Research Insights into How Instructors Design and Deliver MOOCs to Facilitate Participant Self-monitoring

Meina Zhu, Wayne State University
Curtis J. Bonk, Indiana University

Abstract

This mixed-methods study investigates the design and delivery of MOOCs to facilitate student self-monitoring for self-directed learning (SDL). The data sources of this study include an online survey with 198 complete respondents, semi-structured interviews with 22 MOOC instructors, and document analysis of 22 MOOCs. The results of the study indicated that MOOC instructors considered self-monitoring skills critical for SDL. To foster learners' self-monitoring, MOOC instructors reported that they facilitated students' self-monitoring with both internal and external feedback. Students' internal feedback is related to cognitive and metacognitive processes. To facilitate cognitive processes, quizzes, tutorials, learning strategies, learning aids, and progress bars were employed. For metacognition, MOOC instructors provided reflection questions and attempted to create learning communities. In addition, MOOC instructors, teaching assistants, and peers provided external feedback for students' self-monitoring. In addition, synchronous communication technologies, asynchronous communication technologies, and feedback were used with diverse purposes in supporting student's self-monitoring.

Keywords: massive open online courses (MOOCs), self-monitoring, self-directed learning, instructional design, MOOC instructors

Introduction

Self-directed learning (SDL) is considered highly important for learners in massive open online courses or MOOCs (Bonk, Lee, Reeves, & Reynolds, 2015; Kop & Fournier, 2011; Terras & Ramsay, 2015). However, SDL does not mean that instructors should leave learners alone. On the contrary, researchers from the field of nursing have stated that instruction and guidance on SDL at the beginning of the higher education courses is necessary as learners feel anxious about SDL (Hewitt-Taylor, 2001; Lunyk-Child, Crooks, Ellis, Ofosu, & Rideout, 2001; Prociuk, 1990). Consequently, facilitation is important to help learners develop the appropriate SDL skills (Kell & Deursen, 2002; Lunyk-Child et al., 2001).

Based on Garrison's (1997) framework designed at the University of Calgary, SDL includes three dimensions: (1) motivation, (2) self-management, and (3) self-monitoring. Self-monitoring refers to monitoring the learning strategies, processes, and the ability to think about thinking. It is related to cognitive and metacognitive processes. For example, learners can evaluate their learning and conduct self-reflection. Studies by Chang (2007) and Coleman and Webber (2002) argued that self-monitoring can improve learning performance. In effect, as still other studies show, teaching self-monitoring skills will benefit learners (e.g., Delclos & Harrington, 1991; Maag et al., 1992; Malone & Mastropieri, 1991; Schunk, 1982) and result in improved educational outcomes.

However, previous studies indicated that research on the instructional design as well as the actual delivery of MOOCs from the perspective of MOOC instructors is lacking (Zhu, Sari, & Lee, 2018; Margaryan, Bianco, & Littlejohn, 2015; Ross, Sinclair, Knox, Bayne, & Macleod, 2014; Watson et al., 2016). While there is MOOC research from the learner perspective, what is especially lacking is research on facilitating student self-monitoring from an instructor perspective.

In response to these research gaps, this study investigated the design and delivery of MOOCs to facilitate learners' self-monitoring skills from instructors' perspectives. Importantly, different technologies used to facilitate such self-monitoring are also addressed. The purpose of this study, therefore, is to better understand how MOOC instructors facilitated self-monitoring skills while designing and delivering MOOCs.

The following two research questions were the primary mechanisms that guided this study.
1. How do MOOC instructors design and deliver their MOOCs to facilitate students' self-monitoring skills?
2. How are various technologies employed to support MOOC learners' self-monitoring skills?

Theoretical Perspectives

Self-directed Learning (SDL) and Self-monitoring

As mentioned, Garrison's (1997) three-dimensional model of SDL was used as the main theoretical framework of this study. The framework includes: (1) self-management (i.e., task control); (2) self-monitoring (i.e., cognitive responsibility); and (3) motivation (i.e., entering and task). Self-monitoring, as a prerequisite of SDL, is the focus of this particular study. Self-monitoring involves both cognitive and metacognitive processes. Given that internal self-monitoring alone is not sufficient to promote cognitive improvement, external feedback from instructors is predicted to support learners' self-monitoring (Garrison, 1997); that was also expected to be the case in this MOOC study.

