THE ENGAGEMENT AND CHALLENGES OF XMOOC VERSUS CMOOC STUDENTS

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ABSTRACT

The study examines massive open online course (MOOC) students' engagement and learning challenges while comparing two groups: xMOOC, a structured course based on individual learning, and cMOOC, an interactive course based on collaborative learning. Applying a mixed-methods research design, data were collected via an online survey and semi-structured interviews. The findings indicated differences in students' "engagement profile" between the two groups. The xMOOC students asserted high means for cognitive and behavioral engagement, whereas the cMOOC students asserted high means for cognitive and social engagement. The main challenge for xMOOC students was the complexity of course content, while the cMOOC students were more concerned about technical problems. The results reinforce the need for teaching staff to adjust student support according to MOOC type.

Keywords: *collaborative learning, engagement, massive open online courses (MOOCs), mixed methods*

INTRODUCTION

Student engagement in massive open online courses (MOOCs) is a key contributing factor to desirable outcomes such as academic success, motivation, satisfaction, and persistence (Barak et al., 2016; Lan & Hew, 2020; Sun et al., 2018; Sun et al., 2020; Wang et al., 2019; Wei et al., 2021). Previous studies conceptualized "learner engagement" in MOOCs as a unidimensional construct, focusing on behavioral engagement aspects—the patterns of participation of learners in course activities such as watching the videos, asking questions, and completing assignments—or social engagement aspects-learners' social interactions with instructors or peers in discussion forums, working groups, and social networks outside the MOOC platform (Barak & Watted 2018; Campbell et al., 2015; Coffrin et al., 2014; Kizilcec & Schneider, 2015; Seaton et al., 2014; Xiong et al., 2015). Little attention addressed learner engagement as a multidimensional construct incorporating discrete engagement aspects, such as behavioral, cognitive, emotional, and social (Watted & Barak, 2018). Overlooking the multidimensional construct of learning engagement may result in motivational issues and learning barriers (Barak & Watted, 2018).

Massive open online course students encounter many challenges and barriers that, in some cases, lead to course failure (Berliyanto & Santoso, 2018; Henderikx et al., 2018; Mohan et al., 2020; Shapiro et al., 2017). Previous studies have indicated several types of barriers for MOOC learners (Barak & Usher, 2021; Henderikx et al., 2018; Mohan et al. 2020; Rabin et al., 2020; Shapiro et al., 2017). For example, Henderikx et al. (2018) classified barriers that influence intention achievement in MOOCs. According to the researchers, they can be categorized into three groups: Non-MOOC-related barriers refer to difficulties that can be dealt with on a personal level, such as lack of time and lack of technical and online digital skills. MOOC-related barriers refer to difficulties that can be dealt with on MOOC level, such as course design. And partly-MOOC- and partly non-MOOC-related barriers refer to difficulties that can be dealt with on both personal and MOOC level, such as social context. The barriers and challenges described in the

literature are presented in a general manner, disregarding the fact that over the last decade, different types of MOOCs have evolved.

Traditionally, MOOCs are divided into two main types: cMOOCs and xMOOCs (McLoughlin & Magnoni, 2017; Siemens, 2012). The cMOOC stands for connectivist MOOC, focusing on aggregated content, peer interactions, and communication among learners. The pedagogy is based on connectivist and constructivist learning theories, maintaining that learning materials should be presented in an accumulated way rather than preselected and that learners should be active participants. The cMOOC connects learners by engaging them in activities that include posing questions, answering peers' questions, sharing knowledge, and working collaboratively on joint projects (Siemens, 2013). Such courses are less structured, and learners have the freedom to follow their own paths in the learning process. The xMOOCs have a more structured instructional design that follows the traditional lecturer-student structure, in which learners are expected to view short video lectures, work individually on personal tasks, and answer quizzes (McLoughlin & Magnoni, 2017). Due to the distinct differences between MOOC types, the current study was set to provide a more nuanced understanding of MOOC students' engagement and learning challenges by comparing cMOOC and xMOOC students.

