STUDENTS' PREFERENCES AND VIEWS ABOUT LEARNING IN A SMART MOOC INTEGRATED WITH INTELLIGENT TUTORING

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ABSTRACT

Massive Open Online Courses (MOOCs) have become widespread all around the world since their conceptualization, both in terms of the number of students enrolled and the number of courses available. Some issues or learner needs in these environments, such as accreditation, quality of assessment and scaffolding for left-behind learners, have also surfaced as a result of rise in popularity. Profiling learners, using scaffolding strategies, structuring the assessment in a dynamic and effective manner, monitoring performance, and providing feedback/feedforward based on learning analytics are all expected to be valuable solutions to these issues. In this study, it is aimed to describe student views on the MOOC platform, which has the above-mentioned features and was designed and developed according to the AGILE software development model. Participants of this case study consist of 53 undergraduate students from three different universities. The data was collected using a questionnaire and semi-structured form both of which were developed by the researchers. The findings obtained were considered under these themes: benefits, disliked aspects, preferences in different learning contexts, ease of use, features open to improvement. Findings based on both quantitative and qualitative interpretations are presented on each theme. The findings of this study are limited to student views. In the later stages, authentic usage circumstances can be presented by taking into log data as a data source.

1. INTRODUCTION

MOOCs (Massive Open Online Courses) allow learners from all over the world, regardless of their location or educational institution, to specialize in specific subjects and receive certifications. In such environments, learners can progress at their own pace without being constrained by a curriculum, study at anytime and anywhere, and regularly test themselves. Since the term was first used in 2008, the use of MOOCs has grown exponentially around the world, in terms of both the number of courses available and the number of students enrolled (Wong et al., 2019). MOOCs' initial target audience was learners who were excluded from higher education; however, in recent years, the target audience has shifted to primarily higher education students (Lambert, 2020). Agreements between well-known MOOC providers, such as edX, and educational institutions have facilitated in the increase of enrolled students in such environments in higher education. Existing MOOCs, on the other hand, have limited capacity to adapt learners' individual characteristics (Aleven et al., 2017). In addition, one of the most remarkable issues in these environments, which are described as disruptive technologies, is the discrepancy between course enrollment and completion rates. MOOCs are likely to be more effective if they can personalize instruction based on learner characteristics, such as prior knowledge or personal interests. They could also be more effective if they included more learning-by-doing activities (Aleven et al., 2017). Integrating existing adaptive learning technologies such as Intelligent Tutoring Systems into

MOOCs is one way to make them more adaptive, with a wider range of learning-by-doing activities. In addition to personalization of instruction, accreditation issues, assessment quality, scaffolding for left-behind learners, and performance monitoring deficiencies are just a few of the challenges.

Accreditation has been one of the major issues that has limited the widespread use of MOOCs since their beginnings (Danka, 2020). In other words, the fact that the learners' competencies they mastered in these environments were not valuable outside of these environments hampered learners' adoption. In line with the needs and expectations of the learners, providers such as Coursera, Udacity and edX have run their certification processes, but the advantages of these certificates have been found to be limited (Lambert, 2020). Another issue that contributes to this limitation is the assessment processes. A significant part of the competence in the current courses is tested with a few static questions or peer reviews at the end of the episode (Xiong & Suen, 2018). Therefore, some of the higher education institutions have not adopted MOOCs due to the inability to perform this assessment effectively (Zhang et al., 2019). The most important goal of MOOCs in the early years was to reach a large mass, and it is possible to say that it has been accomplished by reaching millions of people today. The next goal should be to adapt the system and assessment processes to the needs of the millions of people it reaches, which can help with the previously mentioned assessment and accreditation issues (Wong et al., 2019). Not only in MOOCs, but also in all online learning environments, adaptively performing both the tutoring and assessment processes can be a solution to the scaffolding problem for students whose self-regulation is insufficient. However, it is critical to provide scaffolding for learners who feel more autonomous in MOOCs than in any other online environment. Because control of learning in MOOCs has moved from educational institutions or cultures to the individual - often an isolated individual - (Swinnerton et al., 2017). Another problem that comes up frequently in MOOCs is performance monitoring, which is linked to the scaffolding and assessment issues mentioned previously. In recent years, learning analytics dashboard (LAD) has made performance monitoring more widely available. However, in commonly used MOOCs, these dashboards are generally limited to the display of progress. As a result, providing the feedback and feedforward needed by learners, particularly those who are left behind or at risk of dropping out, through LAD will make a significant contribution to solving this problem. In summary, it is expected that profiling learners in MOOCs, providing scaffolding support to left-behind learners, structuring the assessment in a dynamic and effective manner, monitoring performance and providing feedback and feedforward accordingly, can all be significant solutions to the issues mentioned above.

