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# INVESTIGATION OF STUDENT PREFERENCES REGARDING LEARNING ANALYTICS INDICATORS IN SMART MOOC DASHBOARD: AN EYE-TRACKING STUDY

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## Abstract

The use of Massive Open Online Courses (MOOCs) for educational purposes is becoming increasingly common. MOOCs are mostly learning environments where learners receive education based on self-directed learning skills. Therefore, it is important for learners to have self-directed skills. However, in MOOCs, learners may need external support and guidance. Dashboards have recently been used in MOOCs for this purpose. In the dashboards of MOOCs, various indicators and metrics about the students are kept, these data are reflected to the student, advice and guidance are given to the student. However, it is a matter of curiosity which of these indicators students pay more attention to and which ones they pay less attention to. The aim of this study is to determine student preferences regarding the indicators on the dashboard of the Smart MOOC environment. The research was conducted using an eye-tracking method. The research was conducted with 5 university students who actively participated in the courses in the Smart MOOC environment. When the results of the research are evaluated in general, it is seen that the students look at their performance in the course, the duration of using the system and the future predictions of the system about them. In line with the findings obtained from the research, various suggestions were made for future research and dashboard design.

**Keywords:** dashboard, Smart MOOC, students, eye-tracking

## Introduction

Massive Open Online Courses (MOOCs) are becoming increasingly important in today's rapidly changing educational processes. MOOCs have become an important component of the education system as they provide students, teachers and educational institutions with more flexibility, access and customization (Badali et al., 2022; Despujol et al., 2022). However, it is also stated that there are various criticisms and aspects that can be improved for MOOCs. One of these is related to the limited capacity of MOOCs to provide personalized education (Karaoglan Yilmaz, Tepgec et al., 2022; Sahin et al., 2022).

Integration of artificial intelligence technologies into MOOCs is seen as a solution to overcome this situation (Karaoglan Yilmaz & Yilmaz, 2022a; Yilmaz, Yurdugul et al., 2022).

Thanks to artificial intelligence technologies, students' learning behaviors in MOOCs can be monitored, analyzed and inferences can be made, and various recommendations and guidance can be made for the student (Yilmaz, Yurdugul et al., 2022). Dashboards play an important role in performing these operations (Karaoglan Yilmaz, 2022a, 2022b). In a way, dashboards function as areas where the interaction between smart MOOCs and students is established (Tepgec et al., 2021). Students' indicators and metrics are shown to the student on the dashboards, as well as advice and guidance for the student can be made through the dashboard (Karaoglan Yilmaz & Yilmaz, 2022b).

When the literature is examined, it is seen that there is a need for research that takes into account student preferences regarding the indicators and metrics on the dashboards of smart MOOCs systems. It is a matter of curiosity which of the indicators and metrics on the dashboard students show more interest and which ones they show less interest. Knowing student preferences on this subject can provide important information and inferences to teachers, system developers, material and content developers. From this point of view, the aim of this study is to determine student preferences regarding the indicators on the dashboard of the Smart MOOC environment with the eye-tracking method. The main reason for using eye-tracking method in the research is to capture the natural usage behaviors of students.

## Method

This research examined the indicator use behavior of university students on the Smart MOOC platform using eye-tracking. The research was conducted using an eye-tracking study on university students who are registered and actively using the Smart MOOC platform. A total of five university students voluntarily participated in the study and data was collected using an eye-tracking device. The students' usage behaviors while monitoring the indicators and metrics on the platform were recorded, which were then subjected to a detailed analysis. This study was conducted as a case study based on qualitative research techniques.

There were three males and two females among the university students participating in the study. Nielsen (2012) states that five users is a sufficient number when diversity is ensured and different types of users are represented, such as in usability problem identification and eye-tracking research.

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

*Indicator 1: Self-awareness Status:* With this indicator, statistics are presented in percentage terms about how much the student knows himself/herself and suggestions are made. For example, "You take achievement tests without knowing enough about the subjects. In order to be successful in these tests, you need to spend more time on the subject materials!".