Chang (2007) stated that self-monitoring refers to learners' skills to track and evaluate one's progress towards their learning goals. Self-monitoring is related to self-awareness that might help learners control their learning process and keep them on track. Given that many prior empirical studies have indicated that teaching student self-monitoring skills will be beneficial for learners (e.g., Delclos & Harrington, 1991; Maag et al., 1992; Malone & Mastropieri, 1991; Schunk, 1982), there is a need today to continue this vein of research by exploring when, if, and how self-monitoring occurs in new and emerging open and online forms of distance learning such as MOOCs.

SDL and Self-monitoring in MOOCs

Many researchers have argued that SDL is important to adult education (Brockett & Hiemstra, 1991; Candy, 1991; Garrison, 1997; Merriam, 2001). Given that most MOOC learners are adults (Shah, 2017), SDL is considered an important element in the learning environment of MOOCs (Bonk et al., 2015; Kop & Fournier, 2011; Terras & Ramsay, 2015). Thus, researchers are becoming increasingly interested in SDL in MOOCs (Bonk et al., 2015). These researchers are often focused on the general perceptions of SDL from students' perspectives (Bonk et al., 2015; Loizzo, Ertmer, Watson, & Watson, 2017) as well as the relations between elements of SDL in MOOCs (Beaven et al., 2014; Kop & Fournier, 2011; Terras & Ramsay, 2015). Despite the substantial increase in universities offering MOOCs (Shah, 2019), especially in the Global South (Zhang, Bonk, Reeves, & Reynolds, in press), most MOOC empirical studies focus on the students' motivation and completion rates (Zhu et al., 2018). Consequently, research on the design of MOOCs to facilitate self-monitoring from the instructor's perspective is rare. Therefore, this study investigates instructor perceptions and practices of designing and delivering MOOCs to facilitate self-monitoring.

Research Methods

A sequential mixed methods design (Creswell & Plano-Clark, 2017; Fraenkel & Wallen, 2009) was used in this study. Quantitative data collection and analysis was conducted first followed by qualitative data collection and analysis (Creswell & Plano-Clark, 2017). The three main data sources in this study included: (1) an online survey with 198 valid responses; (2) semi-structured interviews with 22 voluntary instructors; and (3) course reviews of the MOOCs designed by the 22 interviewees. Different data sources serve the purpose of data triangulation (Patton, 2002).

Data Collection

Online survey. The authors developed a survey by adapting and modifying an instrument developed by Fisher and King (2010) and Williamson (2007), which was based on the theoretical framework of Garrison (1997). First, the authors conducted semi-structured interviews with four MOOC instructors and a pilot survey with 48 MOOC instructors to design the survey instrument (Zhu & Bonk, 2019). The final survey consisted of 29 questions, including 20 five-point Likert scale questions with seven items related to self-monitoring, three close-ended questions, and six questions asking about different demographic-related items. A Cronbach alpha was conducted in SPSS to check the reliability of the survey. The result of this statistical analysis for self-monitoring was 0.76, which was quite acceptable.

MOOC instructor interviews. The interview protocol had 12 questions. The interviewees were selected based on four criteria. First, they must volunteer to be interviewed by providing their contact email at the end of the survey. Second, the volunteers must indicate in the survey that they consider students SDL skills in their MOOC design and delivery phases. Third, their mean scores for the five-point Likert scale questions had to be higher than 2.5. Fourth, the researchers attempted to select potential MOOC instructor

interviewees who represented a diverse array of countries and MOOC subject areas or topics addressed. Also considered was previous experience with online or blended learning, prior MOOC teaching experience, MOOC format (i.e., instructor-led with teaching support, instructor-led without teaching support, self-paced, etc.), and MOOC providers or platforms.