As previously stated, MOOCs are platforms with deficiencies when it comes to effective teaching. In order to provide effective teaching in these environments, it is necessary to integrate adaptive learning technologies. Therefore, the aim of the research is to examine student views on the design of an intelligent MOOC platform based on an adaptive, dynamic, supported by learning analytics and intelligent tutoring. This research is expected to guide designers, teachers, and educational institutions in both designing and developing solutions for common problems in MOOCs, as well as evaluating these solutions from the perspective of students. Secondary aim of the study is introducing the authors' MOOC platform, which was developed using HTML, PHP, JavaScript, and MySQL. In the system architecture, learners can choose content types based on their preferences. The system also includes PowerPoint presentations, e-books, infographics, and alternative videos as alternative learning materials in addition to video lectures. Learners can utilize descriptive analytics to see their current situation, as well as predictive analytics to assess their next learning experience. Learners' entire interaction data are stored, and the system presents the required information via learning analytics dashboard. To do this, the system employs both classification and clustering algorithms in this process. The system also functions as an intelligent tutoring system while the learners are taking the competency test. The system will direct the learner to this module if he fails the competency test without help. The goal of this module is to improve learners' problem-solving skills by using scaffolding strategies like hints and worked examples.

2. METHOD

2.1 Research Model

The model of the research was based on case study, one of the qualitative research designs. The most basic feature of the qualitative case study is the in-depth investigation of one or a few situations (Yin, 2013). The Smart MOOC Integrated with Intelligent Tutoring environment has been developed by considering the AGILE

software development model. In the first stage of the model, the literature was examined and the student needs for MOOC environments were tried to be revealed. Then, based on the findings in the literature, the design and development stages of the Smart MOOC Integrated with Intelligent Tutoring environment, which was supported by learning analytics and based on an adaptive, dynamic, intelligent tutoring system, were carried out. In the next step, usability tests of the developed Smart MOOC Integrated with Intelligent Tutoring environment have been completed. After usability tests, the assessment process, which is the last stage of the first cycle of the AGILE model, was started. The pilot implementation process (evaluation phase of the AGILE model) took eight weeks. At the end of the eight-week implementation process, students' opinions about the advantages, disadvantages and aspects of the Smart MOOC Integrated with Intelligent Tutoring environment were obtained from the students.

2.2 Study Group

The participants consist of undergraduate and graduate students from three different state universities. The total number of participants was 53 and the gender composition was 62.2% (n = 33) male and 37.8% (n = 20) female. Of the participants 51% (n = 27) were undergraduate students and 49% (n = 26) were graduate students. At the beginning of the study, the participants were given information as in regard to the Smart MOOC Integrated with Intelligent Tutoring environments and data collection process.

2.3 Data Collection Tools and Data Analysis

The data was collected using a questionnaire and semi-structured form both of which were developed by the researchers. In the questionnaire, there are questions to determine the demographic characteristics of the students (gender, department of education, university, etc.). The semi-structured interview form consisted of questions asking to determine students' views regarding the Smart MOOC Integrated with Intelligent Tutoring environment. The draft of the semi-structured form questions was developed based on literature review. Five faculty members specialized in educational technologies examined the form and provided feedback. The form aimed to determine liked and disliked features, ease of use of the system and whether the system would be recommended to friends.

In order to analyse the qualitative data content analysis was utilized. The qualitative data was coded by the researcher and recoded by another rater. The reliability of the coding was done by calculating proportion of common codes and total number of codes. The coding reliability was 91%. For the remaining 9% difference, the coders came together and reached a consensus.

