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INVESTIGATION OF STUDENTS' SMART MOOC USAGE BEHAVIORS WITH LEARNING ANALYTICS: WHAT DOES BIG DATA TELL US?

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Abstract: Learning analytics offers an important data analytics method to understand students' habits of using online learning platforms and tools effectively. This approach reveals results such as how often students visit online platforms, what content they are interested in, and the time they spend in their learning process. The results of learning analytics provide students with information about their learning performance, and educators and administrators with valuable insights into student progress. Today's digital learning platforms are powered by artificial intelligence technologies and therefore learning environments are becoming smarter. Intelligent learning environments have the potential to provide students with individualized learning opportunities. However, students' learning preferences in this context still remain unclear. The aim of this study is to investigate the learning preferences and behaviors of students enrolled in a Smart MOOC (Massive Open Online Course) environment using a learning analytics-based approach. The research was conducted on 1236 university students enrolled in the mooc.bartin.edu.tr platform. The research data were obtained from the students' records of their system usage behaviors. The findings are presented visually and it is thought that these results can guide instructors to improve their learning environments and content.

Keywords: big data, big data in education, educational big data, Smart MOOC, students, learning behavior, learning preference

1. Introduction

Obtaining, analyzing and using big data in e-learning environments is very important in terms of improving learning content, environment and processes and enabling data-based decision making (Fischer et al., 2020). Big data results play an important role in understanding students' learning processes and improving their learning processes (Drigas & Leliopoulos, 2014). For teachers and administrators, it can guide teachers and administrators in improving learning environments and processes, as it can provide evidence-based decision-making (Tepgec et al., 2021).

Big data enables a better understanding of students' individual characteristics and learning approaches (Wang, 2016). Thus, personalized learning experience and content specific to each student can be offered in e-learning environments. Students can progress at their own learning pace. Generative artificial

intelligence tools and applications, which have become increasingly widespread in recent years, have become capable of producing their own content based on big data results (Yilmaz & Karaoglan Yilmaz, 2023a, 2023b). This reveals the significant potential of big data in today's artificial intelligence systems for both students and teachers and administrators. Big data results can shed light on how teachers can monitor and evaluate students' learning performance (Daniel, 2019). A better understanding of what students do and do not understand will enable the development of curricula, content and materials. Big data results, monitoring and analyzing student behavior in e-learning environments can help us understand students' individual differences such as attitudes and motivation. Based on these results, teachers can take action to increase student engagement in lessons and increase student motivation (Karaoglan Yilmaz & Yilmaz, 2022a, 2022b).

Big data in education is created with data from online learning platforms, student information systems, digital tools that students interact with, and other sources. These data sources may include students' grades, attendance data, exam results, student feedback, interactions, online course content usage and more. Learning analytics aims to understand learning processes and outcomes by analyzing and interpreting this big data (Picciano, 2012). Learning analytics can provide important information to teachers and educators by examining students' behavior, learning progress and performance (Karaoglan Yilmaz, 2022a, 2022b). This analytics refers to the process of transforming data into knowledge. Learning analytics results use big data to monitor students' academic performance. By analyzing data reflecting student achievement, such as student grades, exam results and attendance data, students' strengths and weaknesses are identified and teachers can take action based on these results.

Big data and learning analytics in education improve data-driven decision-making in education and can be used to improve student achievement. Big data forms the basis of learning analytics and this analytics enables data to be transformed into valuable information so that better results can be achieved in education (Yılmaz & Karaoglan Yilmaz, 2022a, 2022b). Within the scope of this research, big data results obtained from students using Smart MOOC environment were visualized using learning analytics and it was aimed to reveal students' learning behaviors and preferences.

2. Method

The research was conducted based on the data obtained from 1236 university students who attended 8 different courses in the Smart MOOC environment published at mooc.bartin.edu.tr. Smart MOOC environment is designed to support students' self-directed learning (Karaoglan Yilmaz, Tepgec et al., 2022). When a student enters a course in the system, he/she first sees his/her level (according to the result of an adaptive competency test) (Sahin et al., 2022) and the system organizes a personalized learning environment specific to the student. When students enters a course in the system, they first see their level (according to the result of an adaptive competency test) (Sahin et al., 2022) and the system organizes a personalized learning environment specific to the student.

3. Results and Conclusions

Within the scope of the first finding of the study, it was analyzed from which devices students use the Smart MOOC environment the most. The findings are shown in Figure 1.

