Instructor Experiences Designing MOOCs in Higher Education: Pedagogical, Resource, and Logistical Considerations and Challenges

Meina Zhu and Curtis J. Bonk
Indiana University

Annisa R. Sari
Indiana University and Yogyakarta State University, Indonesia

Abstract

As massive open online courses (MOOCs) increase, the large scale and heterogeneity of MOOC participants bring myriad significant design challenges. This exploratory mixed methods study explores 143 MOOC instructors' considerations and challenges in designing MOOCs, 12 of whom were interviewed and had their courses analyzed. The survey, interview, and course review data revealed a variety of considerations and challenges in MOOC design in terms of pedagogy, resources, and logistics. *Pedagogical considerations* included learning objectives, assessment methods, course length, course content, flexibility, and collaborative learning support. *Resource considerations* included the affordance of MOOC platforms, support from the host institution and the platform, and the available intellectual and hardware resources. *Logistical considerations* included the amount of time instructors spent designing the MOOC. The obstacles included *pedagogical challenges* (e.g., engaging learners, increasing learner interaction, and limited assessment methods), *resource challenges* (e.g., limitations associated with the affordances of the platform), and *logistical challenges* (e.g., time limitations for designing and developing MOOCs). To address these challenges, the instructors often relied on reviewing other MOOCs. They also sought help from colleagues, their universities, and support personnel of the adopted platforms.

Keywords: massive open online courses (MOOCs), instructional design, design considerations, design challenges, MOOC instructors

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The nature of online learning, entailing the separation of instructors and learners, elevates the role of instructional designers (Johnson & Aragon, 2003; Phipps & Merisotis, 1999). Design can greatly influence learner interaction and engagement in online learning (Garrison & Cleveland-Innes, 2005). For example, Garrison and Cleveland-Innes (2005) found that online course design and the pedagogical approaches selected influence participant learning and online interaction. Such findings also apply to MOOCs, which have emerged as an innovative form of online learning. Instructors' design of MOOCs can greatly influence learner engagement, deep and meaningful learning, and completion rates (Keyek-Franssen, 2017; Yousef, Chatti, Schroeder, & Wosnitza, 2014). Not surprisingly, MOOCs have faced criticisms since inception, including insufficient and low-quality instructional design (Ferreira, 2014; Margaryan, Bianco, & Littlejohn, 2015). Meanwhile, instructors also face design challenges, such as the difficulty of personalizing MOOCs to meet individual learner needs (Bonk, Zhu, et al., 2018; Beaven, Hauck, Comas-Quinn, Lewis, & de los Arcos, 2014) and the engagement of diverse learners widely spread across the globe (Adair et al., 2014).

Most of the research to date has focused on enrollment, perspectives, behaviors, completion rates, and participation patterns in MOOC environments from a learner perspective (Breslow et al., 2013; Emanuel, 2013; Liyanagunawardena, Adams, & Williams, 2013). In addition, Kop (2011) states that instructors are one of five key elements for a successful MOOC; other important elements include learners, topic, material, and context. Despite the importance of the role of the MOOC instructor, few studies have examined instructional design and the delivery of instruction using MOOCs from instructors' perspectives (Margaryan et al., 2015; Ross, Sinclair, Knox, Bayne, & Macleod, 2014; Watson et al., 2016); especially lacking is research on the design considerations and challenges from MOOC instructors' perspectives (Liyanagunawardena et al., 2013; Ross et al., 2014; Veletsianos & Shepherdson, 2016; Watson et al., 2016). Thus, to better understand instructors' design experiences in MOOCs and provide suggestions for future MOOC instructors, this study examines MOOC instructors' design considerations and challenges.

Review of Related Literature

MOOCs in Higher Education

The term *MOOC* was coined in 2008 by Dave Cormier, Manager of Web Communication and Innovations at the University of Prince Edward Island, when referring to the Connectivism and Connective Knowledge course developed by Stephen Downes and George Siemens (de Freitas, Morgan, & Gibson, 2015; Fournier & Kop, 2015). Shortly after, Downes (2008) classified MOOCs into two main categories: (1) loosely structured networks of distributed online resources (i.e., cMOOCs), such as the Connectivism and Connective Knowledge (CCK08) course, and (2) more explicitly organized and tightly structured learning resources that are often centralized on popular MOOC platforms (i.e., xMOOCs), such as Coursera, Udacity, FutureLearn, and edX (Downes, 2008).

The understanding of MOOCs continued to evolve during the next few years. MOOCs were originally designed to be free and openly accessible without formal assessment or grading (Bonk, Lee, Reeves, & Reynolds, 2015, 2018). Levy (2011) enrolled in the PLENK2010: Personal Learning Environments, Networks and Knowledge (Siemens, Downes, Cormier, & Kop, 2010)

course as a learner. She discovered that learning in a MOOC can happen without assessment and depends on learner effort in the course. As MOOCs became increasingly popular and salient in the news in 2012 and 2013, the main MOOC providers (i.e., Coursera and Udacity) began to partner with universities to offer MOOCs for massive numbers of people to learn from prestigious universities and highly respected professors (Toven-Lindsey, Rhoads, & Lozano, 2015). Since those early years, MOOCs have often been promoted for certain distinct characteristics, including offering content in technology-enriched learning environments, fostering easy access to learning content, allowing the enrollment of massive numbers of learners, and resulting in markedly lower costs than traditional education (Liyanagunawardena, Adams, & Williams, 2013).

Currently, MOOCs are being offered by a variety of providers (Veletsianos, Collier, & Schneider, 2015), including universities, such as Stanford University (Kim & Chung, 2015), the University of Michigan (Severance, 2015), and the University of the Philippines Open University (Bandalaria & Alfonso, 2015), as well as organizations such as the Commonwealth of Learning (Venkataraman & Kanwar, 2015) and the World Bank (Jagannathan, 2015). Typically, anyone with an Internet connection can enroll in MOOCs without admission requirements. Once enrolled, they can obtain course resources, interact with peers, and share their knowledge with classmates (Kop, 2011). This educational innovation, which makes higher education more accessible to massive audiences on a global scale, has gained increasing attention in higher education during the past decade (Bali, 2014; Carver & Harrison, 2013; Liyanagunawardena, Adams, & Williams, 2013).

Higher education instructors consider MOOCs an opportunity to reach more people from diverse backgrounds (Hew & Cheung, 2014; Watson et al., 2016). MOOC supporters believe that MOOCs can provide benefits to both learners and instructors (Hew & Cheung, 2014), such as increasing the knowledge available to learners, reaching more learners, and building the reputations of instructors. As a result, the total number of MOOCs available has continued to escalate (Bonk et al., 2015; Conole, 2015; Watson et al., 2016). Early research revealed that the median enrollment size of MOOCs was over 40,000 participants (Jordan, 2014). In 2017, the total estimated number of MOOC participants was 81 million, while around 9,400 MOOCs were offered (Shah, 2017).

MOOCs have expanded from the natural sciences, engineering, and computer technology to social science courses, such as psychology, management, and climate change (Rodriguez, 2012; Watson et al., 2016). As a result, MOOCs offer many new research possibilities in the open online learning arena (Breslow et al., 2013).

As mentioned earlier, open access, low or no cost, and unique partnerships with those in industry combine to make MOOCs a hot topic in higher education (Toven-Lindsey, Rhoads, & Lozano, 2015). At the present time, MOOCs are generally offered by instructors from universities which have signed partnerships with providers, such as Coursera, edX, FutureLearn, and Udacity (Conole, 2015; Daniel, 2012). In fact, by 2012, Coursera, one of the fastest growing MOOC providers, offered more than 1,000 courses from 112 universities (Evans & Myrick, 2015), including Columbia, Duke, and Stanford (Koutropoulos et al., 2012). Fast forward to 2018, and Coursera now has 2,800 courses servicing 34 million learners and relationships with over 1,400 companies to deliver courses to employees in need of training and credentials for the fast-changing work requirements that they face (Schaffhauser, 2018).

In contrast to traditional education, tens of thousands of people can access a single MOOC offered by an elite university (Jordan, 2014; Lewin, 2012). Not surprisingly, the MOOCs movement, which offers a viable, scalable, sustainable, and alternative form of higher education (Selwyn, 2015), is considered a transformational force in higher education (Barber, Donnelly, & Rizvi, 2013; de Freitas et al., 2015; Friedman, 2013) that has the potential to democratize aspects of higher education (Koller, 2015). For example, Dillahunt, Wang, and Teasley (2014) found that MOOC learners who self-identified as unable to afford formal higher education had high completion rates when they intended to obtain a certificate.

On the other hand, MOOCs have also been facing criticism in higher education. Some instructors have questioned whether MOOCs can provide the same learning experience as either traditional online learning or face-to-face classroom learning in terms of instructional quality, access, and learner engagement (Lewin, 2013; Rhoads, Berdan, & Toven-Lindsey, 2013). Kop (2011) stated that MOOCs were designed for massive learners and provide less instructional support; thus, they require learners to be highly self-regulated and personally engaged. Some learners may struggle in MOOC environments with less structure and instructional support (Kop, Fournier, & Mak, 2011). Others critique the initial purpose of democratizing education because most MOOC learners are well-educated, already employed, and tend to face fewer problems affording and accessing higher education (Christensen et al., 2013; Macleod, Haywood, Woodgate, & Alkhatnai, 2015; Zhenghao et al., 2015). Siemens (2013) mentioned that some scholars even view MOOCs as disruptors in higher education. For example, the American Association of University Professors (AAUP) considered MOOCs a threat to professors' intellectual property (Schmidt, 2013).

Despite these disadvantages, studies have indicated that MOOCs bring a challenge to the limited audience and academic knowledge typically found in institutions of higher education (Krause & Lowe, 2014). Thus, the MOOC has been considered a medium for transformative education due to its open accessibility for lifelong learning, provision of skill development opportunities, and enhancement of the quality of life of large numbers of learners (Daniel, 2012; Kelly, 2014).

Instructional Design and MOOC Design Considerations

Instructional design can have a significant impact on deep and meaningful learning (Garrison & Cleveland-Innes, 2005). As such, appropriate instructional design of MOOCs can engage learners and promote meaningful learning (Yousef, Chatti, Schroeder, & Wosnitza, 2015). A variety of instructional design models were developed in 1960s and 1970s (Branch & Dousay, 2015; Gustafson, 1991; Gustafson & Branch, 1997, 2002) that were intended as a means to enhance the design of instructional resources and course units or modules (Reigeluth, 2013). With these models, instructional designers and instructors can simplify the complex reality of instructional design by utilizing the generic elements in specific contexts (Gustafson & Branch, 2002).

Branch and Dousay (2015) reviewed 34 different instructional designs and argued that the following models were appropriate for online environments: (1) Dick and Carey (2008); (2) Bates (1995); (3) Dabbagh and Bannan-Ritland (2004); and (4) Morrison, Ross, Kemp, Kalman, and Kemp (2012). All of these models are related to the most popular design processes (Dousay, 2018), including analyzing, designing, developing, implementing, and evaluating (ADDIE; Gustafson & Branch, 1997). *Analyze* relates to the identification of the probable causes for a performance gap. *Design* refers to the verification of the desired performances and appropriate testing methods. Next,

the *development* phase involves generating and validating the learning resources. Fourth, the *implementation* phase refers to preparing the learning environment and engaging learners. Fifth, the *evaluation* phase is used to evaluate the quality of the instructional design, products, and processes (Branch, 2009). In effect, this study focuses on instructional design in terms of the ADDIE process.