3. FINDINGS

3.1 Student Views on the Benefits of the Smart MOOC Integrated with Intelligent Tutoring Environment

The students were asked in what ways they found the developed Smart MOOC Integrated with Intelligent Tutoring environment beneficial. The opinions of the students are given in Table 1.

Examining the students' views in Table 1, it is seen that the students liked the dynamic assessment feature of the Smart MOOC Integrated with Intelligent Tutoring environment the most. In addition, the students expressed that they liked the Smart MOOC Integrated with Intelligent Tutoring environment that it offers multiple alternative content such as e-books, presentations, videos, infographics, and learning tasks. Students stated that they liked the short and concise narration of the videos in the MOOC environment. Students state that another feature of the system that they like is that the system gives advice, hints, and guidance messages through feedback. In addition, the simple and useful interface feature of the developed MOOC environment is stated as another preferred aspect of the system. These are the most admired features of the system developed by the students.

Table 1. Students' views on the benefits of the Smart MOOC Integrated with Intelligent Tutoring environment

Sub-Theme	Frequency
Teaching the subject by reinforcing the questions and tips in the dynamic assessment system	22
Contain alternative learning contents	12
Teaching subjects with short and concise narration in videos	10
The use of the system is simple and straightforward	9
Making it easy to learn	8
Guiding the student in the learning process	7
Detecting learning deficiencies	6
Providing the opportunity to progress according to the student's individual pace and preference	6
Enabling the student to self-monitoring with learning analytics	6
The proficiency test is adaptable	5
Leave the feedback preference to the user (being adaptable)	4
Having a fun structure	3
Being able to predict whether the student is competent in a subject or not	2

Some students, on the other hand, stated that the other features of the system are guiding the student, detecting learning deficiencies, providing the opportunity to progress according to the student's individual pace and preference, providing the student with the opportunity to make self-monitoring with learning analytics, and the system has an adaptable structure. Some of the student views are as follows:

S1: *"It is easier for us to understand the subjects because they are told briefly and concisely. And since it supports the subjects with tests, the system helps us to fully understand the subject."*

S3: *"One of the features I like is that it graphically shows my interaction and my tendency towards the subjects I work on. The fact that he presents my individual performance in a summary manner enables me to monitoring myself more clearly."*

3.2 Student Views on the Disliked Aspects of the Smart MOOC Integrated with Intelligent Tutoring Environment

Students were asked in what ways they disliked the Smart MOOC Integrated with Intelligent Tutoring environment developed. The opinions of the students are given in Table 2.

Table 2. Students' views on the disliked aspects of the Smart MOOC Integrated with Intelligent Tutoring environment

Sub-Theme	Frequency
There is no defect in the system	22
The low number of questions in the system	4
Failure to solve more questions after seeing the decision in the competency test	4
The lecture part is a little insufficient / not detailed	3
Not knowing how many questions to be competent in determining competence	3
Feedback given in some questions is not appropriate	3
The system is inadequate in terms of visual design	2
Low interaction in learning contents	2
Low number, quality and variety of learning tasks for implementation	2
Graphics showing learning analytics are not sufficient in terms of interpretation	2

When the views of the students in Table 2 are examined, the majority of the students stated that there is no feature about the system that they do not like. Some students stated that the number of questions in the dynamic assessment section of the system could be increased, and they would find it useful to allow the system to allow the system to solve questions after the competence of the student in the adaptive test was determined. Some of the student views are as follows:

S2: *"There were very few questions on some issues, the number of questions may be more."*

3.3 Student Views on the use of Smart MOOC Integrated with Intelligent Tutoring Environment Developed in Different Learning Contexts

The students were asked whether you can use the developed Smart MOOC Integrated with Intelligent Tutoring environment in the context of different courses and learning, apart from the statistics course. Students' answers are given in Figure 1.
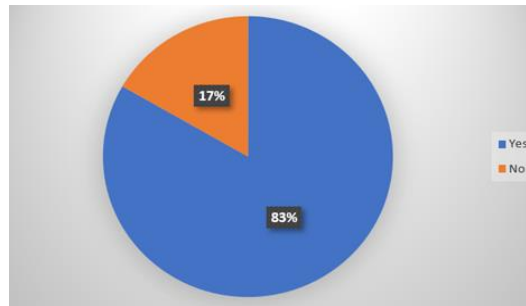

Figure 1. Students' Preferences in Different Learning Context Using the Smart MOOC Integrated with Intelligent Tutoring Environment

When Figure 1 is examined, it is seen that 83% of the students stated that they will use the Smart MOOC Integrated with Intelligent Tutoring environment developed within the scope of different courses and learning contexts. Students were asked why they would like to use this system in the context of different courses and learning contexts. The answers of the students are given in Table 3.