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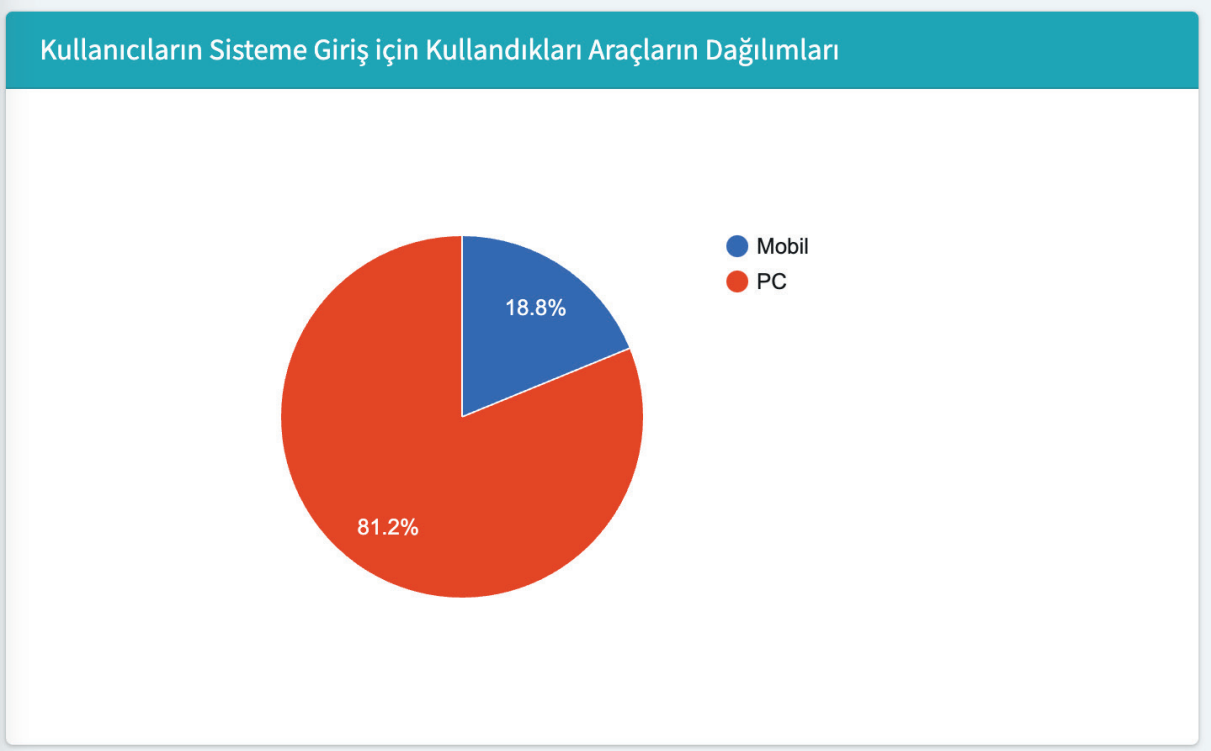

Figure 1. Students' preferred device type for using the Smart MOOC environment

It is seen that 81.2% of the students use the Smart MOOC environment via computer. It was observed that 18.8% of the students used the Smart MOOC environment via mobile devices. According to these findings, it can be said that computers are more preferred to use Smart MOOC environments than mobile devices. This situation is thought to be related to the difficulty of using the indicators and tools on the Smart MOOC dashboard via mobile devices. This situation can be investigated in depth by using techniques such as qualitative research in the future.

The second finding of the study analyzed which component of the Smart MOOC environment students spent more time in. The findings are shown in Figure 2.