LITERATURE REVIEW

Learners' Engagement in MOOCs

Student engagement is described as an important factor to successful learning and teaching (Alemayehu & Chen, 2021; Henrie et al., 2015; Trowler & Trowler, 2010). A high level of engagement is associated with better performance and learning outcomes (Lee, 2014). Conversely, a low level of engagement is related to adverse effects on performance and learning outcomes (Nystrand & Gamoran, 1991). In the context of MOOCs, learner engagement plays a pivotal role in MOOC completion rates, and it is considered a potential driver for persistence and success in MOOCs (Barak et al., 2016; Hone & El Said, 2016; Lan & Hew 2020; Petronzi & Hadi, 2016; Sun et al., 2020). Given that completion rates are a major concern in MOOCs, learner engagement should be further studied from various aspects.

Prior studies conceptualized "learner engagement" in MOOCs as a unidimensional construct that focuses on behavioral engagement aspects or social engagement aspects (Barak & Watted 2018; Campbell et al., 2015; Kizilcec & Schneider, 2015; Sunar et al., 2020). Behavioral engagement refers to the patterns of participation of learners in course activities, including watching the videos (Campbell et al., 2015; Seaton et al., 2014), asking questions, and completing assignments (Coffrin et al., 2014). For example, Williams et al. (2018) defined MOOC engagement as the percentage of assignments and activities attempted by each participant throughout the course.

Social engagement refers to learners' social interactions with instructors or peers in discussion forums, working groups, and social networks outside the MOOC platform, wishing to know their peers and learn through their experiences (Chiu & Hew, 2018; Deng et al., 2020; Sunar et al., 2020). For example, Sunar et al. (2020) investigated learners' social engagement on an MOOC platform and the impact of engagement on course completion. The results showed that the type and level of social engagement are correlated to course completion, and it may be an indicator for the prediction of course completion (Sunar et al., 2020). Similar results were indicated by the Barak et al. (2016), who examined learners' social engagement in online forums in MOOCs. The study indicated positive relationships between participants' motivation gain (i.e., the difference between pre and post ratings), the number of messages posted to the online forums, and the number of members in the online study groups. Most studies on learners' engagement in MOOCs focused mainly on behavioral and social engagement aspects because they are overt and easily identified (Deng et al., 2020). Studies often use course statistics as an indicator for learners' behavioral or social engagement (Barak et al., 2016; Kizilcec & Schneider, 2015; Xiong et al., 2015).

Engagement aspects that are more nuanced and less observable are emotional and cognitive engagement. They received far less attention from researchers because they are more complex and difficult to identify and measure. Emotional engagement in MOOCs refers to the presence of positive or negative emotional reactions toward instructors and peers, as well as having an

interest in the MOOC content (Comer et al., 2015; Li & Baker, 2018). These emotional reactions may involve interest and curiosity, enjoyment, belonging, anxiety, altruistic emotions, and depression (Cheng, 2014; Daniels et al., 2016). Emotional engagement in MOOCs has been investigated using mainly quantitative research approaches (Cheng, 2014; Comer et al., 2015). For example, in an exploratory study, Cheng (2014) examined learners' altruistic and intergenerational emotions in an MOOC in computer science by analyzing the interaction transcripts in the discussion forums of the MOOC. Cognitive engagement in MOOCs refers to the mental investment that learners exert while conducting a learning activity, and their ability to comprehend new ideas and master challenging skills (Deng et al., 2020). A study indicated that MOOC learners with high cognitive engagement achieved higher grades compared with their peers, particularly those who followed the instructed learning track (Li & Baker, 2018). A more recent study referred to cognitive engagement as conceptual knowledge and academic achievements that can be measured as the outcomes of MOOCs (Wei et al., 2021). The study maintained that outcome-oriented feedback and a combination of knowledge tests and skill tasks could serve as means for examining cognitive outcomes in MOOCs (Wei et al., 2021).

Studies that examine "learner engagement" in MOOCs from a multidimensional perspective present an in-depth understanding of the learning process (Lan & Hew, 2020; Li and Baker, 2018). For example, by analyzing click stream data, Li and Baker (2018) examined the relationships between behavioral and cognitive indicators of engagement and course outcomes for different participant subgroups in MOOCs. Their study maintained that the engagement variable may predict achievement differently for different participant subgroups for both behavioral and cognitive engagement. Another example is the study of Lan and Hew (2020), which examined student engagement in MOOCs from behavioral, emotional, and cognitive engagement aspects. The study indicated that the behavioral, emotional, and cognitive engagement aspects predict learners perceived learning, however, the emotional engagement aspect showed the largest positive impact. Furthermore, all these engagement aspects poorly predicted MOOC learners' completion.