Table 3. Reasons for students to choose the Smart MOOC Integrated with Intelligent Tutoring environment within the scope of different courses and learning contexts

Sub-Theme	Frequency
Because it facilitates learning	13
Since it provides repetition and reinforcement in courses	13
Because it is a self-monitoring system	7
Because the smart system makes decisions about the student	3
Because it increases my competence in a subject	2
As it helps a lot	2
Because the system is easy to use	2
As it provides videos and documents	2
Because I can instantly access information about myself with learning analytics	2
Since it has an adaptable structure	2

When Table 3 is examined, it seems that the most dominant reason for students to prefer the Smart MOOC Integrated with Intelligent Tutoring environment developed in different courses and learning contexts is that the system facilitates learning, provides repetition and reinforcement in courses, and offers self-monitoring. Some of the student views are as follows:

S2: *"Yes because everything is learned more easily this way."*
S3: *"I would use it. Because even the hardest things to learn can be learned easily from this system."*

3.4 Student Views on the Ease of use of the Smart MOOC Integrated with Intelligent Tutoring Environment

The students were asked whether they found the developed Smart MOOC Integrated with Intelligent Tutoring environment easy to use or not. Students' answers are given in Figure 2.
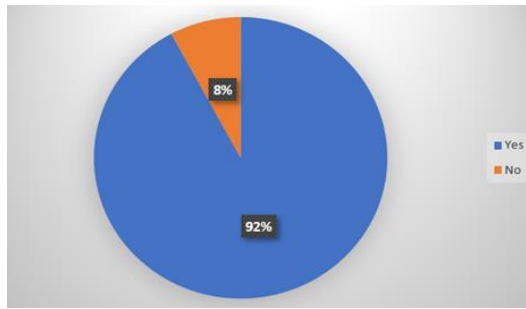
Figure 2. Students' Views Regarding the Ease of Use of the Smart MOOC Integrated with Intelligent Tutoring Environment

When Figure 2 is examined, it is seen that 92% of the students find the developed Smart MOOC Integrated with Intelligent Tutoring environment easy to use. It was observed that 8% of the students found the use of the developed Smart MOOC Integrated with Intelligent Tutoring environment to be moderate.

3.5 Suggesting Situations of Students to use the Smart MOOC Integrated with Intelligent Tutoring Environment to their Friends

The students were asked if you would recommend them to their friends to use the Smart MOOC Integrated with Intelligent Tutoring environment. Students' answers are given in Figure 3.
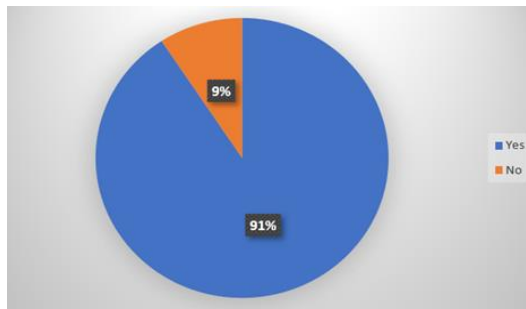

Figure 3. Suggesting Situations of Students to Use the Smart MOOC Integrated with Intelligent Tutoring Environment to Their Friends

When Figure 3 was examined, it was seen that 91% of the students stated that they would recommend them to their friends to use the developed Smart MOOC Integrated with Intelligent Tutoring environment. It is seen that 9% of the students would not recommend them to their friends to use the developed Smart MOOC Integrated with Intelligent Tutoring environment. The students were asked about the reason for this situation. Students' answers are given in Table 4.

