable students to see which courses they have attended, which subjects they have completed, and how they have performed on exams or assignments. This information can be presented directly to the student, enabling them to self-assess, or it can be presented to teachers and administrators, providing better guidance to students and supporting their development (Araka et al., 2021; Schwendimann et al., 2016).

In e-learning environments, dashboards can also be used for educational content creators and instructors to design, develop, restructure and manage course content and materials. These contents can be updated, edited or removed if they are not needed according to the indicator results on the dashboard (Karaoglan Yilmaz, 2022a, 2022b). Dashboards can provide teachers with ideas on the design of course content and materials by monitoring students' completion rates and their interaction with the course material (Sedrakyan et al., 2016; Tepgec et al., 2021).

It would be appropriate to determine which data and indicators will be presented on dashboards according to the needs of instructors, administrators and students. When the literature is examined, dashboards mostly contain information such as students' attendance and participation, course success and performance, students' interaction with each other and the content (Karaoglan Yilmaz & Yilmaz, 2022b; Yilmaz & Karaoglan Yilmaz, 2022a). When the literature is examined, it is seen that there are various discussions on how these metrics are determined. It is understood that the preferences of system developers are dominant in this regard. However, it is seen that there is a need for results based on concrete data about the indicator preferences of teachers, students and administrators (Yilmaz & Karaoglan Yilmaz, 2022a).

The aim of this study is to reveal which indicators and metrics in the dashboard are mostly interested in and which ones are less interested in the instructors who actively use a dashboard developed for Smart MOOC environment by using eye-tracking method. Thus, instructors' preferences for indicators and metrics in dashboard design will be revealed with concrete data.

Methodology

In this study, the dashboard usage behaviors of lecturers in Smart MOOC environment were examined by eye-tracking method. An eye-tracking study was conducted with the lecturers who open courses in the Smart MOOC environment used within the scope of the research and manage their courses from here. Data were collected from five instructors who voluntarily agreed to participate in the study. The usage behaviors of the instructors while monitoring the indicators and metrics on the dashboard related to the course were recorded with an eye-tracking device. The data obtained in this process were analyzed. In this context, the research is a case study conducted using qualitative research techniques.

Participants and Dashboard

The participants of the study were lecturers working at a university located in the Western Black Sea Region of Turkey, who opened a course in the Smart MOOC environment published at mooc.bartin.edu.tr (Yilmaz et al., 2022) and actively used this environment in their courses. Two of the lecturers participating in the study were male and three were female. Nielsen (2012) states that five users is a sufficient number in determining usability problems, in eye-tracking research, in cases where diversity is provided, such as having different types of users.

The following indicators and metrics are kept in the dashboard respectively.

Indicator 1: Tended Materials: This indicator shows which of the course materials (number of video views, number of e-book views, number of infographic views, number of presentation views, number of alternative video views) students in the class tend to use.

Indicator 2: Average Number of Passed/Failed Subjects According to Competency Tests: This indicator provides information on which subjects the students in the class are successful and which subjects they are unsuccessful in according to their competency test results.

Indicator 3: Competency Awareness Status: This indicator presents the percentage of students' awareness of their competencies related to the course.

Indicator 4: Weekly Progress: In this indicator, students' attendance is presented graphically in daily and monthly durations.

Indicator 5: Utilization Level of Assisted Question Solving: This indicator presents data on students' utilization of assisted question solving using the Smart MOOC system's intelligent tutoring system.

Indicator 6: Duration of System Components: With this indicator, the time spent by students in the system components (time spent in the content, time spent in the indicator, time spent in competency tests, time spent in the intelligent tutoring system) is presented graphically.

Indicator 7: Average Time Spent on Subjects: With this indicator, the time spent by students on the topics covered in the course is presented graphically.

Indicator 8: Course Completion Rate of Students: This indicator presents data on the percentage of students (class average) completing the course.

Indicator 9: Number of Competent and Non-Competent Students by Subject: This indicator provides statistics on the number of competent and non-competent students by subject.

Indicator 10: Overall Performance: This indicator presents the number of participants (students) regarding course completion, competency awareness, correct response rate in tests, weekly activity status, and alternative content viewing status.

Indicator 11: Content Likes: This indicator presents statistics on students' liking of weekly subject content (the number of times they pressed the like button).

Indicator 12: Time spent on content per competent subject: This indicator presents the amount of time students spend on the topics they are proficient in, in minutes.

A screenshot of the indicators is given in Figure 1.