Employing the above criteria, 22 MOOC instructors were selected for the interviews. Based on the work of Guest, Bunce, and Johnson (2006), in such in non-probabilistic sampling interviews, saturation likely occurred within the first twelve interviews. Stated another way, the twenty-two interviews employed here went well beyond the data saturation point. The MOOC instructor interviewees' institutions were from diverse counties such as the United States (n = 9), UK (n = 6), Australia (n=3), France (n = 1), Belgium (n = 1), Netherlands (n = 1), and Israel (n = 1). While definitely not a comprehensive assembly of countries, such a sampling allowed the researchers to begin to learn how SDL in MOOCs might be viewed and implemented in different regions of the world.

The interviewees also represented a diverse array of expertise and previous online experience. As an example, Emma from the U.S. taught a MOOC in the area of literacy and language science using Coursera. She had just taught this one MOOC and it was self-paced. Mason, from Australia, also had taught just one MOOC but with teaching assistant support. His MOOC was in education which too employed Coursera. Fernando, from Belgium, on the other hand, taught research methods three times via MOOCs using the Blackboard platform. Importantly, just like Mason, he also had teaching assistant support during his MOOC offering. Both Andrew and Emily in the UK used the FutureLearn platform to deliver multiple MOOCs with teaching assistance. Andrew had delivered three previous MOOCs in the field of art, whereas Emily had completed two MOOCs in the field of medicine and health. Those are just five examples of the 22 volunteer interviewees who each had highly interesting MOOC experiences and personal stories.

The first author shared the interview protocol with interviewees to better prepare them before their interview. In addition, the first author conducted a review of each interviewee's MOOC to support the interview conversation. Interviews were conducted and recorded through Zoom, a synchronous meeting tool. Each interview lasted around 30 to 60 minutes.

Document analysis. The MOOCs designed or taught by the interviewees were analyzed by the first author. She reviewed the course in terms of learning resources, activities, and assessments provided in MOOCs, both before as well as after the instructor interview. This document analysis phase that was employed helped to triangulate the data and, thereby, increase the trustworthiness or validity of the study.

Data Analysis

For quantitative data from the survey, the data was analyzed using descriptive statistics such as mean, frequency, and percentage in SPSS and Excel. These quantitative results are reported in the next section.

Regarding the qualitative data, a classical content analysis was conducted in NVivo 12. Following member checking, the researchers utilized classical content analyses to abductively analyze the data (Leech & Onwuegbuzie, 2007). The unit of analysis in this study was the meaning unit. To perform an abductive content analysis, the first author had a general self-monitoring concept and research questions in mind. Accordingly, she read through the entire dataset, chunked the data into smaller meaningful parts, labeled each chunk with a code, and compared each new chunk of data with previous descriptions. After data coding, the lead researcher categorized the codes by similarity into themes.

Results

Survey Participant Disciplines and Online Experience

The number of the survey participants in this study was 198. The participants in this study had diverse disciplinary backgrounds including social science, medicine and health, language and literacy, business and management, etc. Among these 198 participants, 102 (51.5%) did not have any online or blended course design and teaching experience prior to designing their initial MOOC. In terms of MOOC design and teaching experience, 118 participants (59.6%) had designed or taught only one MOOC. In general, therefore, they did not have extensive MOOC design and teaching experiences.

Research Question #1: How Do MOOC Instructors Design and Deliver Their MOOCs to Facilitate Students' Self-Monitoring Skills?

Survey Results

 Survey participants of this study (n = 198) ranked on a scale of 1 (Strongly disagree) to 5 (Strongly agree) whether the design and delivery of their MOOC helps the students to develop self-monitoring skills on various elements (see Table 1). For instance, a majority of participants reported that the design and delivery of their MOOCs helped students to be in control of their learning (M =4.15; SD = 0.55). However, the statement "helps the student set his/her own learning goals" was rated the lowest (M = 3.68; SD = 0.91) among seven items.