Even though there is a generic or commonly accepted design process, designers might consider different perspectives in specific contexts or particular situations. Correspondingly, different instructional designs of MOOCs can lead to varying results. For example, self-paced MOOCs allow learning to occur based on the learners' own schedule, while instructor-led MOOCs or xMOOCs require learners to follow a fixed schedule (Daradoumis, Bassi, Xhafa, & Caballe, 2013; Lowenthal & Hodges, 2015). These different MOOC designs are guided by an assortment of considerations, including time, available technology, pedagogy, and teamwork (Najafi, Rolheiser, Harrison, & Haklev, 2015).

Alario-Hoyos, Pérez-Sanagustín, Cormier, and Kloos (2014) classified MOOC design considerations into three categories: (1) resources, (2) pedagogy, and (3) logistics. In terms of resources, they introduced a visual participatory framework as a two-step guidance for MOOC design: (a) identifying available resources and (b) making design decisions based on these resources. The available resources include both technology resources and human resources. As indicated, however, design decisions are related to available resources as well as pedagogical considerations (Alario-Hoyos et al., 2014).

In terms of pedagogical considerations, instructors focus on a variety of perspectives. From a learning environment perspective, many researchers advocate for participatory learning environments (Ahn, Butler, Alam, & Webster, 2013), sufficient support from platform providers and universities, and a collaborative community (Watson et al., 2016). From a learner perspective, some researchers have argued for cohort-driven pedagogical designs, which emphasize the importance of knowing the nature of MOOC learner cohort, the learner expectations of the learning process, and motivations for taking MOOCs. Such an approach would help to tailor the learning design for greater MOOC success (Keller & Suzuki, 2004; Malin, 2015; Walji, Deacon, Small, & Czerniewicz, 2016). Some researchers emphasize knowing learners' prior knowledge (Phan, McNeil, & Robin, 2016), building scaffolding, establishing clear expectations among learners, and encouraging participant articulation and reflection (Salmon, Pechenkina, Chase, & Ross, 2016). Studies have also shown that short video lectures, resources, social media, and digital badges (an assessment and credentialing mechanism) were valued by learners (Salmon, Gregory, Lokuge Dona, & Ross, 2015; Salmon et al., 2016).

From a theoretical perspective, Phan et al. (2016) identified three key elements in MOOC design—namely, incorporating (1) key principles of instructional design (Dick, Carey, & Carey, 2009), (2) connectivist learning theory (Siemens, 2005), and (3) self-regulated learning strategies (Barnard, Lan, To, Paton, & Lai, 2009). Key principles of instructional design can ensure rigorous instructional design. Connectivism encourages social interaction among learners. Self-regulated learning strategies can increase learners' self-directedness and time-management skills. These elements will help learners to achieve their learning goals in MOOCs.

The third main consideration in MOOC design is related to logistical elements of the course, such as sufficient time to plan MOOCs, peer assessment, and teaching presence in the course (Arnold, Kumar, Thillosen, & Ebner, 2014; Holland & Tirthali, 2014; Najafi et al., 2015). The

particular characteristics of large-scale and diverse learners made designing MOOCs different from designing small online courses (Knox, 2014). For example, the need to expose learners to the practice of online learning interaction in MOOCs is vastly different from face-to-face courses or smaller online ones (Stewart, 2013; Walji et al., 2016). However, research systematically exploring MOOC design considerations and challenges is scarce.

Challenges of Designing MOOCs

The large scale and heterogeneity of MOOC participants also bring design challenges (Bonk, Zhu, et al., 2018). The design challenges for MOOCs include promoting active participation of learners (Anders, 2015), nurturing peer assessment (Kulkarni et al., 2015; Phan, McNeil, & Robin, 2016), evaluating learners' work, providing immediate feedback, adjusting to time and cost, and encouraging participation in the discussion forums (Hew & Cheung, 2014; Milligan et al., 2013; Waite, Mackness, Roberts, & Lovegrove, 2013). Fournier and Kop (2015) found other challenges, such as providing personalized learning environments, addressing ethical as well as privacy issues in networked environments, and finding appropriate and effective ways to use learner data in the research and development process of MOOCs. With these issues and challenges, the instructional design aspects of MOOCs are extremely weighty and pose difficulties for those on the MOOC design team attempting to maximize the number of participants. Given that instructional design can impact learning, these challenges ultimately influence the resulting learning that takes place within them (Andrews & Goodson,1980; Jonassen, 1997).

In summary, MOOCs are becoming increasingly popular in higher education. Meanwhile, some criticize MOOC instructional design. Previous studies indicate that MOOC instructors might consider three general aspects of their course: resource issues, pedagogical issues, and logistical issues, during the design and delivery processes. Meanwhile, they also face significant challenges during the delivery of their MOOCs, including actively engaging and timely evaluating learners. However, research systematically exploring MOOC design considerations and challenges is scarce.

Methods

The purpose of this study is to explore MOOC design considerations and challenges from the instructor's perspective to better understand instructors' design experiences with MOOCs and provide suggestions for future MOOC instructors in higher education. With this purpose, this study was guided by the following three research questions:

1. What are the considerations of instructors when designing a MOOC?
2. What challenges do instructors perceive when designing a MOOC?
3. How do instructors address the challenges that they perceive related to MOOCs?

To explore instructors' considerations and challenges when designing MOOCs, this study used an exploratory sequential mixed methods design (Creswell & Clark, 2007). More specifically, we used the survey data to revise the interview questions and identify interviewees. A mixed methods approach was used for sequential triangulation and enabled the researchers to have both an overall picture from a large number of participants and rich descriptions of the phenomena.

Participants

A link to a Web-based survey was sent out to 1,400 instructors. This online survey resulted in 143 valid responses. It is important to point out that our MOOC instructor database of 1,400

names was collected by accessing MOOC summary portals from Class Central (https://www.class-central.com/) and the MOOC list (https://www.mooc-list.com/) as well as specific MOOC vendor websites. More specifically, these MOOC vendors and providers included Coursera, edX, FutureLearn, Open2Study, Canvas, NovoEd, Blackboard, iversity, and Kadenze. We primarily collected data from MOOCs presented in English and then cross-checked the various MOOC information items collected for duplicity and errors. As English was the only common language of the research team, it was important to limit this study to courses delivered in English. An additional criterion was to include a maximum of three instructors from one MOOC in the database.

In terms of qualitative data, 12 MOOC instructors were selected from 62 survey volunteers for interviews. The goal was to include instructors representing different countries and subject matter areas. The resulting interviewees (see Table 1) were MOOC instructors teaching in the United States ($n = 4$), UK ($n = 2$), China (mainland and Hong Kong; $n = 2$), Canada ($n = 1$), Australia ($n = 1$), Sweden ($n = 1$), and India ($n = 1$). The instructor who taught in mainland China was originally from Germany. The instructor who taught in Hong Kong was originally from the United States.

Table 1

Interviewees' Demographic Information

Number	Country	Subject area	Platform
1.	U.S.	Language and literacy	Coursera
2.	U.S.	Education	Coursera
3.	U.S.	Education	Canvas
4.	U.S.	Chemistry	Coursera
5.	UK	Public health	FutureLearn
6.	UK	Language and literacy	FutureLearn
7.	China (Hong Kong)	Math	Coursera
8.	Mainland China	Math	Coursera
9.	Canada	Psychology	Coursera
10.	Australia	Public health	Open2Study
11.	Sweden	Computer science	EdX
12.	India	Management	edX

Data Collection

The key data sources of this study included (1) an online survey with 143 valid responses, (2) interviews with 12 instructors who volunteered to participate, and (3) course reviews of the MOOCs of the 12 interviewees using content analysis. The researchers were able to validate and cross-check the findings using different data sources (Patton, 1990). Such an approach provided more nuanced understandings of instructors' MOOC design considerations and challenges than relying solely on one data source (Baxter & Babbie, 2004). The procedure of the data collection included collecting survey data, selecting interviewees, analyzing their MOOCs, interviewing them, and then reanalyzing their MOOCs.

Survey. We developed the survey questions by adopting questions from a previous study by Bonk, Zhu, et al. (2018) as well as reviewing the prevailing literature on MOOC design and MOOC challenges (e.g., Alario-Hoyos et al., 2014; Zhu, Sari, & Lee, 2018) with the goal of investigating the considerations and challenges of MOOC design.

The survey was created using SurveyMonkey, a Web-based platform (see Appendix A). It was then reviewed by six people (i.e., five graduate students and one MOOC expert). Revisions were made based on their feedback. For example, one respondent suggested using a Likert scale rather than a "slider bar" to measure instructor level of involvement in the design process. The final survey included six questions about demographics and 13 questions about design, delivery, and challenges. In addition to the quantitative measures, the survey also included two open-ended questions about the design considerations and challenges of MOOCs.

Interview. The semistructured interviews probed more deeply into the considerations and challenges of designing MOOCs. The semistructured interview included 14 questions with some subquestions for further probing (see Appendix B). The interview questions related to their MOOC design experiences, considerations, challenges, and ways to address the MOOC design problems and issues. Interviews were conducted via Zoom, an encrypted videoconferencing tool. One Web-based interview was conducted with each interviewee, which lasted around 30–60 minutes. The total interview time across the 12 participants was 522 minutes. The interviews were video-recorded and transcribed verbatim by the first author using tools within Kaltura. To ensure validity, the researchers conducted member checking with interviewees to confirm the accuracy of the transcripts. Nine of them provided detailed revision (e.g., misspellings), while three replied without revision but claimed that the transcript was accurate.

Course review. The lead researcher conducted a MOOC content analysis both before and after the interview. Before the interviews, the researchers reviewed the design, course materials, assessments methods, learning activities, and discussion forums of the interviewee's MOOC to gain an initial understanding of the course, show respect to the interviewee, and enhance the efficiency of the interviews. After the interview, the researcher analyzed the MOOCs in detail to triangulate what the instructors described in the interview in terms of the course design. For example, the learning activities that instructors used to engage learners were analyzed to triangulate interview data.

Data Analysis

Closed-ended data from the survey was analyzed using descriptive statistics embedded in SurveyMonkey. The transcribed interviews and the open-ended questions were inductively coded for emerging themes using content analyses (Elo & Kyngäs, 2008). Part of the rationale for using inductive coding was to gain unexpected insights from the data. Here, two researchers read the transcripts and performed the open coding individually. For the two open-ended questions, we also individually coded the data. Once the individual coding was completed, these two researchers met to discuss the discrepancies. Importantly, they reached consensus on categories and themes with 92% interrater agreement.