*Indicator 2: Concepts Learned:* This indicator shows what concepts the student has learned within the scope of the course topics.

*Indicator 3: Level of Use of Learning Materials:* In the system, alternative course materials such as videos, infographics, e-books in pdf form, and presentations have been produced for students. With this indicator, it can be determined which material the student is most interested in.

*Indicator 4: Overall System Performance:* This indicator presents data on the student's course completion status, self-awareness level, achievement test performance, activity status in the course in the last 1 week, use of alternative content in the course and their class average.

*Indicator 5: Time spent using system components:* This indicator includes statistics on the time students spend watching course videos, time spent on the dashboard, time spent on course content, time spent on achievement tests and their class averages.

*Indicator 6: Subject Success Predictions:* In this indicator, statistics on the probability of the student's success in the subjects of the course are presented as a percentage.

*Indicator 7: System Component Interactions by Subject:* This indicator presents data on which components of the system the student interacts with according to the topics of the course.

*Indicator 8: Projected Course Completion:* In this indicator, the probability of completing the course is estimated as a percentage based on the student's current performance.

*Indicator 9: Level of Effective Use of System Components:* This indicator provides information about the student's interaction with the system components (video interaction, indicator interaction, intelligent teaching system interaction).

*Indicator 10: System Engagement Status:* In this indicator, the student's engagement to the system is indicated in percentage and recommendations are made.

*Indicator 11: Overall Achievement Performance:* This indicator provides information about the student's performance in achievement tests related to the subjects of the course and course completion (in percentages).

A screenshot of the indicators is given in Figure 1.