Table 1

Mean Score and Standard Deviation of the Specific Self-Monitoring Skills that the Participants' MOOC Facilitate

Items	Mean	SD
1. helps the student be in control of his/her learning	4.15	0.55
2. helps the student set his/her own learning goals	3.68	0.91
3. helps the student evaluate his/her own performance	3.94	0.78
4. helps the student be responsible for his/her learning	4.06	0.79
5. helps the student be able to focus on a problem	3.87	0.74
6. helps the student be able to find out information related to learning content for him/herself	4.02	0.70
7. helps the student have high beliefs in his/her abilities of learning	3.73	0.74

Note: The stem of these items are: "For the following questions, please imagine a learner who enrolls in your MOOC and intends to complete it."

Interview Results

 MOOC instructors reported that they facilitated students' self-monitoring in a variety of ways from helping students with internal self-feedback to providing external feedback. Internal feedback included students' cognitive and metacognitive processes. Cognitive processing was related to self-observation, self-judgment, and self-reaction. Metacognitive processing is related to self-reflection and thinking critically. External feedback included that obtained from MOOC instructors and their teaching assistants as well as from peers enrolled in the MOOC.

 Facilitate student internal feedback. MOOC instructors help student cognitive learning processes related to self-monitoring in myriad ways. For instance, they can do this through quizzes for self-assessment, tutorials on technology use, navigational aids for the course, supplemental resources, and instructional modeling. In this study, among 22 interviewees, 13 mentioned that they used quizzes or tests for student self-assessment. Lucas, a social science instructor stated: "I do think frequent quizzes and somewhat lengthy quizzes are really helpful... It makes the whole thing hang together as a unit. So, I gave a little quizzes at the end of my videos."

 Besides facilitating cognitive processes, MOOC instructors also facilitated students' metacognitive processes while designing and delivering MOOCs. In terms of metacognition, the interviewees reported that they encouraged students to reflect and think critically through reflection questions. Among 22 interviewees, five had self-reflection questions embedded in the MOOC. A science instructor from the US, Samuel, utilized weekly questions to foster self-monitoring and reflection in his MOOC. As he stated:

> We do ask, kind of, a summary discussion question at the end of the week. I'll ask: "What did you learn? How do you feel about that? How would this apply to a real world application?" So, we asked those kind[s] of reflection questions.

Provide external feedback to help students' self-monitoring. In addition to internal feedback, MOOC instructors also mentioned that they provided external feedback to help student self-monitoring. The external feedback was primarily from MOOC instructors, teaching assistants (TAs), and student peers.

Six out of 22 interviewees mentioned that they or their TAs provided feedback to students to assist in monitoring their learning. In addition, Joseph from the UK provided feedback through panels or lectures. As Joseph explained:

> We have [a] discussion moderator, who was also in that space talking to students. So, we try to engage students on some of those points, and question some of the things that they're saying. Maybe get them to reflect.

Given that 12 out of 22 MOOC instructors had TAs in their MOOCs, the TAs helped provide feedback to students. For instance, the business instructor, Ethan, asked his TA to provide feedback to students on a discussion board. As Ethan explained:

> We do have a tutor, who monitors the discussion boards and looks if any inquiries, or anything else comes in. But, I think her [TA] time is restricted to half a day a week. Her work has a lot of monitoring. And [she] follows up with all sorts of things.

Thirteen out of 22 interviewees adopted peer-assessment to help students' self-monitoring. They viewed self-monitoring as a social process which involves interaction with others. Peer-assessment was considered beneficial for the learners being assessed as well as those conducting the assessment (Barak & Rafaeli, 2004; Dochy, Segers, & Sluijsmans, 1999). In peer assessment, students not only obtain feedback from others, but also help self-reflection through providing feedback to peers. For example, Emma, encouraged learners to provide feedback to their peers. As she observed:

> We also put in peer evaluation because the interaction between students would motivate them. We give a very, very basic syllabus because we don't know what the educational background and the levels of the students. We gave them five different key points to enable them to evaluate other students on assignment.

MOOC Review Results

Through our review of the MOOCs of the 22 instructors who were interviewed, it was apparent that the design and delivery of MOOCs facilitated students' self-monitoring through their internal cognitive and metacognitive processes as well as various external supports. For example, quizzes, providing introductions, aids to help with course navigation, progress bars, and optional resources were used to help foster cognitive processes. In addition, to help metacognitive processes, these MOOC instructors encouraged learners to participate in discussion forums and attempted to build a sense of a learning community.