The final codes included 10 themes related to MOOC instructor design considerations and challenges. For example, the design considerations include learners' diverse prior knowledge level, assessment methods, learner engagement and motivation, facilitation issues, timeline/scope of the course, and learning objectives. For example, in terms of the "engaging and motivating learners" theme, one instructor mentioned, "I engaged people also in the forum. So each week I would write

a message that would be the new welcome page for the week that would say, hey come to the forum and ask questions about this."

Meanwhile, to triangulate the interview data, the researchers reviewed the layout, resources, and activities of the 12 MOOCs of the instructors who were interviewed. For example, when an instructor mentioned that he used peer evaluation as one of the assessment methods in the MOOC, we reviewed his MOOC in terms of the assessment methods to determine whether peer evaluation was used in the course.

Results

Context of the Results

The following paragraphs recap the key demographic information of the MOOC instructors. In total, 145 out of 1,400 MOOC instructors responded to the survey. The data from two MOOC instructors was excluded because they were not involved in the MOOC design process. However, not all of the remaining 143 respondents answered all the questions in the survey. As a result, the total number of respondents to each item varied.

There were more than 20 different disciplines represented in this study. As revealed in Figure 1, the subjects that MOOC instructor participants ($n = 143$) taught, included medicine and health (16%), computer science (14%), education (11%), language and literacy (8%), business (6%), and engineering (6%).
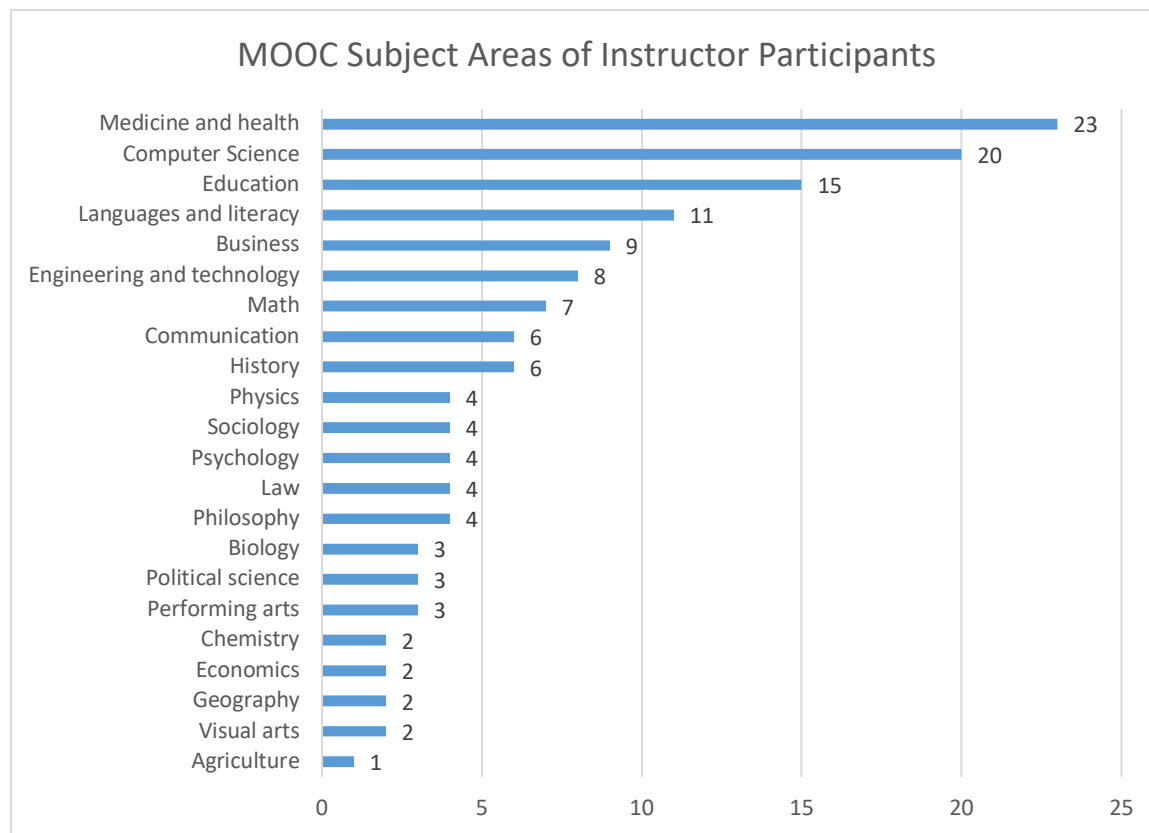

Figure 1. The MOOC subject areas taught by the survey participants.

The instructors' prior online course design experiences were also quite varied. Instructors (*n* = 139) ranked on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*) whether they had many experiences related to designing fully online or blended courses prior to designing their MOOCs. On average, they did not have extensive previous online design experience (*M* = 2.52, *SD* = 1.47; see Figure 2).
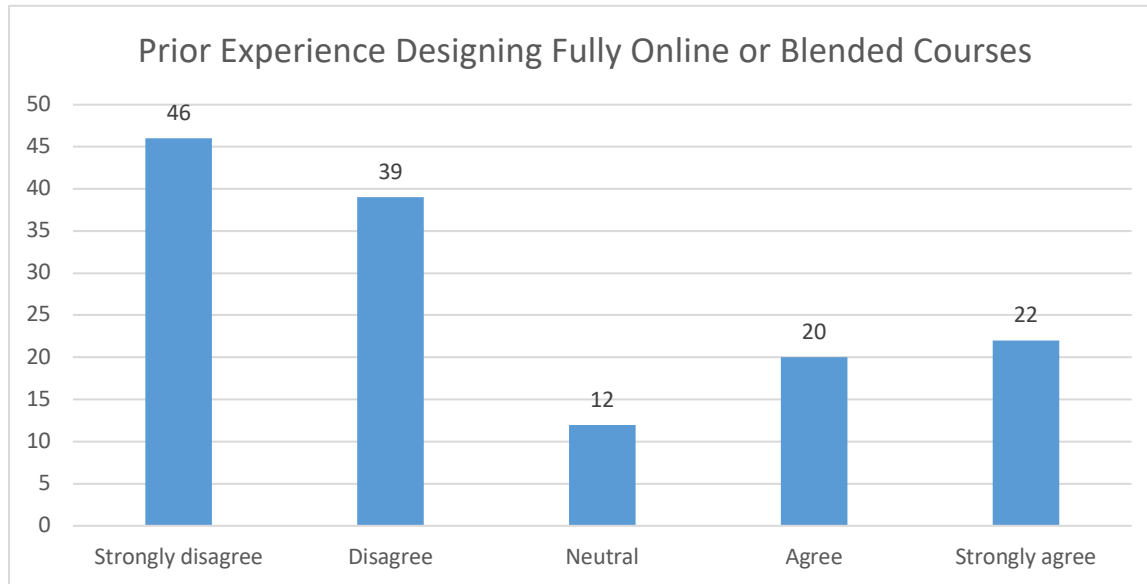

Figure 2. Instructor experience related to designing fully online or blended courses prior to designing the MOOC

Among these 143 instructors, more than half of them (58%) had taught one MOOC, 25 instructors (17%) had taught two MOOCs, 20 instructors (14%) had taught three MOOCs, and 15 instructors (11%) had taught four or more MOOCs before (see Figure 3).
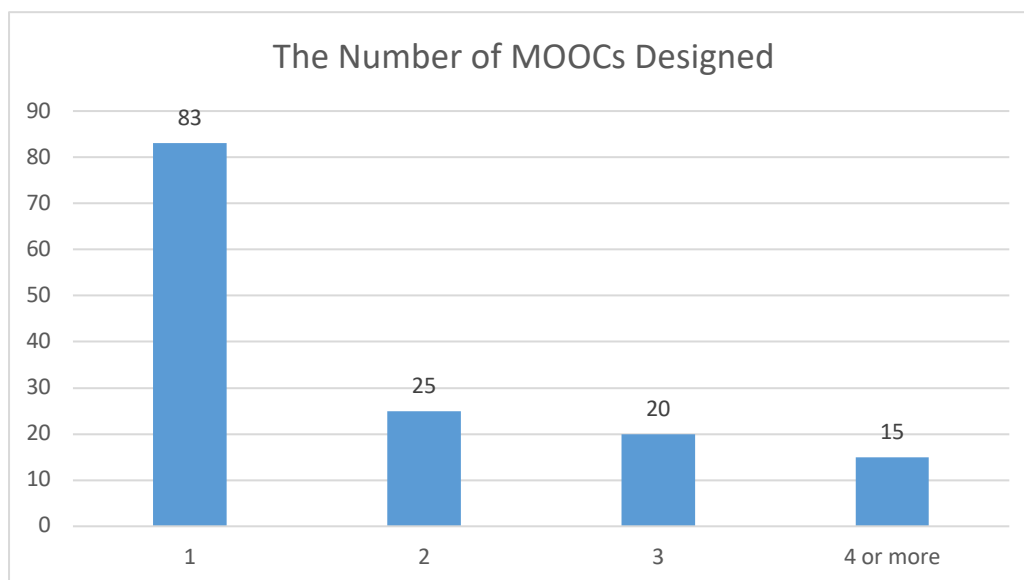

Figure 3. The number of MOOCs that the instructor had designed.

It was deemed important to also know whether MOOC instructors were involved in the design of the MOOCs in which they taught. As shown in Figure 4, in terms of current MOOC design, most of them were fully involved in designing the MOOCs ($M = 4.63$, $SD = 0.81$) and enjoyed the process ($M = 4.21$, $SD = 0.95$). In fact, more than 75% of the 139 MOOC instructors responding to this question strongly agreed, whereas a mere 4% disagreed or strongly disagreed.
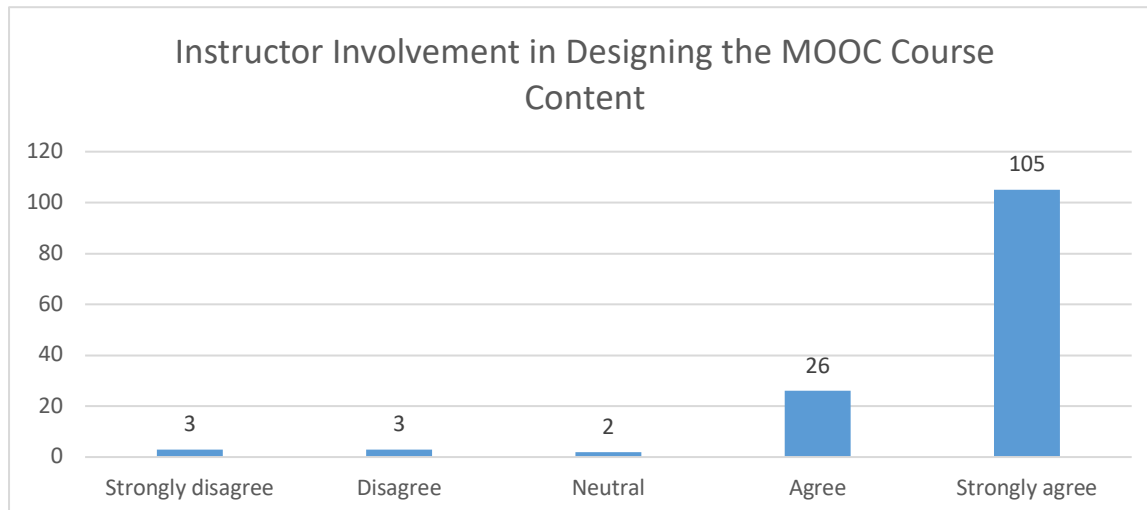
Figure 4. Instructor perceptions of whether they were fully involved in designing their MOOC.