MOOC Learners' Challenges and Barriers

The literature on MOOCs refers to many challenges and barriers that may hinder learning and sometimes lead to high dropout rates of learners (Barak & Usher, 2021; Li et al., 2016; Mohan et al., 2020). Extensive literature showed that barriers to MOOC learners can be either MOOC-related or non-MOOC-related (Henderikx et al., 2017, 2018). Barriers and challenges which are MOOC-related include course design **(**Gutiérrez-Santiuste et al., 2015; Henderikx et al., 2018; Shapiro et al., 2017), lack of faculty support (Gutiérrez-Santiuste et al., 2015), lack of instructor presence (Mohan et al., 2020; Onah et al., 2014), inappropriate learning conditions (Khalil & Ebner, 2014; Li et al., 2016), and diversity in the native language of MOOC learners (Barak & Usher, 2021). For example, Gutiérrez-Santiuste et al. (2015) conducted their study to examine the barriers emerging while using MOOC for learning purposes performed through formal and nonformal learning environments. They found that the nonformal group was dissatisfied with "planning, design, and assessment" compared to the formal group, where students were "more satisfied" with the whole learning environment, which included course design, content, and collaborative community. Yet, the researchers found that building a community of supportive learners created a sense of satisfaction among students who were more satisfied with planning, course design, and community creation. Later, Barak and Usher (2021) identified heterogeneity in native language as a hindering factor of students' learning outcomes. The research findings were explained by difficulties in communication among learners, resulting in misunderstandings and unresolved conflicts (Barak & Usher, 2021).

Barriers and challenges which are non-MOOC-related include lack of time (Henderikx et al., 2018; Khalil & Ebner, 2014; Onah et al., 2014; Rabin et al., 2020; Shapiro et al., 2017), insufficient academic background (Rabin et al., 2020; Shapiro et al., 2017), lack of effective self-regulated learning (Henderikx et al., 2018; Shapiro et al., 2017), time constraints (Mohan et al., 2020), technical problems (Mohan et al., 2020; Rabin et al., 2020), insufficient technology background (Khalil & Ebner, 2014), and family issues (Henderikx et al., 2018, 2019). For example,

Shapiro et al. (2017) investigated the factors that encourage learners to engage in a MOOC, as well as the demotivating barriers. The researchers indicated that lack of time was one of the most cited challenges for MOOC users who stated that they "were not prepared for the time demands of taking a university-level online course" (Shapiro et al., 2017, p. 46). In another study with similar results, Mohan et al. (2020) found that time constraints and technical problems were significant learning barriers that demotivated learners. As presented above, the literature addresses many challenges university students face while studying an MOOC; yet, little attention was devoted to their classification from the perspectives of cMOOCs and xMOOCs.

METHOD

Research Goals and Participants

The research goal was to examine MOOC students' engagement and learning challenges while comparing two groups: an xMOOC, a structured course based on individual learning, and a cMOOC, an interactive course based on collaborative learning in small groups. This raised the following research questions:

1. What are the differences in students' learning engagement in the xMOOC versus the cMOOC?
2. What are the differences in students' learning challenges in the xMOOC versus the cMOOC?

The research population (N = 176) included two samples of university students: 117 participants who studied and completed an xMOOC and 59 participants who studied and completed a cMOOC. In both samples, around 70% were female and most of the participants (about 90%) were between the ages of 21–35. The participants signed an informed consent form, indicating that participation is voluntary and that they could withdraw at any given time. The researchers retrieved the data blindly and analyzed them in the aggregate to maintain the privacy of the participants. Semi-structured interviews were collected from 33 participants: 17 participants from the xMOOC and 16 from the cMOOC.

Research Setting

We conducted the study in the settings of two MOOCs delivered via the campus online system (https://campus.gov.il). While the two courses were different subjects, the learning activities were aligned. Both course durations were eight weeks with an estimated workload of 4–6 hours per week, including eight units. The courses featured recorded mini lectures and assessments, such as weekly quizzes and open-ended questions. The difference between the two courses were individual compared to group learning methods. The first course "The Hook, the Bait, and the Fish: Approaches to Teaching Thinking," was designed as an xMOOC, and the second course, "Introduction to Multiculturalism and Cultural Diversity," was designed as a cMOOC.