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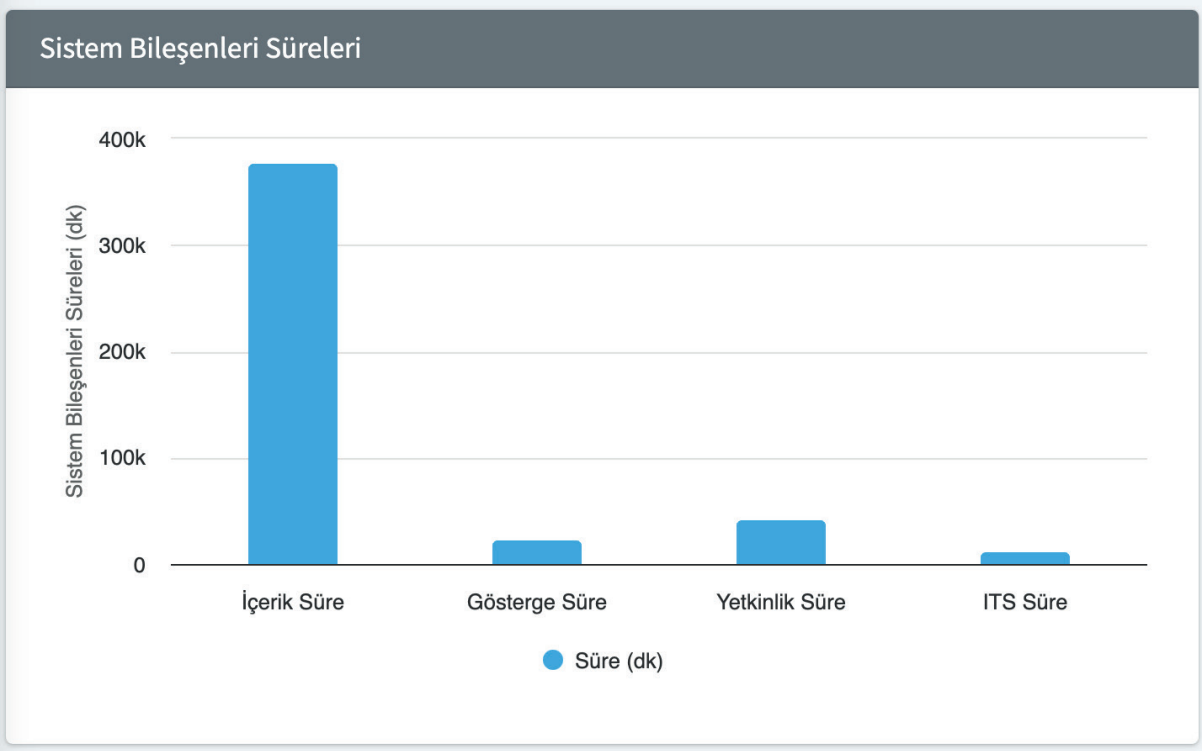

Figure 2. Students' use of Smart MOOC components

Figure 2 shows that students spent the most time on content. The content component includes videos, e-books, infographics, presentations, learning tasks, alternative videos, etc. related to the lessons and topics. Students spent most of their time in these components while studying the topics of the course.

After the content component, students spent the most time on the competency component of the system. In the competency component, students took an adaptive competency test in order to successfully complete the relevant topic of the course. For students who successfully complete the test, the topic is marked as completed. In the adaptive competency test, the system adaptively asks questions according to the student's knowledge and competency level.

After the competency component, students spent the most time on the dashboard component of the system. In the dashboard component, data on students' behaviors during the learning process are presented as learning analytics results. In this component, individualized advice and recommendations are provided to students.

Students spent the least amount of time in Smart MOOC's intelligent tutoring system. Smart MOOC's intelligent tutoring system provides an alternative for students who have studied the materials in the content but have not passed the adaptive competency test of the relevant subject. The intelligent tutoring system gives hints to the students and makes them practice solving questions. Thus, the student interacts with the system, solves questions and tries to learn the subject.

The third finding of the study analyzed students' use of the Smart MOOC environment's intelligent tutoring system. The findings are shown in Figure 3.