In terms of the MOOC format, 50 out of 143 MOOCs (35%) were instructor led with teaching assistant support, while 32 instructors (22%) had no such support (see Figure 5). Besides instructor-led MOOCs or xMOOCs, 23 MOOCs were self-paced, and 23 were primarily learner driven (i.e., cMOOCs). Only five out of 43 MOOCs (4%) were hybrid or blended types of MOOCs.

Figure 5. Survey participants' MOOC delivery format.

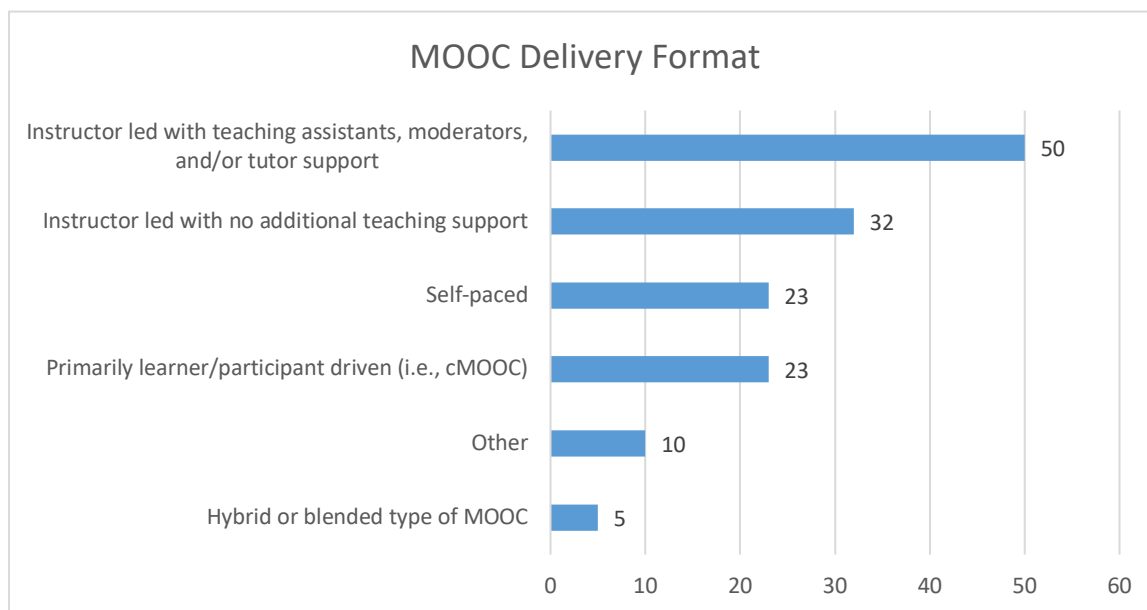In these MOOCs, 38% of respondents' MOOCs (55) had fewer than 5,000 learners; 21% (30) had 5,001–10,000 learners; 13% (18) had courses with 10,001–15,000 learners; 5% (7) had courses with 15,001–20,000 learners; and 23% (33) had courses with more than 20,001 learners (see Figure 6). Such data are lower than previously reported initially in the literature (e.g., Jordan, 2014). However, this finding aligns with a more recent report from Chuang and Ho (2016) that indicated that the median number of participants in Harvard and MIT open online courses was around 9,400.
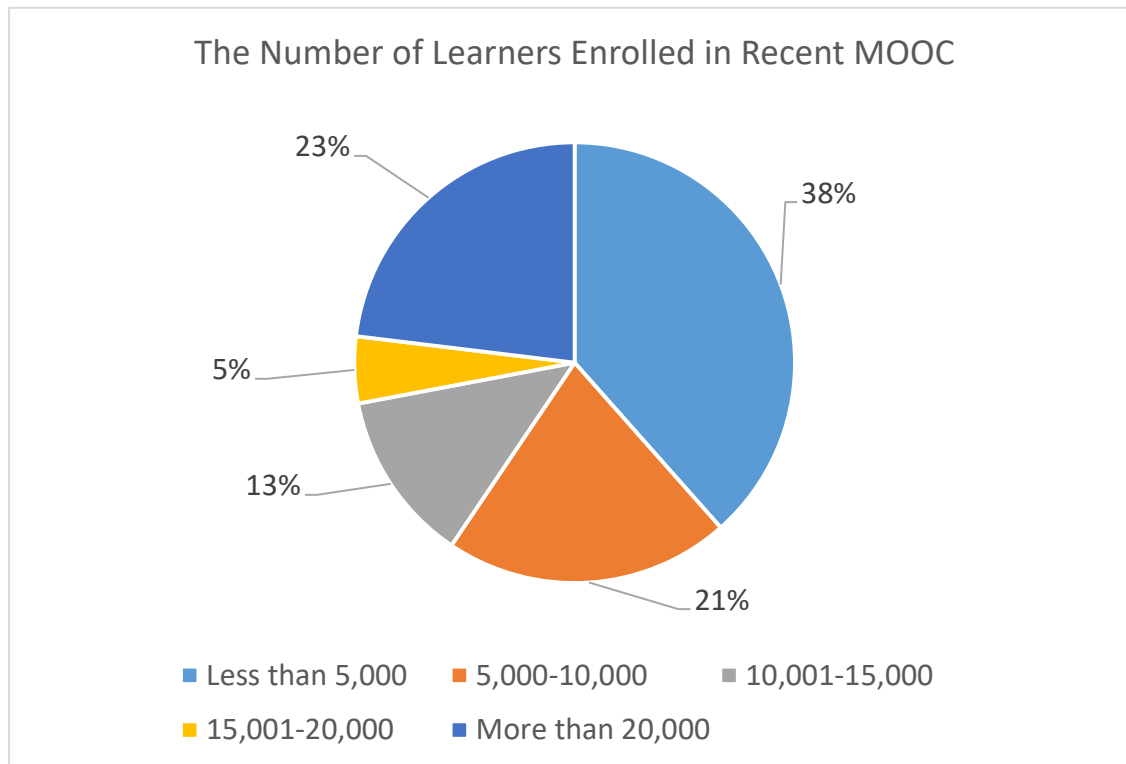

Figure 6. The number of learners enrolled in the participants' most recent MOOC.

Research Question 1: What Are the Considerations of Instructors When Designing a MOOC?

When instructors designed MOOCs, most (75%) considered the learning objectives of the course. In addition, 92 out of 139 instructors (66%) took assessment into consideration, and 84 instructors (60%) considered the duration of the course. Roughly half (71) of the respondents took into account the time required in designing their MOOC and the platform for offering the MOOC (69). Other findings included that 48% of instructors reflected on their pedagogical approaches, and 47% of instructors examined the course content to be delivered (see Figure 7). In line with the survey results, one interviewee from the United States stated, "The learning objectives [were] my most important thing each week. I would think [of] questions such as: What are my learning objectives this week?"
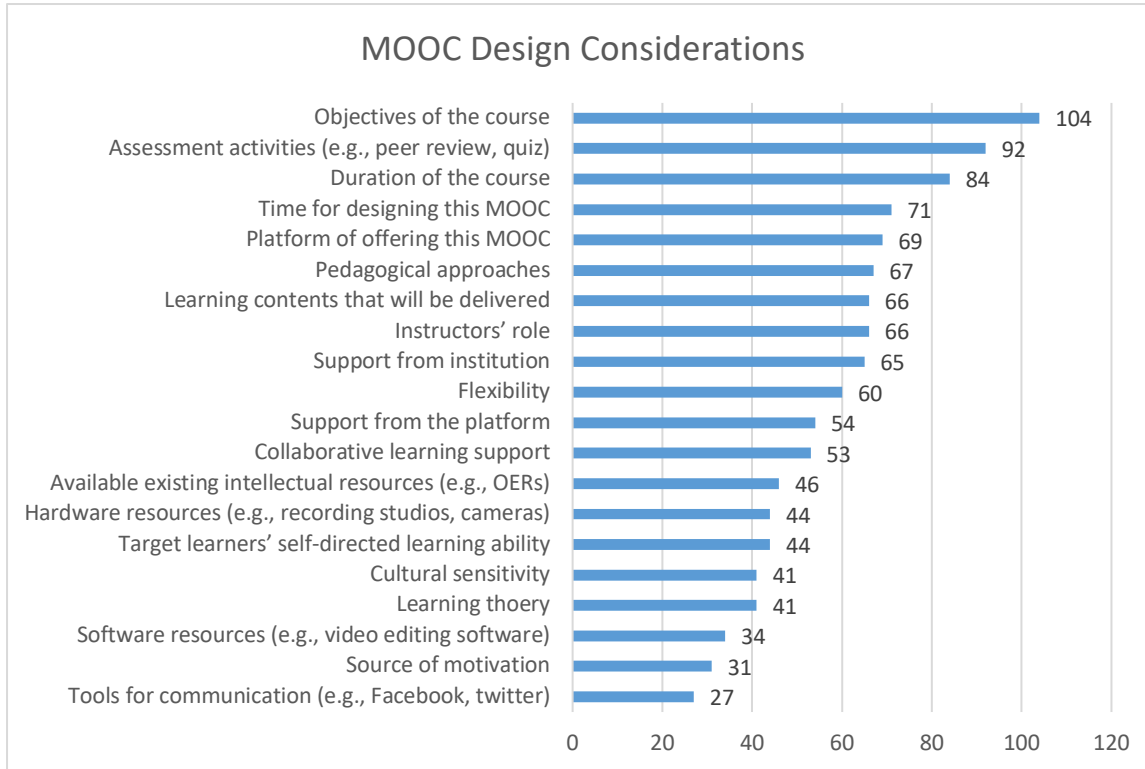
Figure 7. MOOC design considerations of the survey participants.

As reported previously by Watson et al. (2016), another main design consideration related to the types of learner assessment. In terms of learner assessment practices, among 134 respondents, 56 instructors (42%) used the learning management system features, such as automated grading for multiple-choice questions to assess student learning; 18 instructors used a sharing portal; and 11 instructors asked students to present during the final class (see Figure 8). The 61 instructors who selected "other" mainly mentioned quizzes and peer assessment. In one of the interviews, an instructor who taught in China mentioned that "then there has to be some assessment…There are a lot of multiple choice questions."

Figure 8. Ways MOOC instructors used to assess participant learning.