Figure 1. Screenshot of the indicators

Data Collection

Within the scope of the study, reports obtained from measurements made with the eye-tracking device were used. The research was conducted with a portable screen-based eye-tracking device (Tobii pro fusion eye-tracker). At the beginning of the research process, the instructors were given an orientation explaining the purpose of the research. Then, the eye-tracker was calibrated for each instructor in order to collect data. The research was conducted by the researchers using the eye-tracking device and a laptop computer with its software installed. The gaze behaviors of the instructors were examined through the sensors on the device.

Data Analysis

The actions performed by the users were made into tables and graphs using Tobii Pro Lab software and the necessary analyzes were made.

Findings, Discussion and Conclusion

Information on the duration of the instructors' looking at the indicators on the dashboard is given in Table 1.

Table 1: Instructors' duration of looking at the indicators on the dashboard

Total duration of fixation in AOI	Participant	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	Average	Median	Sum	Total Time	Total Recording Duration
	Participant 1	11,34	4,68	1,18	11,14	3,83	6,98	1,67	2,70	11,47	6,65	0,55	17,45	6,64	5,66	79,64	103,95	235,03
	Participant 2	12,24	4,86	5,41	5,68	5,51	9,14	13,37	4,31	11,82	12,06	6,71	5,90	8,09	6,30	97,03	123,56	201,94
	Participant 3	10,89	5,98	3,78	2,81	4,35	6,43	20,00	3,01	16,95	1,92	5,75	14,49	8,03	5,86	96,36	114,17	215,83
	Participant 4	12,59	6,16	2,86	3,06	5,20	5,46	4,93	3,38	11,89	7,84	7,79	8,76	6,66	5,81	79,94	90,77	151,68
	Participant 5	9,46	4,63	3,58	4,28	2,18	6,18	4,81	2,07	9,91	1,32	7,69	5,55	5,14	4,72	61,66	75,25	140,08
Average		11,31	5,26	3,36	5,40	4,21	6,84	8,96	3,09	12,41	5,96	5,70	10,43	6,91	5,67	82,93	101,54	188,91
Share of Total Time (%)		13,63	6,35	4,06	6,51	5,08	8,25	10,80	3,73	14,97	7,18	6,87	12,58					
Percentage Fixated (%)		100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00					
Variance		1,53	0,56	2,36	11,61	1,74	1,96	57,01	0,70	7,10	19,78	8,98	28,25	1,48	0,34	212,90	364,39	1698,17
Standard Deviation (n-1)		1,24	0,75	1,54	3,41	1,32	1,40	7,55	0,84	2,66	4,45	3,00	5,32	1,22	0,58	14,59	19,09	41,21

When the data in Table 1 are analyzed, it is seen that in terms of the average duration of looking at the indicator, from the indicator looked at for the longest time to the indicator looked at for the shortest time, I1, I9, I12, I7, I6, I10, I11, I4, I2, I5, I3, and I8, respectively. According to this, it is seen that the instructors mostly examined which materials the students tend to use. Then, it is understood that they examined the indicator where the number of competent and non-competent students are given according to the subjects. Also, it is understood that the instructors examined the time spent by the students in the content per competent subject. Afterwards, the time spent by students in the subjects and the time spent by students in the system components were examined for a longer period of time. The indicators that were analyzed for the least amount of time were competency awareness and course completion rate of students.

When evaluated in general, it is seen that instructors look at the student's performance in the course, successful and unsuccessful subjects, and the duration of students' use of the system and its components. In line with the findings obtained from the research, it can be said that including these frequently used indicators and metrics in the dashboards of systems developed for e-learning purposes can be useful for instructors. In this study, the dashboard and the perspective analysis of the indicators and metrics in the dashboard were examined from the perspective of the instructors. In future studies, studies can be conducted to determine the differences in instructors' gaze behaviors according to individual differences. Similarly, researchers emphasize that it may be important to conduct research to examine dashboard usage behaviors for students. In these studies, eye-tracking studies can be conducted in terms of data security and confidentiality (Yilmaz & Karaoglan Yilmaz, 2022b). One of the points to be considered when interpreting the results of the research is that the time spent by the instructors may differ depending on whether the indicators are complex or simple. For this reason, it may be important to investigate whether the relationship between the simplicity or complexity of the indicator and the instructor's interest in the indicator is significant. Because while the instructor can understand a simple indicator in less time, she/he can understand a complex indicator in a longer time. However, this may not necessarily mean that she/he shows more or less interest in the related indicator. In-depth research can be conducted with qualitative studies on this subject.

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