Facilitate student self-monitoring. As mentioned before, practice quizzes with immediate feedback were provided for students' self-assessment. Whereas some of the quizzes were independent tasks, others were embedded in MOOC videos (see Figure 1). Once a quiz was finished, students could obtain immediate automatic feedback and brief comments.
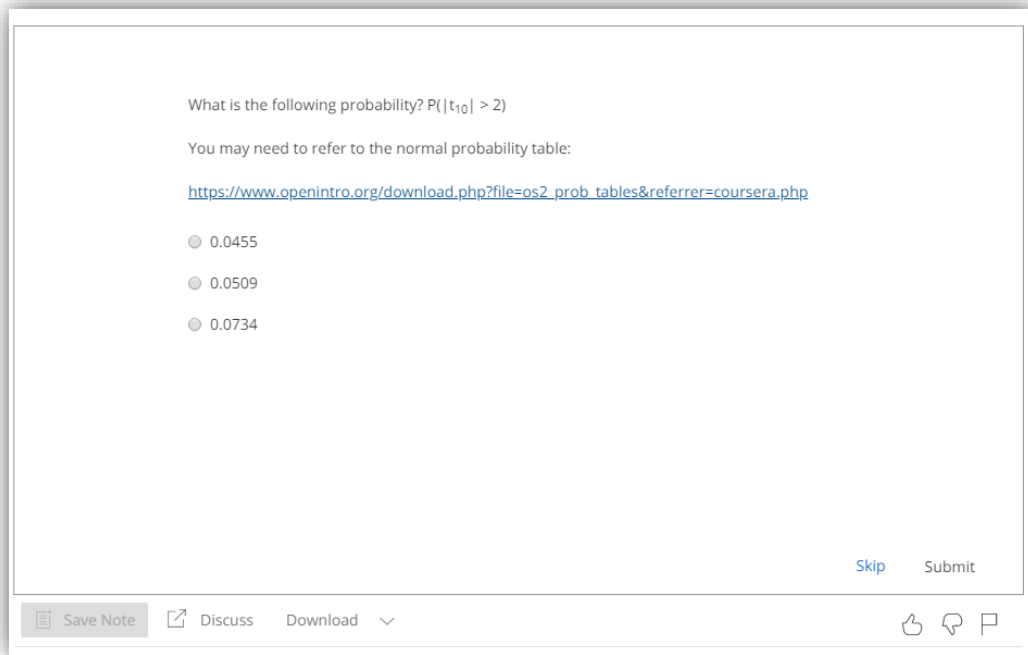
What is the following probability? $P(|t_{10}| > 2)$

You may need to refer to the normal probability table:

https://www.openintro.org/download.php?file=os2_prob_tables&referrer=coursera.php

○ 0.0455

○ 0.0509

○ 0.0734

Skip   Submit

Save Note   Discuss   Download ∨

Figure 1. Example of the quizzes embedded in videos used in MOOCs

To help students monitor their learning process, a progress bar was often employed in the MOOCs we analyzed. Additionally, optional reading materials or additional learning resources were used to help students make decisions on their own based on their learning situations (see Figure 2). With these resources, students can monitor their own learning progress and choose learning materials that fit their particular needs and preferred processes.
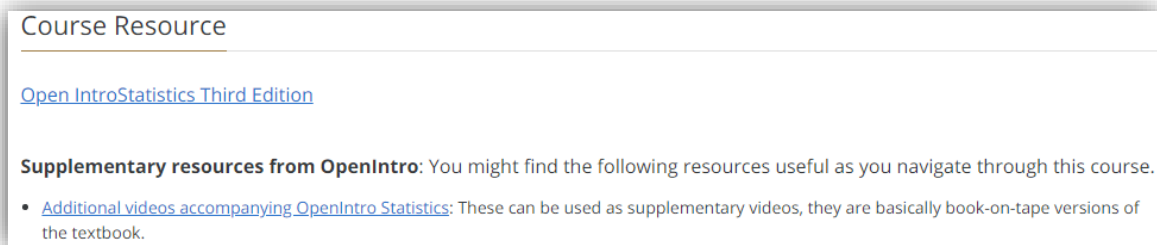

Course Resource

Open IntroStatistics Third Edition

Supplementary resources from OpenIntro: You might find the following resources useful as you navigate through this course.