Engaging learners was one of the main MOOC design considerations mentioned in the interviews and surveys. To engage MOOC participants in learning, 93 out of 136 instructors (68%) provided certificates, 59% of instructo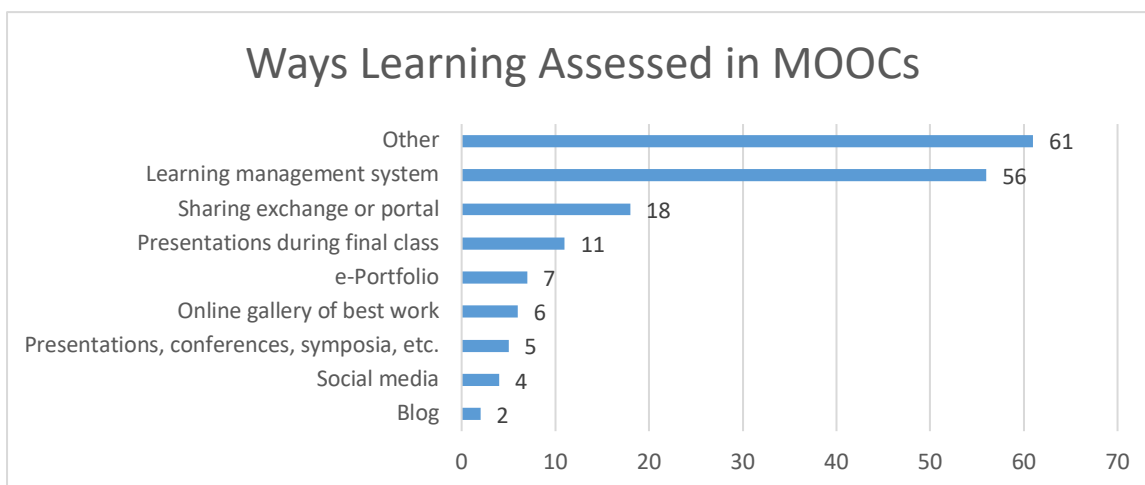rs used self-paced learning, 57% provided optional readings, videos, or other materials, and 41% encouraged learners to design authentic projects (see Figure 9). One instructor from the UK mentioned the following:

> When we were designing, we tried to have a hook for each week, a reason for learners to come back each week. So, we built that into our learning design. So what's going to be the big thing that makes you want to join the course in Week One.

Ways Engaged MOOC Students in Learning

Category	Value
Providing a certificate	93
Self-paced learning	80
Optional readings, videos, or other materials	77
Encouraging authentic projects	56
Options with assignments	40
Encouraging students to contribute to the course	30
Two or more media elements to learn the same content	29
Providing badges	13
Competitions	4

Figure 9. Ways that survey participants engaged their MOOC students in learning.

The survey respondents were asked about the degree to which they considered unique learner needs while designing their MOOCs. More than two thirds of MOOC instructors (77%) agreed or strongly agreed that they placed much effort on meeting unique learner needs in their MOOCs ($M = 3.84$, $SD = 1.05$; see Figure 10).

Made Effort to Meet Unique Learner Needs During MOOC Design

Response	Value
Strongly disagree	4
Disagree	12
Neutral	29
Agree	51
Strongly agree	43

Figure 10. Effort expended by MOOC instructors to meet unique learner needs ($n = 139$).

We were also interested in the specific tactics or strategies that MOOC instructors employed to meet the needs of their MOOC participants. The survey results revealed that to address learners' varying competencies and needs, 74% of the instructors (103) established learner-based discussion forums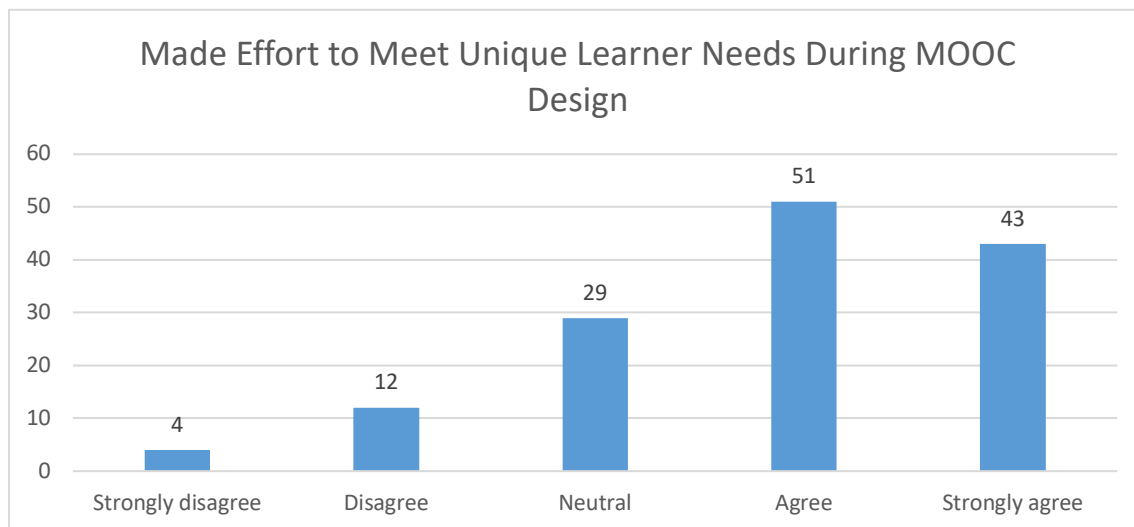, 67% (93) embedded supplementary course materials, and half of the respondents (70) posted timely course announcements and sent emails (see Figure 11).

The instructors also provided different kinds of learning resources. For instance, 123 out of 136 instructors (90%) provided discussion forums or threads, 78% of instructors embedded video lectures and tutorials in the MOOC, 74% of instructors included readings, 55% of instructors offered practice quizzes and exams, and 54% of them relied on expert interviews. Other resources that these respondents used in their courses included interactive assessments (45%), PowerPoint and other presentation slides (41%), instructor lecture notes (40%), visuals (e.g., concept maps, diagrams, etc.; 36%), and animations and other types of animated or interactive contents (34%).
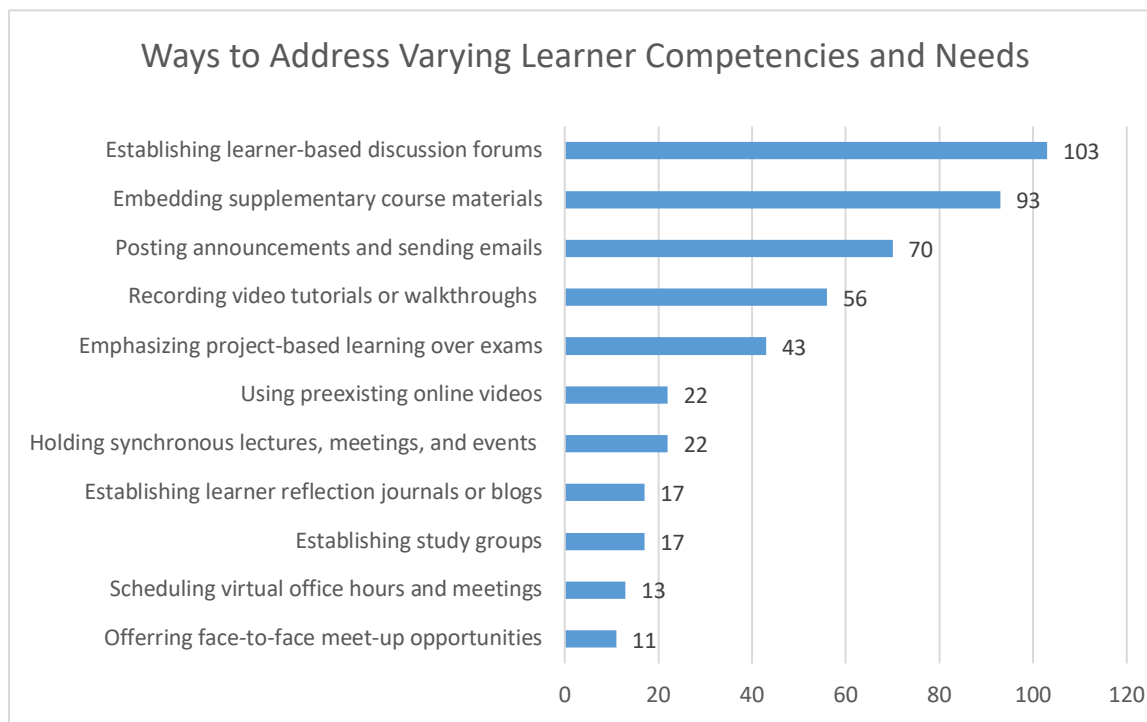

Ways to Address Varying Learner Competencies and Needs

Category	Value
Establishing learner-based discussion forums	103
Embedding supplementary course materials	93
Posting announcements and sending emails	70
Recording video tutorials or walkthroughs	56
Emphasizing project-based learning over exams	43
Using preexisting online videos	22
Holding synchronous lectures, meetings, and events	22
Establishing learner reflection journals or blogs	17
Establishing study groups	17
Scheduling virtual office hours and meetings	13
Offering face-to-face meet-up opportunities	11

Figure 11. Ways used by MOOC instructors to address learner varying competencies and needs.

Another factor investigated concerned MOOC instructors' attempts to take into account the learners' self-directed learning ability during the design of the MOOC. The survey results showed that 30% of instructors (42) strongly agreed that they placed much effort on considering learners' self-directed learning ability when designing the MOOC, 44% (61) agreed with the statement, and 16% (22) were neutral (see Figure 12). The remaining 9% did not think that they expended much effort on considering learners' self-directed learning ability ($M = 3.93, SD = 0.96$).
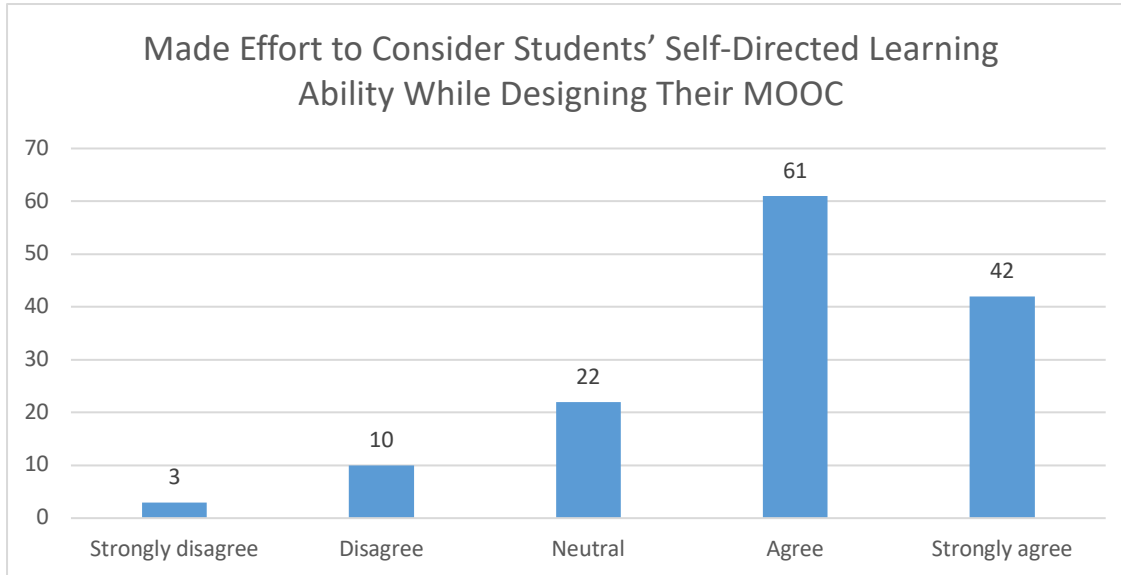
Figure 12. Effort expended considering learners' self-directed learning ability.