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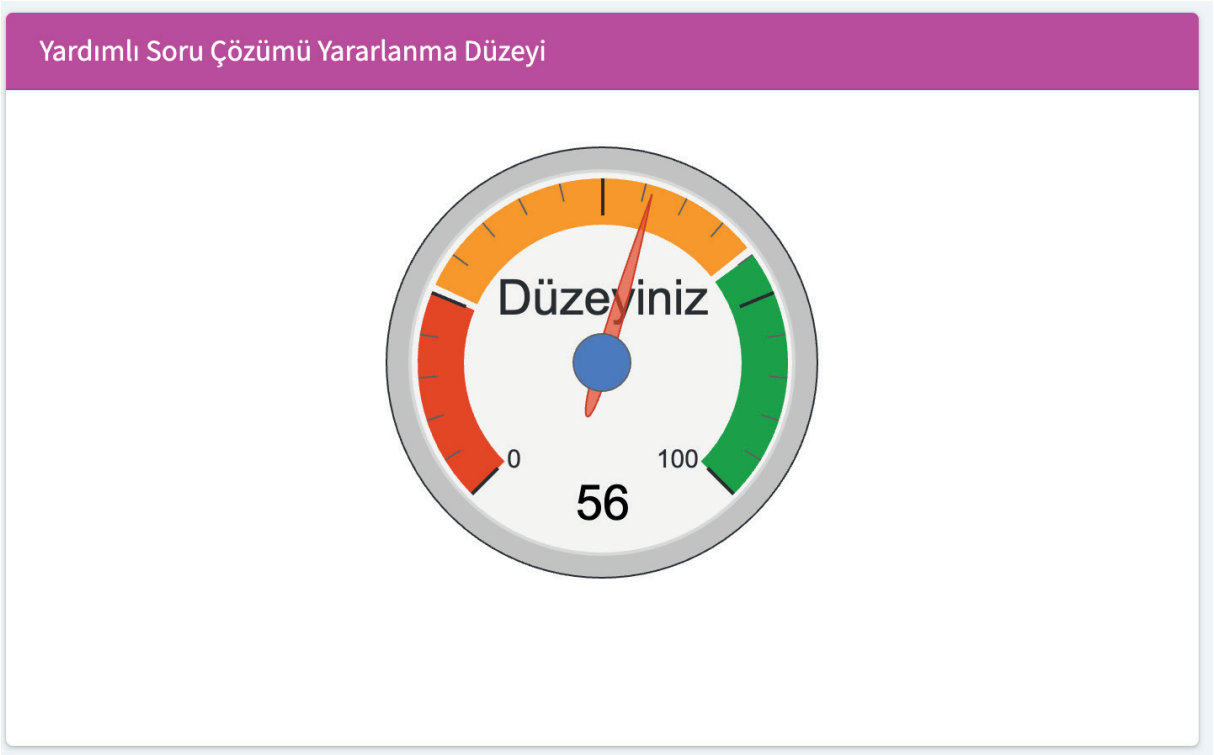

Figure 3. Students' utilization of assisted question solving (intelligent tutoring system)

Figure 3 shows that 56% of the students in the system used the intelligent teaching system of the Smart MOOC environment. In other words, it was observed that approximately one out of every two students benefited from assisted question solving in order to learn the subject better. This finding points to the importance of including the assisted question solving (intelligent tutoring system) component in the systems to be developed in the future.

The fourth finding of the study analyzed students' competency awareness in the Smart MOOC environment. The findings are shown in Figure 4.

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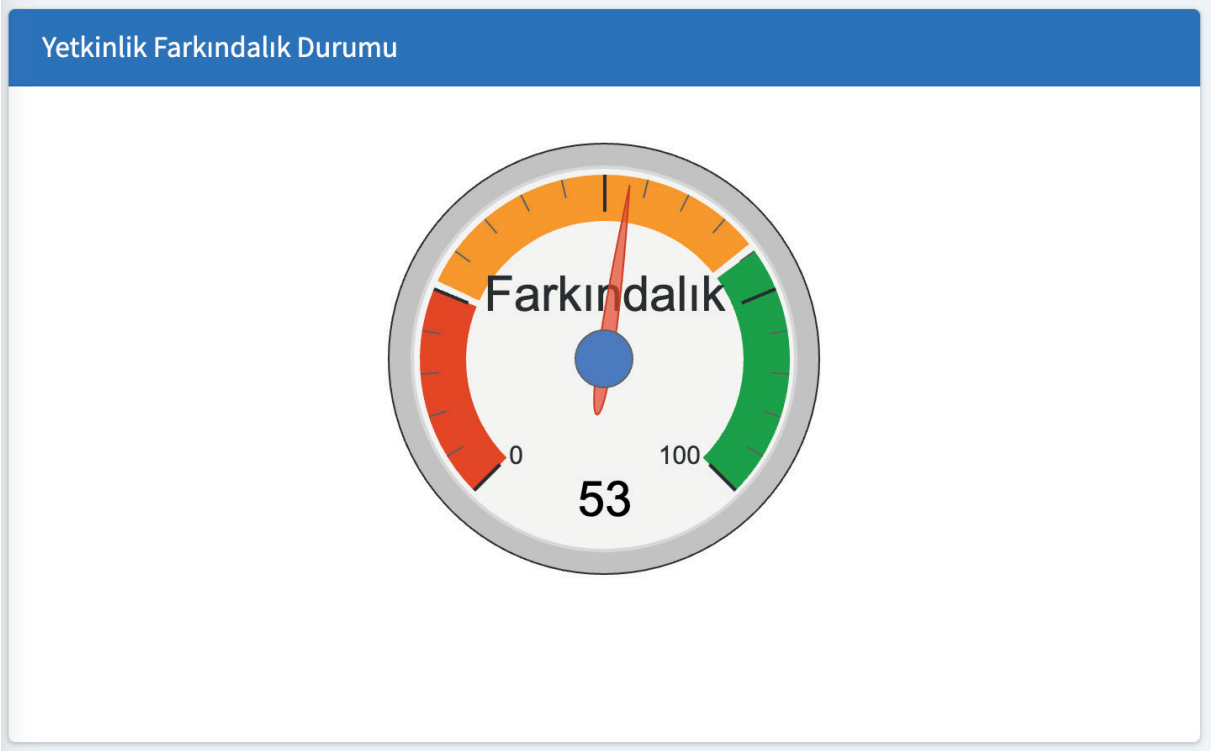