The course "The Hook, the Bait, and the Fish: Approaches to Teaching Thinking," objective was to advance instructional thinking among students. The course presents education for thinking from different approaches: the skills approach, the dispositions approach, and the understanding approach. The course discusses key questions, such as *What generates good thinking and how should we teach it to develop an awareness of effective, critical, and creative thinking?* It included eight video lectures, divided into short segments of 10–15 minutes, and individual assignments, such as weekly quizzes, open-ended questions, and a final exam.

The course "Introduction to Multiculturalism and Cultural Diversity" introduces issues of multiculturalism, such as personal identity, culture, prejudice, stereotypes, and connections between different groups in the global world. The course objectives were to cultivate multicultural sensitivity, develop an understanding of the components of our identities, and acquire tools to deal with the lack of tolerance and discrimination. Students prepared for the topics through role-play and taking on different identities, watching videos that demonstrate the theoretical topics of the course, and participating in forums composed of students from different geographic areas. In this MOOC, learners not only talk about but *do* by using the virtual collaborative world "Fire Storm," which allows meetings between members of different groups from different places. The course included collaborative assignments, such as participating in the virtual assignments in small groups, collaborative writing of responses to open- and closed-ended questions, and participating in interactive discussions.

Methodology, Tools, and Data Analysis

This study employed a mixed-methods research design in the form of an exploratory case study, in which the quantitative and qualitative methods were prioritized equally (Creswell & Plano Clark, 2007). The researchers gathered the data at the end of the MOOCs via an online survey and semi-structured interviews, as detailed below. We used a Google form tool for online surveying.

The researchers administered a Google form tool for online surveying to identify participants' engagement in the MOOCs, providing an answer to the first research question. The survey included two parts: demographic data and a closed-ended scale. The demographic data included gender, age, and academic background. The researchers modified the closed-ended scale from the MOOC engagement scale (Deng et al., 2019), which included four categories—behavioral engagement, cognitive engagement, emotional engagement, and social engagement—each composed of three items, on a 1 (strongly disagree) to 6 (strongly agree) Likert-type scale. The scale's overall reliability by Cronbach's alpha was .92. The reliability for each category was: behavioral engagement α=.91, cognitive engagement α=.81, emotional engagement α=.91, and social engagement α=.72. The quantitative data was statistically analyzed by the IBM Statistical Program for the Social Sciences (SPSS), version 22.0 (IBM, 2013). Because mean ratings met the assumptions of normal distribution, homogeneity, and independence (Field, 2009), the researcher ran data analysis through a series of t-tests to examine differences between the MOOC students.

The researcher ran the semi-structured interviews to examine the learning challenges that the MOOCs' participants faced and overcame, providing an answer to the second research question. The researchers categorized the interviews as a conversation based on questions and answers that they used to navigate the interview. The questions were: *Was learning via MOOC a positive or negative experience? Please give examples. What challenges did you face and how did you address them? Would you recommend a friend to learn an MOOC?* Thirty-three MOOC students volunteered to be interviewed, seventeen from the xMOOC group and sixteen from the cMOOC group. The interviews were about 45 minutes, conducted face-to-face in person, using research diary, audiotaped via Audacity tool (http://audacity.sourceforge.net) and fully transcribed.

To establish the study's trustworthiness and the validity of the data analysis and interpretation processes, we performed two types of triangulations (Denzin, 2006). First, we performed methodological triangulation through the use of a survey and interviews to collect data as well as the use of both qualitative and quantitative analysis methods. The strengths of both methods compensate for their individual weaknesses and decrease the biases that may come from any single method (Creswell & Plano Clark, 2007; Denzin, 2006). Secondly, we performed investigator triangulation through the use of more than one investigator (i.e., the authors) to analyze the same datasets and to provide an independent examination. We aligned the data analysis and interpretation across investigators to enhance the credibility of the findings (Denzin, 2006).

FINDINGS

This section includes two parts, each answering one of the research questions. The first part presents the differences in the learning engagement of students in the xMOOC versus the cMOOC. The second part describes the differences in the learning challenges in the xMOOC versus the cMOOC.

The Differences in Learning Engagement of xMOOC and cMOOC Students

Findings indicated that the xMOOC students expressed higher means (on a scale of 1–6) for "overall engagement" compared with the cMOOC students (M = 4.80, SD = 0.77; M = 4.32, SD = 1.01, respectively). The results were statistically significant for the "overall engagement" (t(92.74) = 3.21, p =.02) and for three of the four categories: "behavioral engagement" (t(92.00) = 5.44, p =.00), "social engagement" (t(174.00) = 2.13, p =.03), and "emotional engagement" (t(85.36) = 4.04, p =.00). With regards to "cognitive engagement," only one item showed statistically significant difference between the two groups. Therefore, the overall category showed nonsignificant difference. Table 1 presents the means, standard deviations, and t-test results for each category and items.