To encourage peer interaction, 102 out of 136 instructors (75%) used asynchronous discussion forums, 43 assigned pair-based assignments or peer reviews, and 29 used social media, such as Facebook and Twitter. Besides peer interaction, instructor and learner interaction was also investigated. A majority of instructors (82%) interacted with learners through the online discussion forum. Platform messages (26%), social media connections (21%), personal emails (20%), and virtual meetings (10%) were also utilized for instructor–learner interaction. No one used phone calls or texting for interaction. Sixteen instructors did not find instructor–learner interaction applicable to their MOOCs.

Another design consideration in MOOCs is monitoring or tracking learners' learning progress. The results of the present study revealed that 50 out of 136 MOOC instructors (37%) used modular-based progress data to track learning, 35% of the instructors used weekly or daily reports offered by learning analytics, and 35% of the instructors also allowed learners to do self-monitoring and self-evaluation. Just 18% of the instructors asked moderators or teaching assistants to monitor learning. Even fewer employed peer or group member reports (13%), personal tracking from tutors, moderators, and teaching assistants (9%), and personal tracking from the instructor (3%) in their MOOCs. Interestingly, 15% (21) of the instructors did not monitor learner learning progress in the MOOC. It is apparent that MOOC instructors have limited ways of tracking/monitoring their participants' learning processes and overall progress.

A further crucial course design consideration is the feedback provided to learners. In this respect, 63% of instructors used peer feedback, and 73 out of 134 instructors (55%) used the system or computer to provide feedback (54%). The remaining ways of providing feedback included feedback from TAs (40%), assignment rubrics (34%), feedback from instructors (30%), self-feedback (26%), and feedback from outside experts (5%). Only one third of the instructors directly provided feedback to MOOC learners.

Research Question 2: What Challenges Do Instructors Perceive When Designing a MOOC?

Instructors also faced many challenges while designing MOOCs. More specifically, 91 out of 143 the survey respondents (64%) had challenges regarding assessments methods (see Figure

13). In addition, 70 instructors (49%) thought engaging student learning was challenging. Nearly half of the respondents considered finding strategies to engage learners in active participation (49%) and interaction (46%) to be difficult. Another key challenge was time limitations when designing MOOCs (48%), which is similar to the response percentage reported by Watson et al. (2016).
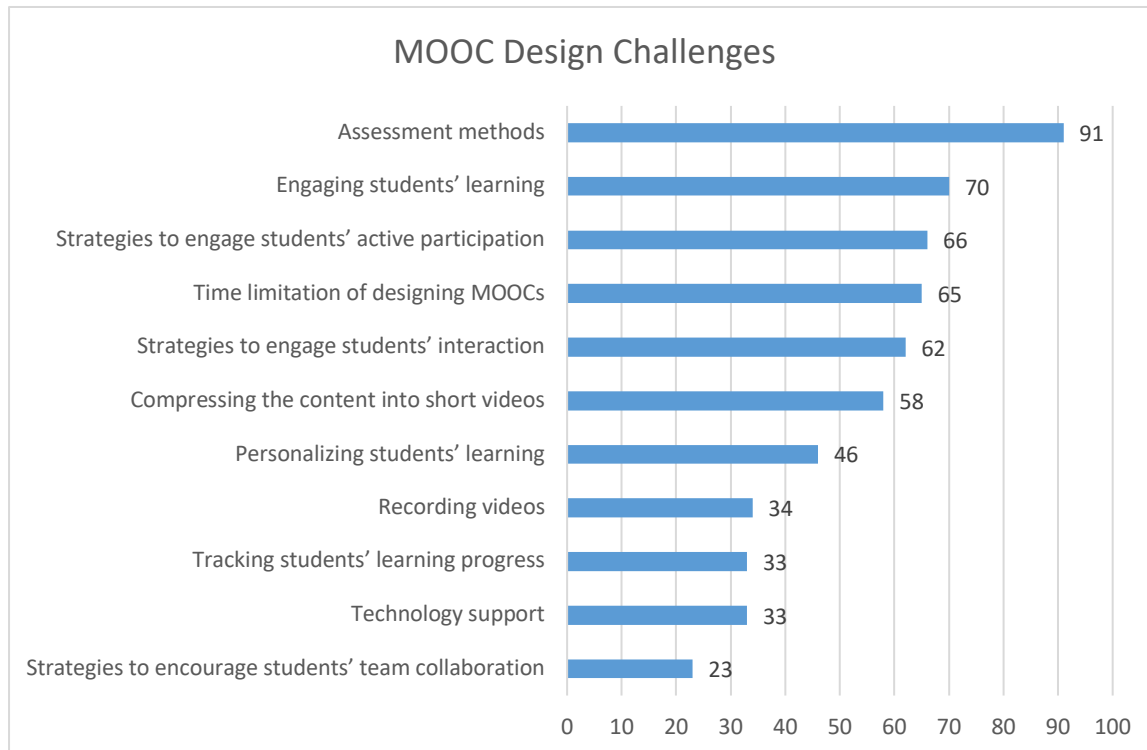
MOOC Design Challenges

Challenge	Value
Assessment methods	91
Engaging students' learning	70
Strategies to engage students' active participation	66
Time limitation of designing MOOCs	65
Strategies to engage students' interaction	62
Compressing the content into short videos	58
Personalizing students' learning	46
Recording videos	34
Tracking students' learning progress	33
Technology support	33
Strategies to encourage students' team collaboration	23

Figure 13. Design challenges faced by the MOOC instructors.

In similarity to the survey results, 10 themes emerged from the interview data, including unknown audience, limited assessment methods, engaging learners, time limitation of design MOOCs, a lack of instructor and learner interaction, building community, recording short videos, time zone differences, conservative opinions from colleagues, and copyright issues. Among those themes, assessment, engaging learners, time limitations in designing MOOCs, and getting to know the audience were the key challenges mentioned by these 12 MOOC instructors.

An instructor from China noted the challenge of assessment due to the large numbers of learners. Consequently, he expected to automatically grade every kind of assessment. He stated the following:

> One challenge, of course, is that you have a lot of students. And you have probably more assessments if you have students who have more submissions. Then you or your TAs could not handle. Nobody wants to do grading. So you need automated grading.

A challenge for instructors besides assessment is engaging the students. One instructor from the United States mentioned the following:

> With the MOOCs…you're not as engaged with students. I've taught classes where it's a smaller class with discussion-base, where I'm in there and I'm talking to people all the

time for a period of time. And you do get engaged with them. I don't think that happened in MOOC because of the scale and the course design. We never got that connected…

The interviewees also mentioned the time devoted to designing and developing a MOOC. Because the universities usually do not count MOOCs as an ordinary work responsibility or job criterion, instructors typically have to find extra time to design as well as facilitate and evaluate their MOOCs. One instructor said the following:

I think one of the challenges is time. It does take a lot of time to get the videos done. I did not get a course release when I was doing [the MOOC], and it was a side project at the same time as my regular load. I think it gets to be concentration and balance about what's going on.

Another challenge often mentioned in the interview is getting to know the audience. One instructor said

The challenges that I had were considering the audience. It is a different audience with what we have in the classroom. I can't really depend on interaction during the video itself. I was also just doing a content based curriculum for the level that we're targeting… I designed for a level, but not necessarily met the level of the people who joined the course… It was a little bit of a challenge.

Research Question 3: How Do Instructors Address the Challenges That They Perceive Related to MOOCs?

To address the aforementioned challenges, 66% of the instructors surveyed browsed other MOOCs to glean ideas, examples, and benchmarks. In addition, 60% of the instructors sought help from the platform. More than half of the respondents attempted to seek help from colleagues (53%) and institutions (50%). Attending conferences and training sessions and reading the news, books, and articles about MOOCs were deemed less valuable (see Figure 14).
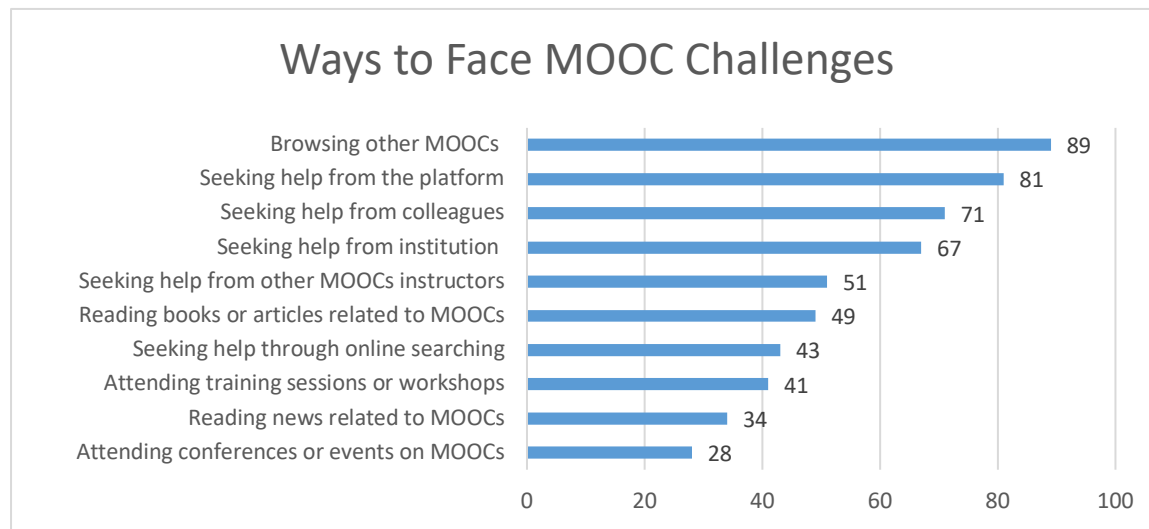

Figure 14. Ways to address challenges faced by the MOOC instructors.

In line with the survey results, the instructors mentioned teamwork as an important way to face challenges. One instructor mentioned the following:

> Teamwork. It was amazing to have such support on the development side. There was never a time where I wrote a script for a MOOC. It was like: "OK. Let's go with this." There was always a discussion…We think examples to clarify that for visual learners or learners who respond better to auditory cues. So the challenges were never greater than the team here.

Another way to solve the challenges is browsing other MOOCs to get ideas. As shown in the quote below, one instructor from the United States mentioned this strategy:

> The peer review side was new to me at least. So I enrolled in the course that started before us: English for business and entrepreneurship…Being able to take the course and experience a peer review for a while.