Figure 4. Students' competency awareness status

Figure 4 shows that 53% of the students using the Smart MOOC environment are aware of their own competencies regarding the course topics. In other words, approximately one out of every two students is aware of their competencies related to the course. The fact that the dashboard of the Smart MOOC environment includes an indicator for competency awareness may have an effect on the high competency awareness of the students. Within the scope of this indicator, the competency awareness status of the student is presented individually and the system makes suggestions about what the student should do to increase it.

Within the scope of the fifth finding of the study, it was analyzed which of the contents in the Smart MOOC environment students preferred the most. The findings are shown in Figure 5.

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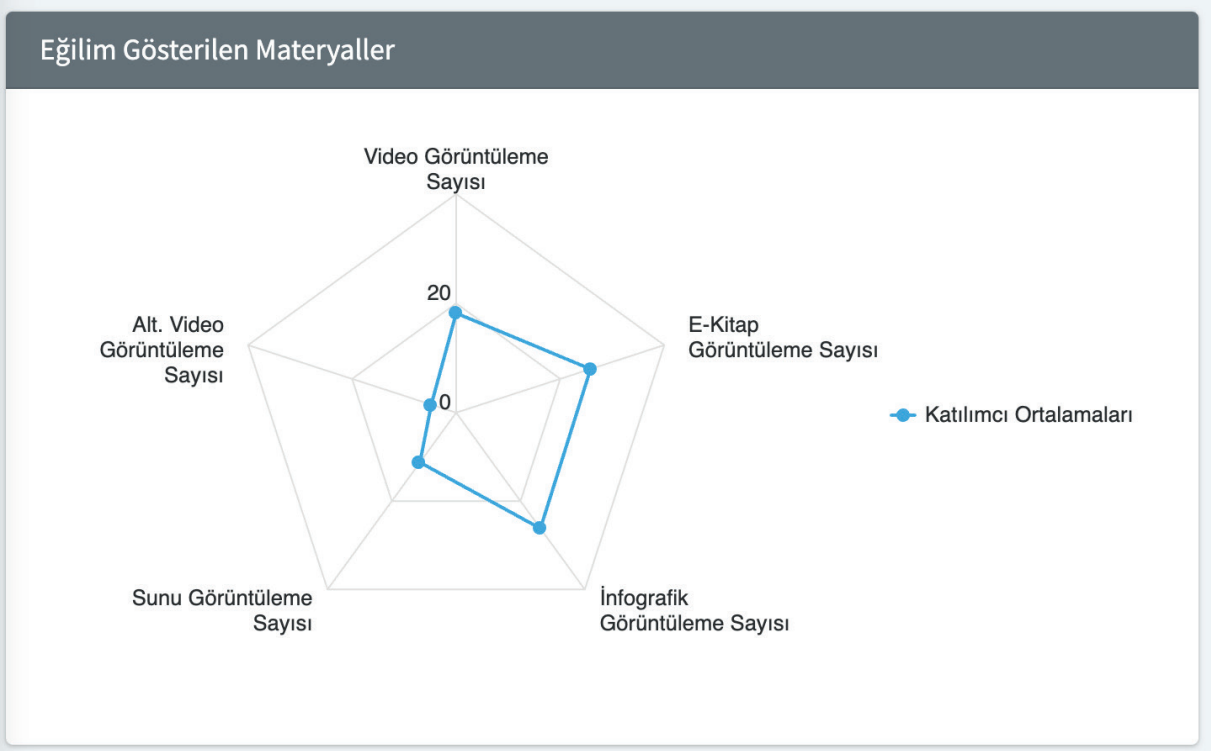

Figure 5. Materials that students tend to use

When Figure 5 is analyzed, it is seen that students tend to use e-books, infographics, videos, presentations and alternative videos respectively. It is important to prepare videos, e-books and infographics especially for course subjects. Teachers should take this finding into consideration when developing content in e-learning environments and preparing alternative content for students can be effective on students' success. It is an important finding of the study that students prefer e-books and infographics more than videos.

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