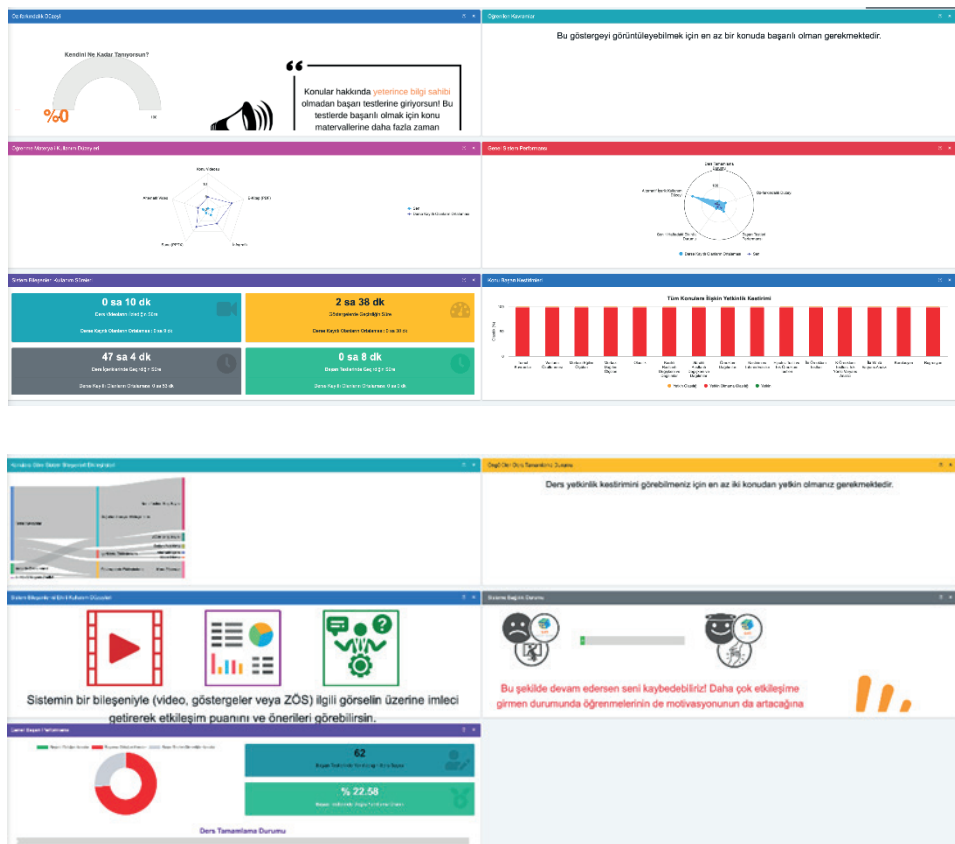


Figure 1. Screenshot of the indicators

## Data Collection

During the study, the measurements and reports obtained with the eye-tracking device were used. The research was conducted using a portable eye-tracking device, the Tobii Pro Fusion Eye Tracker. At the beginning of the research process, students were given an orientation explaining the purpose of the study. Then, a calibration process was performed for each student to ensure that the eye tracker could collect data. The researchers conducted the study using a laptop computer containing the eye-tracking device and associated software. The eye behavior of the students was studied in detail thanks to the sensors on the device.

## Data Analysis

The actions of the users were collected using Tobii Pro Lab software, these data were converted into table and graph format and the necessary analysis was performed on these data.

## Findings, Discussion and Conclusion

Information about the time students spent looking at the indicators on the dashboard is given in Table 1.

**Table 1: Students' time spent looking at the indicators on the dashboard**

Total durat	Participant	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	Average	Median	Sum	Total Time	Total Recor
	Student 1	1,02	11,64	0,58	9,79	0,48	4,70	1,88	3,56	2,13	4,01	0,72	3,68	2,13	40,52	68,06	165,30
	Student 2	0,07	10,29	3,16	13,77	1,23	20,54		3,35	0,55	1,68	0,40	5,50	2,42	55,04	124,47	257,38
	Student 3	0,30	3,28	2,95	2,35	1,25	4,26	0,23	1,20	1,68	3,06	4,18	2,25	2,35	24,75	75,85	125,06
	Student 4	3,05	8,66	13,62	18,35	16,57	29,51	4,51	8,38	6,26	9,39	17,62	12,36	9,39	135,94	168,53	275,63
	Student 5	4,86	3,81	7,01	6,31	12,92	8,13	2,95	2,95	4,50	4,31	12,46	6,38	4,86	70,22	82,08	161,93
<b>Average</b>		1,86	7,54	5,47	10,12	6,49	13,43	2,39	3,89	3,02	4,49	7,08	6,04	4,23	65,29	103,80	197,06
<b>Share of To</b>		2,85	11,54	8,37	15,49	9,94	20,56	2,93	5,95	4,63	6,88	10,84					
<b>Percentage</b>		100,00	100,00	100,00	100,00	100,00	100,00	80,00	100,00	100,00	100,00	100,00					
<b>Variance</b>		4,20	14,42	26,11	39,04	58,56	124,39	3,24	7,17	5,34	8,55	58,39	15,06	9,57	1844,34	1786,99	4309,79
<b>Standard D</b>		2,05	3,80	5,11	6,25	7,65	11,15	1,80	2,68	2,31	2,92	7,64	3,88	3,09	42,95	42,27	65,65

When the data in Table 1 are examined, it is seen that the average duration of looking at the indicator is G5, G11, G6, G3, G4, G1, G9, G10, G2, G7, G8, respectively, from the indicator looked at for the longest time to the indicator looked at for the shortest time. It is seen that indicator G5 is the duration of use of system components. Within the scope of this indicator, the student examines how much time she/he spends in which component of the system. Within the scope of the general achievement performance indicator numbered G11, the student looks at the information about the student's performance in achievement tests related to the subjects of the course and the course completion status (in percentage). Indicator G6 examines the student's predictions of success related to the topics. Indicator G3 examines student tendencies towards learning materials. Indicator G4 examines students' overall system performance. In general, it is seen that they look at the students' performance in the course, the duration of using the system and the future predictions of the system about the student. In future research, students' system usage behaviors can be examined with eye-tracking and their relationship with individual differences (Yilmaz & Karaoglan Yilmaz, 2022a, 2022b) can be examined.

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