As discussed above, these MOOC instructors were highly involved in the design process. While designing their MOOCs, they considered a variety of aspects, including pedagogy, resources, and logistics. Pedagogical considerations included learning objectives, assessment methods, the length of the MOOC, learning content, flexibility, collaborative learning support, learners' self-directed learning ability, and cultural sensitivity. Resource considerations included the affordances of MOOC platforms, support from the host institution and the platform, available intellectual resources, and hardware resources. The instructors also considered logistics, such as the time spent designing the MOOC and the instructor's role.

While designing MOOCs, they also faced some challenges in terms of pedagogy, resources, and logistics. The main pedagogical challenges concerned limited assessment methods, appropriate ways to engage learners and encourage them to participate in the class, increasing learner interaction, condensing lectures into shorter video snippets, personalized forms of learning, and monitoring learning. The main logistical challenge related to time limitations in designing MOOCs. To cope with all these challenges, the MOOC instructors usually joined other MOOCs as learners and sought help from the MOOC platform, colleagues, their institutions, and other instructors who had previously taught MOOCs.

Discussion

This study aimed to explore MOOC design considerations and challenges from an instructor's perspective to better understand the design experiences in MOOCs and provide suggestions for future MOOC instructors and instructional designers. Not only did most of these instructors have limited experiences designing MOOCs, the majority of them lacked adequate prior history designing blended or fully online courses. Not surprisingly, then, the present study found that MOOC design challenges were a key consideration and concern. As was seen in the work of Alario-Hoyos et al. (2014), resources, pedagogy, and logistics are three general MOOC-design considerations; this study also found these three aspects. The pedagogical factors were the primary design considerations and challenges in MOOC design, especially assessment and engagement strategies. The limited time for creating MOOCs was the primary logistical consideration.

Resource Considerations and Challenges

The design process is intended to take into account the available human and technology resources. In terms of the former, MOOC instructors usually have a design team, which includes

technicians, instructional designers, and usability testers. This team approach is in line with previous studies on team formation during MOOC design (Belanger & Thornton, 2013; Alario-Hoyos et al., 2014). While instructors play a leading role in the design process, team member collaboration is also vital.

The second resource consideration—and also a key challenge—relates to the technology resources provided by the platform and the host institution. Such resources result from MOOC providers' limitations regarding assessment or presentation of content. Instructors often have various innovative instructional ideas but cannot find the requisite technology resources. As an example, MOOC instructors may not know how to find or use automatic grading tools and systems to assess learners' papers or presentations. More likely, however, such tools or systems may simply not exist in the platform that they are utilizing.

Pedagogical Considerations and Challenges

The primary focus of the MOOC instructors in this study related to pedagogical considerations, including design components, instructional strategies, and innovative ideas to foster learner engagement and overall learning. This finding was corroborated by the heavy amount of previous studies focusing on pedagogy issues (e.g., Ahn et al., 2013; Alario-Hoyos et al., 2014; Watson et al., 2016). A majority of the instructors considered the learning objectives of the MOOC during the design process. Some instructors set learning objectives based on the standards in the subject areas, whereas others based their objectives on the content that they would like to deliver as well as their possible audience. However, getting to know the learners was a challenge, especially when considering their massive numbers and the concomitant diversity of backgrounds, prior knowledge, and learning motivation of the participants (Adair et al., 2014). The instructors in this study felt that this was an enormous challenge when designing their MOOCs.

Once they decided on their learning objectives, they had to consider the assessment methods employed to measure whether the learners met the intended learning objectives. Such considerations are also a major challenge for instructors. The instructors usually employed both formative and summative assessment. To assess learning, most of them used tools and features within their learning management systems, such as auto-graded quizzes. However, the limited assessment types available in the MOOC platform (e.g., multiple-choice, true-or-false, fill-in-the-blank, etc.) fail to measure higher order forms of learning. In some subject areas, such as literacy, many of the MOOC instructors in this study preferred to let the learners submit their writings; however, their MOOC platforms did not provide auto-grading functions for learner essays, reports, or other forms of writing.

Given that it is impossible for instructors to evaluate thousands of assignments in a short period, MOOC learners are often disappointed (Watson et al., 2016). To efficiently grade a MOOC, therefore, the instructors in this study often sought to use peer assessment in their MOOCs. However, considering the diverse background and knowledge levels of the learners, peer grading may engender various problems, including the accuracy of peer feedback, quality, and fairness. Kolowich (2013) mentioned that 34% of the instructors employed peer grading in their MOOCs, while only 26% of his respondents considered peer grading reliable. Likewise, Meek, Blakemore, and Marks (2016) also stated that people raised questions about the effectiveness of peer grading.

At the same time, other researchers found that using peer assessment appropriately might benefit both the learners who provide the feedback and the learners who receive feedback (Barak & Rafaeli, 2004; Dochy et al., 1999). In fact, some studies stated that peer assessment has the same

effect as instructor feedback (Cho & Schunn, 2007; Gielen, Peeters, Dochy, Onghena, & Struyven, 2010). Ashton and Davies (2015) stated that peer assessment with proper guidance in a MOOC can be effective in evaluating learning. Thus, rubrics for learners to do peer assessment are important and required (Bonk & Lee, 2017; Fink, 2003). In terms of the MOOC situation, Kulkarni et al. (2013) stated that providing clear and practical rubrics to support peer assessment is critical. A potentially ideal way to address this challenge may be the use of artificial intelligence technology to automatically grade different types of assignments.

Another major design consideration and challenge is engaging learners in MOOCs. Among their favorite strategies, the study participants listed providing certificates, self-paced learning opportunities, more engaging videos, optional learning materials, and authentic project-based learning. Using certificates to engage learning is often deemed effective because learners make a commitment and will be actively involved in the learning process. However, not all learners want to obtain certificates of course completion (Watson et al., 2016). Another way to engage learners is to allow them opportunities to control their own learning pace and path.

Naturally, there are issues concerning the extent of learners' self-control. Currently, MOOCs have diverse formats. Some MOOCs are released based on a certain time period and schedule. When this occurs, learners are required to take the course during certain weeks but can set up their own learning pace during the allotted period. Some MOOCs run on more open schedules and time allotments, allowing the learners to enter the MOOC to learn at any time. The MOOC instructors in the present study mentioned that the latter format raised serious challenges for them. Among the key concerns was that they could not monitor the course year-round due to their hectic schedules. Consequently, they often choose to give up monitoring the MOOCs and only let mentors and teaching assistants provide learning support.

In addition to mentors and other teaching assistants, videos play an important role in MOOCs because they require less instructor and learner interaction in the delivery process (Salmon et al., 2016). However, the videos need to be engaging. Some instructors encounter significant challenges when attempting to record instructional videos. The challenges include compressing the course content into short lectures, finding ways to best present the content, writing scripts, and learning how to lecture naturally in front of the camera. Since instructors are used to teaching in front of live students, they may feel uncomfortable lecturing in front of a camera. Therefore, in terms of lecture capture, working with mentors or engaging in a professional development situation involving recording oneself in front of camera is often valuable and necessary.

One of the ways to engage the learner is through personalization. Making courses more personal and providing flexible learning paths is an important aspect for instructors to consider (Bonk, Zhu, et al., 2018; Simonson & Maushak, 1996; Watson et al., 2016). However, the instructors in this study did not place much emphasis on meeting each MOOC participant's unique learning needs; nevertheless, they instinctively attempted to personalize learning through discussion forums, course materials, announcements and emails, tutorials, project-based learning, and synchronous meetings. The instructors mainly utilized discussion forums to monitor students' learning progress and adjust support mechanisms and task directions when students were confused (Beaven et al., 2014). It also appears that the use of weekly course announcements and emails may make learners feel more personally connected. A similar result occurs when allowing MOOC learners to personally select from a diverse array of learning materials.

Another issue considered by the instructors is facilitation. The lack of instructor presence in MOOCs is a common complaint from learners (Clara & Barbera, 2013). Instructors primarily used discussion forums to interact with MOOC learners. However, research indicates that learners may not always actively participate in the discussion forums (Breslow et al., 2013; Koutropoulos et al., 2012); for instance, they might be frustrated with the overall course responsiveness and lack of personalized feedback (Rice, 2013). Thus, it is vital to design appropriate discussion prompts and timely and consistent facilitation of discussion. Despite instructor attempts to show high teaching presence in MOOCs, it is impossible for them to facilitate the course alone considering the large numbers of learners enrolled.

To address this issue, some MOOC instructors in this study relied on teaching assistants (TAs). Instructors ask their graduate students to be their TAs, or they recruit their previous MOOC participants. TAs help monitor discussion forums and answer questions. Key questions and common issues that the TAs are unable to answer or address are often escalated to the MOOC instructors. Some instructors leave the discussions forums in total control of the TAs without ever communicating with them about how to manage problems or student questions. Therefore, identifying the instructor's role and the relationship between instructors and TAs need further exploration (Ross et al., 2014).

Another possible way to assist instructors in facilitating the course is monitoring learner behavior—for instance, by checking learning analytics in the platform. With such detailed data, the instructors can know whether the learners watch the videos, which parts they tend to pause, the length of such pauses, and which topics are popular in the discussion forums. Task adjustments and modifications can then be inserted. Therefore, further exploration of the use of learning analytics to help with MOOC facilitation is necessary.

Logistical Considerations and Challenges

Logistical considerations and challenges were less dominant in this study. Among the key logistical design considerations, however, was the time allocated for designing MOOCs. Simply put, it is vital for instructors to consider the time they can devote to designing their MOOCs. As shown by Hew and Chung (2014), time limitations are an immense challenge for MOOC instructors. For instance, Watson et al. (2016) found that instructors expended significant time and effort on MOOC design, but they usually did not receive course release or other incentives from their institution. In turning such findings into action, it will likely be helpful to MOOC design if institutions better supported MOOC instructors (e.g., through workload release) or provided useful motivational supports and incentives (Head, 2013).

Limitations

This study has several limitations. First, the instructor names, institutions, contact information, and courses were gathered from vendors, such as Coursera, FutureLearn, and edX; the MOOC instructor lists from many other MOOC vendors, such as xuetangX, one of the largest Chinese MOOC providers, were either not available or were not in English. In effect, for the most part, this study did not include thousands of MOOC instructors whose MOOCs were not presented in English. For instance, MOOCs delivered in other languages, such as Chinese, Arabic, Italian, and Spanish, were not included in this data. The data provided by other vendors or languages might lend different insights, which were not captured by the present study. In addition, the participants who volunteered for this study may have been more favorable toward aspects of MOOC instructional design than those who did not respond. Finally, we only reviewed the MOOC courses

of the 12 interviewees, not all of the study participants. Therefore, the research findings might not be generalizable to all other MOOC formats and designs.

Conclusions

This exploratory mixed methods study examined instructional design considerations and challenges from the perspective of MOOC instructors. The study found a variety of design considerations and challenges in MOOC design in terms of resources, pedagogy, and logistics. Pedagogical aspects were the primary design considerations as well as challenges. The strategies that instructor participants used to address the challenges in MOOC design were identified.