Table 1.
The Engagement Category, Means, Standard Deviations, T-Tests by Research Group

Engagement Category	xMOOC (N=117)		cMOOC (N=59)		t	p
	Mean	Sd	Mean	Sd		
Behavioral Engagement	***4. 91***	***1.04***	***3.80***	***1.38***	***5.44***	***.00***
• I set aside a regular time each week to work on the MOOC.	4.96	1.63	4.05	1.49	4.09	.00
• I took notes while studying the MOOC.	4.87	1.17	3.63	1.46	5.69	.00
• I revisited my notes when preparing for MOOC assessment tasks.	4.91	1.14	3.73	1.56	5.14	.00
Cognitive Engagement	***5.07***	***0.80***	***4.74***	***1.16***	***1.93***	***.57***
• I often searched for further information when I encountered something in the MOOC that puzzled me.	5.03	1.03	4.44	1.50	3.73	.01
• When I had trouble understanding a concept or an example, I went over it again until I understood it.	5.09	0.88	4.78	1.34	1.63	.10
• If I watched a video lecture that I did not understand at first, I would watch it again to make sure I understood the content.	5.07	0.99	5.00	1.29	0.39	.70
Social Engagement	***4.41***	***1. 15***	***4.79***	***1.08***	***2.13***	***.03***
• I often responded to other learners' questions.	4.50	1.44	4.67	1.57	0.98	.32
• I contributed regularly to course discussions.	4.43	1.60	5.14	1.18	3.32	.00
• I shared learning materials (e.g., notes, multimedia, links) with other MOOC classmates.	4.29	1.59	4.97	1.30	2.82	.00
Emotional Engagement	***4.80***	***1.01***	***3.93***	***1.45***	***4.04***	***.00***
• I was inspired to expand my knowledge in the MOOC.	4.87	1.00	4.08	1.48	3.67	.00
• I found the MOOC interesting.	4.76	1.19	3.88	1.74	3.49	.00
• I enjoyed watching video lectures in the MOOC.	4.78	1.17	3.83	1.60	4.04	.00

Table 1 shows that the xMOOC students expressed high means for the following items: "When I had trouble understanding a concept or an example, I went over it again until I understood it" and "If I watched a video lecture that I did not understand at first, I would watch it again to make sure I understood the content" (M = 5.09, SD = 0.88; M = 5.07, SD = 0.99, respectively). Both items are under the Cognitive Engagement category. xMOOC students expressed low means for the following items: "I contributed regularly to course discussions," and "I shared learning materials (e.g., notes, multimedia, links) with other MOOC classmates" (M = 4.43, SD = 1.60; M = 4.29, SD = 1.59, respectively). Both items are under the Social Engagement category. Interestingly, these two items received the highest means among the cMOOC students, while the lowest means were assigned to two behavioral engagement items: "I revisited my notes when preparing for MOOC assessment tasks" and "I took notes while studying the MOOC" (M = 3.37, SD = 1.56; M = 3.36,

SD = 1.46, respectively). The results show that each MOOC type had a different "engagement profile." The xMOOC engaged students in cognitive and behavioral learning processes, while the cMOOC engaged students in cognitive and social learning processes. Emotional engagement received medium ratings in both MOOCs, suggesting that it was an important component, but not a defining one.

The Differences in Learning Challenges of xMOOC and cMOOC Students

The analysis of participant interviews indicated 156 text excerpts that referenced a variety of learning challenges and barriers that the MOOC students encountered and overcame. Through an iterative coding process, 14 learning challenges emerged, which were grouped into four main categories: course design, learning conditions, personal and social issues, and technical problems, as shown in Table 2.