Table 4. Reasons for recommending students to their friends to use the Smart MOOC Integrated with Intelligent Tutoring environment

Sub-Theme	Frequency
Because it helps and facilitates learning a lot	18
Because it reinforces and supports learning	15
Because the system is easy to use	10
As it provides an individualized learning environment	9
As it has a rich and alternative content in terms of learning materials	5
To benefit from the problem solving feature of the system	4
Because it adds curiosity and interest to the course	3
Because the lectures are clear and understandable	2
For level determination on the subject	2
As it provides learning analytics and advisory system support	2
Because the videos have a short and concise narrative	2
Because it increases the permanence of what has been learned	2

When Table 4 is examined, it is seen that the main reasons why students recommend the developed Smart MOOC Integrated with Intelligent Tutoring environment to their friends are that the system helps and facilitates learning, reinforces and supports learning, is easy to use, and provides an individualized learning environment. Some of the student views are as follows:

S1: *"Yes, because the lectures are clearly understandable, the tests increase the memorability, so I would recommend them."*

S2: *"I recommend, yes, because thanks to this system, I both reinforced my issues and determined my shortcomings."*

3.6 Students' Views on the Aspects of the Smart MOOC Integrated with Intelligent Tutoring Environment that are Open to Improvement

The students were asked what aspects of the developed Smart MOOC Integrated with Intelligent Tutoring environment could be open to improvement. The opinions of the students are given in Table 5.

Table 5. Students' views on the aspects of the Smart MOOC Integrated with Intelligent Tutoring environment that are open to improvement

Sub-Theme	Frequency
I have no suggestions as it is great.	10
Uploading video of the topics in a little more detail	9
Interface design should be improved	8
It can be motivating for users to see other users' data.	3
There may be more questions	2

When Table 5 is examined, it is seen that the students stated that the lecture videos could be more detailed, the interface design could be improved, it would be useful to see the class average of the users in the dashboard regarding learning analytics, and the number of questions in dynamic assessment could be increased. Some of the student views are as follows:

S1: *"I can wait for the videos to be uploaded in a little more detail."*

S3: *"It can show our ranking among those who use the system."*

4. CONCLUSION AND DISCUSSION

In this research, students' views on the SMIT environment that is based on the adaptive and dynamic intelligent tutoring system supported with learning analytics were analyzed. Each component of this environment was grounded and developed by taking the solution offers for the problems commonly introduced in the literature regarding the MOOCs as references. Following the general assessment of the findings obtained, it is possible to state that the views of the students concerning the system are positive. Upon the analysis of the findings in detail, the dynamic assessment present in the system and multiple alternative contents provided such as e-book, presentation, video, infographics, and learning tasks stand out as the positive features. The students are given scaffolding questions or tips as feedback when they cannot solve a problem and it is aimed for them to reach competence by doing so. This process is called dynamic/interactive assessment (Tzuriel, 2000). There is also a dynamic assessment module in the SMIT environment intended for providing the students with the support they need during problem-solving. The support to be provided to the students at the time when they cannot solve a problem is important to achieve the learning. Students' opinions refer to the importance of this support.

The positive views of the students about providing alternative content can be assessed within the context of flexibility. The universal learning design built on the idea of creating flexibility in the curriculum (Meo, 2008) recommends enabling the variety of expression for students during their performances through various learning tasks and using different presentation forms such as voice, text, and visual in transferring information in order to achieve flexibility (Meyer and Rose, 2006). In the system developed, the flexibility achieved through alternative content became a significant design component regarded positively by the students following the dynamic assessment. Considering the students' views, it can be expressed that the students have expectations

towards videos provided as the alternative content to have a brief expression and the system meets this expectation. It was observed that the students have positive intentions to use the developed SMIT environment since it facilitates the learning in different courses and learning contexts and provides repetition and reinforcement in the courses.

The research was limited with liked and disliked features of the SMIT environment, its preferability for various learning contexts, and opinions on the ease of use of the system. In the next stage, it is considered to analyze the student's acceptance structures regarding the developed SMIT based on the real usage data on the basis of technology acceptance models. In addition, the research was conducted in accordance with the case study, which is one of the qualitative research designs. As the continuation of this research, it is projected to carry out a study on a systematic analysis of the students' perspectives on SMIT environment through Q-methodology, which has a predominant qualitative aspect, however, regarded as a mixed-method since it involves a principal components analysis stage.

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