This study offers extensive insights into MOOC design considerations and challenges as well as ways to address these challenges based on the investigation of MOOC instructors around the world. Hopefully, the results will prove informative to instructional designers, instructors, and other stakeholders of what instruction-related factors should be considered in the design of MOOCs and how to address the various challenges. This study can be used to inform instructional designers of possible MOOC instructor expectations that they may be working with while designing MOOCs. The online surveys and interviews employed in this particular study were just the first steps in the process. Deep course reviews, follow-up course observations, and inquiry into learner perspectives (e.g., retrospective analyses of learner behavior in the MOOC) will further inform the instructional methods and pedagogical activities that can lead to the design of more effective and engaging MOOCs.

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Appendix A

Survey Questionnaire Instrument:
Instructors' experience of MOOCs instructional design:
Motivation, considerations and challenges

Part 1: Basic Course Demographics
(Note: There are 3 parts to this survey)

1. How many MOOCs have you taught (including any that you are currently teaching)?
   a. 0
   b. 1
   c. 2
   d. 3
   e. 4 or more
2. How many people enrolled in your most recent MOOC?
   a. Less than 5,000
   b. 5,001-10,000
   c. 10,001-15,000
   d. 15,001-20,000
   e. More than 20,000

3. How many MOOCs have you designed?
   a. 0
   b. 1
   c. 2
   d. 3
   e. 4 or more
4. What is the name of your most recent designed or taught MOOC?
   _____

5. What is your department or primary discipline affiliation? _____

6. What is the delivery format of your most recent MOOC?
   a. Instructor led with teaching assistants, moderators, and/or tutor support
   b. Instructor led with no additional teaching support
   c. Primarily learner/participant driven (i.e., cMOOC)
   d. Self-paced
   e. Hybrid or blended type of MOOC
   f. Other (Please describe): _____

Part 2: Design experience

7. Please rate your agreement/disagreement with the statements that describe your experience of designing MOOC in question #4

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have many prior experiences of designing fully online or blended courses prior to designing the MOOC					
I was fully involved in designing the course content for the MOOC					
I enjoyed very much designing the course content for the MOOC					
I placed much effort on meeting unique participants or learner needs during the design of the MOOC					
I placed much effort on considering students' self-directed learning ability during the design of the MOOC					

8. What is your motivation of offering MOOCs? [Select all that apply]
   a. Building institutional reputation
   b. Building national identity
   c. Building personal reputation
   d. Conducting research on teaching and learning
   e. Encouragement of the university
   f. Experiencing teaching and connecting to a large and diverse audience throughout the world
   g. Helping get tenure position
   h. Increasing student access to higher education worldwide
   i. Innovation in teaching and learning
   j. Personal interest

Other (Please describe): _____

9. What were the key factors that you considered when you designed your MOOCs? [Select all that apply and rank them]
   a. Assessment activities (e.g., peer review, quiz)
   b. Available existing intellectual resources (e.g., OERs, videos)
   c. Collaborative learning support
   d. Cultural sensitivity
   e. Duration of the course
   f. Flexibility
   g. Hardware resources (e.g., recording studios, cameras)
   h. Instructor's role
   i. Learning theory
   j. Learning contents that will be delivered
   k. Objectives of the course
   l. Pedagogical approaches
   m. Platform of offering this MOOC
   n. Software resources (e.g., video editing software)

      o. Source of motivation
      p. Support from institution
      q. Support from the platform
      r. Target learners' self-directed learning ability
      s. Time for designing this MOOC
      t. Tools for communication (e.g., Facebook, Twitter, blog, QQ)

Other (Please describe): _____

10. How do you address students' varying competencies and needs? [Select all that apply]
      a. Embedding supplementary course materials (e.g., readings, animations, simulations, maps, job aids, news, videos, etc.)
      b. Emphasizing project-based learning over exams
      c. Establishing study groups
      d. Establishing learner reflection journals or blogs
      e. Establishing learner-based discussion forums
      f. Holding synchronous lectures, meetings, and events (e.g., Skype, Google Hangouts, Zoom, etc.)
      g. Offering face-to-face meet-up opportunities
      h. Posting timely course announcements and emails
      i. Recording video tutorials (e.g., Screencasts, YouTube walkthroughs, etc.)
      j. Scheduling virtual office hours and meetings
      k. Using preexisting online videos (e.g., Lynda.com, TED talks, YouTube, etc.)
      l. Other (Please describe): _____

11. What types of learning resources can participants select from in your most recent MOOC? [Select all that apply]
      a. Animations and other types of animated or interactive contents
      b. Discussion forums or threads
      c. Expert interviews
      d. Job aids and study guides
      e. Instructor blogs
      f. Instructor lecture notes
      g. Interactive assessments
      h. Learner blogs
      i. Mobile applications
      j. Podcasts
      k. Popular media (e.g., news stories and videos)
      l. PowerPoint and other presentation slides
      m. Practice quizzes and exams
      n. Readings (including textbooks, literature, and scientific and technical reports)
      o. Simulations and games
      p. Social media (e.g., Facebook, Instagram, Snapchat, Twitter, Pinterest, etc.)
      q. Video examples (e.g., TED talks, YouTube, etc.)
      r. Video lectures and tutorials
      s. Virtual conferences and summits
      t. Visuals (e.g., concept maps, diagrams, flowcharts, timelines, etc.)

        u.   Wiki-style documents
        v.   Other (fill in the blank – optional): _____

12. In what ways was peer interaction encouraged in your MOOC? [Select all that apply]
        a.   Assigning peer groups
        b.   Assigning pair-based assignments or peer reviews (e.g., critical friends, email pals, and Web buddy activities)
        c.   Asynchronous discussion forums
        d.   Local meet-ups arranged or encouraged
        e.   Offering or encouraging breakout discussion forums or groups
        f.   Social media connections (e.g., Facebook, Twitter)
        g.   Synchronous conferencing and chat tool(s)
        h.   System formed collaborative teams
        i.   Virtual worlds
        j.   Not applicable

13. In what ways is instructor-learner interaction encouraged in your MOOC? [Select all that apply]
        a.   Online discussion forum
        b.   Personal email
        c.   Phone call/message
        d.   Platform message
        e.   Social media connections (e.g., Facebook, Twitter)
        f.   Virtual meeting
        k.   Not applicable

14. How do you design your course to engage students' learning? [Select all that apply]
        a.   Competitions
        b.   Encourage students to be involved in authentic projects
        c.   Encourage students to contribute to the course content
        d.   Optional readings, videos, or other materials
        e.   Options with assignments
        f.   Provide badges
        g.   Provide certificate
        h.   Self-paced learning
        i.   Two or more media elements to learn the same content
        j.   Other (Please describe): _____

15. How is student progress/participation monitored or tracked? [Select all that apply]
        a.   Not applicable (learner progress is not monitored or tracked in this MOOC)
        b.   Moderator, tutor, or teaching assistant's feedback
        c.   Modular or unit based progress
        d.   Peer or group member reports
        e.   Personal tracking from instructor
        f.   Personal tracking from tutors, moderators, and teaching assistants

    g. Self-monitoring and self-evaluation
    h. Weekly or daily reports offered by learning analytics
    i. Other (Please describe): _____

16. In what ways do students get feedback in the course? [Select all that apply]
    a. Instructor feedback
    b. Moderator, tutor, or teaching assistant feedback
    c. Outside expert feedback
    d. Peer feedback
    e. Self-feedback
    f. System or computer feedback
    g. Task or assignment rubrics
    h. Other (Please describe): _____

17. In your most recent MOOC, how do you assess students' learning? [Select all that apply]
    a. Blog
    b. e-Portfolio
    c. Exams
    d. Learner creations and artifacts
    e. Learning management system
    f. Online role play
    g. Online gallery of best work
    h. Papers
    i. Presentations during final class
    j. Presentations at online conferences, symposia, or other events
    k. Self-reflection
    l. Sharing exchange or portal
    m. Not applicable

18. What are your challenges of designing MOOCs? [Select all that apply]
    a. Assessment methods
    b. Compressing the content into short videos
    c. Engaging students' learning
    d. Personalizing students' learning
    e. Recording videos
    f. Strategies to engage students' active participation
    g. Strategies to engage students' interaction
    h. Strategies to encourage students' team collaboration
    i. Technology support
    j. Time limitation of designing MOOCs
    k. Tracking students' learning progress
Other (Please describe): _____

19. What did you try to do when facing the challenges of designing MOOCs? [Select all that apply]

      a.   Attend conferences or other professional events on MOOCs
      b.   Attend training sessions or workshops
      c.   Browse other MOOCs for ideas, examples, and benchmarks
      d.   Seek help from colleagues
      e.   Seek help from institution (e.g., administrator)
      f.   Seek help from other MOOCs instructors
      g.   Seek help from the platform
      h.   Seek help through online searching
      i.   Read books or articles related to MOOCs
      j.   Read news related to MOOCs

Other (Please describe): _____

Part 3: Open-Ended Items

20. What are the three most important elements you considered when you design your MOOC?
21. What are the top three challenges that you encountered when you design your MOOC?
22. If you would like a copy of our final report, please provide your email. _____

23. Would you be willing to participate in a follow-up interview?

    If you reply yes, please make sure to provide your email address in the question above. If you are selected, you will receive an email with further instructions. These 30 minute interviews are conducted online and scheduled based on your convenience. [Yes/No]

24. If you like to be entered into a drawing for a $15 Amazon gift certificate, please enter your email address (10 randomly drawn winners):

Appendix B

Interview Protocol

The purpose of this research is to explore the motivation for offering MOOCs, design considerations, and the challenges that you encountered when designing massive open online courses (MOOCs).

For this interview, please read the following instruction:
1. The interview will be audio recorded with your permission.
2. Efforts will be made to keep the information you provide to us confidential.
3. The duration of the interview will be around 30 minutes. Member-checking email might be sent to you for clarification about the interview.
4. The participation is voluntary. Feel free to stop the interview if you are uncomfortable with any question.

Template for Interview Questions

1. Please introduce yourself briefly.

2. What motivated or prompted you to offer MOOCs?

    · How might the motivations be different now in offering an additional MOOC?

3. Could you please tell us your experiences of designing and developing MOOCs?

    · What was unexpected? What was critical that others might want to think about?

4. Could you please tell us your experiences of delivering MOOCs?

    · Were there any special or significant moments that stuck out?

5. What are the elements that you consider most when you design MOOCs?

    · Why? Could you please describe your design process and explain why you follow this procedure?

6. How did you decide the goals or learning objectives of your MOOCs?

    · How might such goals and objectives change now that you have completed that MOOC (i.e., what would be different next time and why)?

7. How did you choose the content, resources, tools, and materials for your MOOCs?

    · Which ended up being less and more important and why?

8. What kind of activities/tasks do use for your MOOCs?

    · What were pedagogical or instructional innovations that you tried out in your most recent MOOC, if anything (i.e., what was new or different)?

9. What new activities or resources might you try to employ next time? Is there anything unique or highly creative in mind?

10. How did you choose the assessment methods for your MOOCs?

· How might these change next time?

11. What do you think are the strengths or important aspects of your MOOCs?

12. What kind of challenges and obstacles did you face when you designed MOOCs?

13. What did you do to solve these problems or challenges?

14.   What would you modify, change, add, or delete if you have a chance to redesign this MOOC?