Table 2.
Learning Challenges of MOOC Participants and Their Prevalence Among the Participants

Categories	Learning Challenges	% of Students
Course Design	Complexity of course content	33
	Complexity of course assignments	21
	Problems with peer-graded assignments	15
Learning Conditions	Information overload	52
	Time constrains	48
	Language challenges	27
	Unclear instructions	33
	Limited support	27
Personal and Social Issues	Low self-efficacy	15
	Low self-regulated learning	26
	Low time management ability	18
	Low self/group commitment	34
Technical Problems	Inadequate digital competence	36
	Problems with network connection	21
	Technical problems with hardware	48

Table 2 shows that the most common challenge was information overload, with more than half of the participants (52%) stating it. Other commonly coded challenges included time constrains (48%) and technical problems with hardware (48%). The least-mentioned challenges were problems with peer graded assignments (15%) and low self-efficacy (15%). For example, Alla, an undergraduate student, stated:

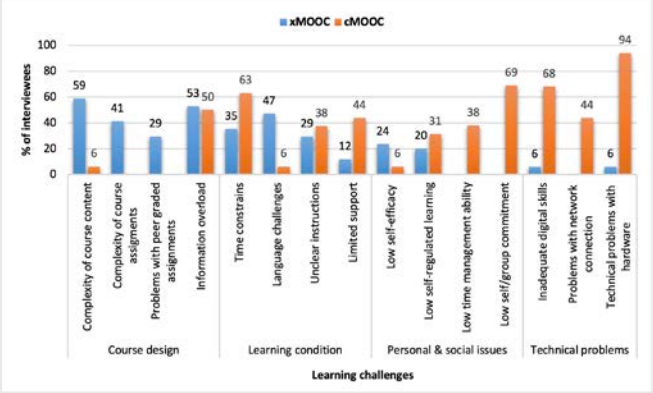
> This is the first time that I took an online course. The course requires a lot of effort; each week I have to follow up the learning materials, resolve the quizzes, and even try more than once, in case I did not succeed from the beginning in solving the required. Also, the subject of the course is not an easy topic, so I spend a lot of time solving the task because there is no feedback from the instructor."

Another example is Lora's statement regarding time constraints: "It's not easy to study an online course. I need to devote one or two hours per week to study the course materials and approximately six hours on the weekly assignments. …Sometimes I don't have enough time." Like Lora, many students were not prepared for the time demands that are required to study MOOCs. With regards to technical problems, Amjad stated, "Some of our group members had technical problems with the audio system in their labs while meeting in the virtual world, so they could not communicate with us. Others were unable to enter the virtual word on time because they didn't receive the email message promptly."

A deeper analysis of learners' interview transcripts indicated differences in the learning challenges profiles of the xMOOC and the cMOOC students. According to the data analysis, the xMOOC students' main challenge related to course design—namely, they were concerned about complexity of course content (59%), information overload (53%), and the complexity of course assignments (41%). Other challenges focused on learning conditions, mainly language challenges (47%) and time constraints (35%). The challenges that were least mentioned related to personal and social issues and technical problems. The xMOOC students were not concerned about challenges related to low time management ability, low self

or group commitment, and problems with network connection. The cMOOC students' main challenge related to technical problems while using the virtual world platform to work in small groups. The main challenges related to technical problems with hardware (94% of interviewees) and inadequate digital competence (68% of interviewees). Other commonly coded challenges focused on personal and social issues, mainly low self or group commitment (69% of interviewees). The challenges that were least mentioned related to the course design. The cMOOC students were not concerned about challenges related to complexity of course assignments or problems with peer graded assignments. Figure 1 presents the differences in learning challenges of xMOOC and cMOOC students.

Figure 1.
The Differences in Learning Challenges of xMOOC and cMOOC Students



DISCUSSION AND CONCLUSIONS

In the past decade, studies have looked at retention rates with an eye toward better understanding the learners' barriers of engagement via MOOC (Henderikx et al., 2018; Rabin et al., 2020; Shapiro et al., 2017; Sun et al., 2020). In the current study, we built upon previous research and examined students' learning challenges and engagement aspects in MOOCs in two distinct course types: an xMOOCs, a structured course based on individual learning, and a cMOOC, an interactive course based on collaborative learning in small groups. Our main findings are summarized and discussed in the following paragraphs.

Learners' Engagement via MOOC

The study extends the scope of previous research on learner engagement via MOOCs (Alemayehu & Chen, 2021; Barak et al., 2018; Hone & El Said, 2016) and endorses its conceptualization as a multidimensional construct that includes four discrete engagement aspects: behavioral, cognitive, emotional, and social. This study examined differences in learners' engagement in an xMOOC and a cMOOC, indicating a distinct engagement profile for each MOOC type. This finding corresponds with previous research, which indicates that different MOOCs had different patterns of participation (Brooker et al., 2018) and different MOOC features (e.g., duration, discipline, level of difficulty pedagogy, and type of assessment) that can influence learners' engagement (Deng et al., 2020; Evans et al., 2016; Rayyan et al., 2016; Williams et al., 2018). For example, Williams et al. (2018) indicated that course engagement was significantly predicted by the main effects of course discipline. Deng et al. (2020) found that the configuration and manipulation of the teaching and learning environment, such as the type of assessment, can facilitate or hinder the way learners engage in MOOCs. Correspondingly, the current study indicated that the xMOOC students expressed high means for cognitive and behavioral engagement. The xMOOC is designed for self-learning through watching videos and lectures, reading e-journals, and performing exercises. The lecture videos presented a conceptual map that included many difficult and complex concepts. Consequently, the learners were accustomed to taking notes, documenting arguments, and posing questions about the learning materials. This was supported by the xMOOC's individual assignments, which were designed to encourage students to develop effective thinking, critical thinking, and creative thinking.

The study's findings also indicated that the cMOOC students expressed high means for cognitive and social engagement. The cMOOC applied a virtual world platform that allowed students to study in small groups and apply a variety of role-play scenarios. This included participation in interactive discussions and a virtual escape room, which was designed by the instructors and required cognitive efforts from the students. The cMOOC provided a multicultural platform as students worked in small groups with students from different colleges.

To conclude, the unique features of MOOCs imply that learners may exhibit different aspects

of engagement in each purposefully constructed learning space. Different aspects of engagement should be taken into consideration while developing and designing MOOC curriculums, learning activities, organizing learning environments, and creating assignments. The explication of learners' engagement can provide new insights into the background and consequences of engagement and disengagement and, thus, increase the quality of learning outcomes in MOOCs.

Challenges That MOOC Students Face

In this study, we uncovered and classified the challenges encountered by MOOC learners. These challenges or barriers might hinder the learning process and, in some cases, lead to high dropout rates (Kop et al., 2011; Li et al., 2016; Mohan et al. 2020; Shapiro et al. 2017; Viswanathan, 2012). This study classified MOOC students' learning challenges into four categories: course design, learning conditions, personal and social issues, and technical problems.

Overall, information overload, time constraints, and technical problems with hardware were the major barriers of the students in both MOOCs. This can be explained by the idea that some of the MOOC students were not prepared for the time demands of taking an MOOC or for the efforts that were required for these types of online courses. These results were indicated in other studies, suggesting that time is the most important resource for learners in MOOCs (Mohan et al. 2020; Shapiro et al. 2017; Viswanathan, 2012). The results of the current study were also supported by the work of Kop et al. (2011), who pointed out that some learners are overwhelmed by the amount of information and effort required for completing an MOOC.

Deeper analysis indicated different profiles of learning barriers between the two distinct MOOC students. In the xMOOC group, the most coded barriers focused on the course design, particularly the complexity of course content and information overload. This can be explained by the fact that MOOC students are not fully equipped with the necessary prior content knowledge or sufficient academic background (Henderikx et al., 2017, 2018)

In the cMOOC group, the most coded barriers focused on technology, particularly technical problems with hardware and inadequate digital competence, as well as personal and social, mainly low self or group commitment. This can be explained by the fact that MOOC students are not fully equipped with the necessary abilities and skills for learning in an MOOC environment and face difficulties adapting to this type of learning design, where they have to use technological applications, navigate in virtual worlds, and work collaboratively in multicultural groups.

CONCLUSIONS

The findings of the study provide useful insights into higher education institutions planning to introduce MOOCs. Different patterns of engagement will be taken into consideration while developing and designing MOOC learning environments and creating assignments to increase the quality of learning outcomes in MOOCs.

Different types of barriers emerged in distinct MOOCs—information overload, time constraints, technical problems with hardware, and inadequate digital competence were the major barriers of the students in the two MOOCs. Therefore, we recommend that MOOCs be integrated into the curriculum and that universities encourage blended learning through MOOCs in regular courses. Blended learning would facilitate interactions with the instructor and the teaching staff. The role of the instructor and the teaching staff is critical in MOOCs, as they will offer support for students who have difficulties learning via MOOC, by explaining the complexity of course content, helping them solve technical problems, and suggesting solutions for problems-based collaborative learning.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to ethical restrictions.

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