- Additional videos accompanying OpenIntro Statistics: These can be used as supplementary videos, they are basically book-on-tape versions of the textbook.

Figure 2. Example of the supplementary resources used in MOOCs

In addition, as is often found in smaller online and blended learning situations, discussion forums were commonly incorporated into the 22 MOOCs that we evaluated, at least in part, for instances of students' metacognitive processing. It was in these discussion forums and related resources that the MOOC instructors encouraged learners to self-reflect, share ideas, and build learning communities (see Figure 3).
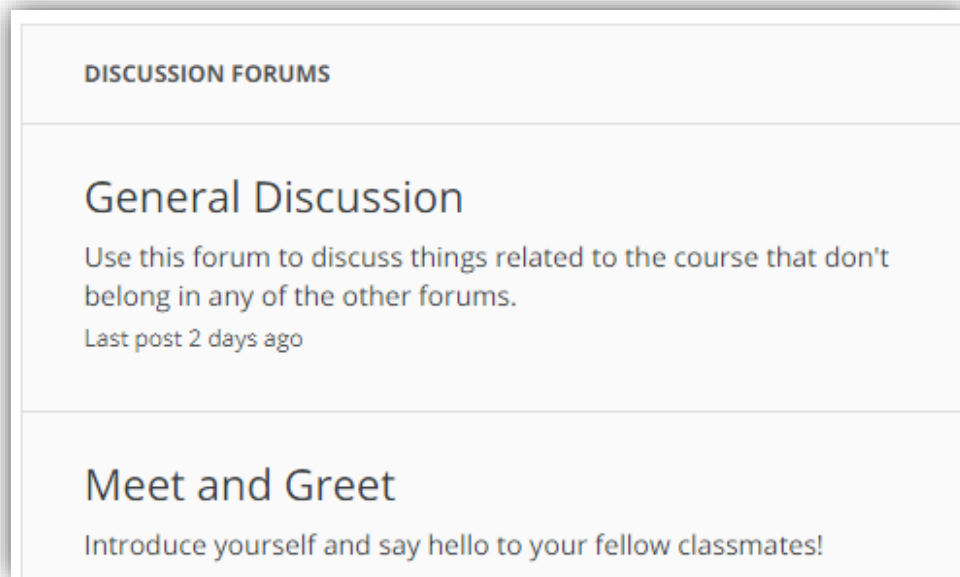
Figure 3. Example from discussion forum used for building a learning community

Provide external feedback for students' self-monitoring. In conjunction with interview results, the MOOC review results demonstrated that MOOC instructors and TAs facilitated the discussion forums by addressing students' confusions and encouraging peer-assessment (see Figure 4). Such external feedback might help students with their self-monitoring in learning.

Figure 4. Example of tool for peer-assessment in MOOCs

Research Question #2: How Are Various Technologies Employed to Support Learners' Self-Monitoring Skills?

Technologies play a vital role in MOOCs. MOOC instructors reported that a variety of technologies were used to facilitate students' self-monitoring such as synchronous communication technologies, asynchronous communication technologies, and feedback tools to facilitate student self-monitoring. Follow-up research might manipulate different features or components with the intention of nurturing specific self-monitoring skills and behaviors.

Synchronous Communication Technologies

Synchronous technologies such as Google Hangouts and YouTube Live were used to host meetings with students. Instructors employing such events reported that synchronous technologies can foster social interaction between instructors and students, which can further foster students' self-monitoring. Ashley, for example, used YouTube Live to stream her lectures online and answer participant questions.

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Asynchronous Communication Technologies

Besides synchronous communication technologies, asynchronous communication technologies such as discussion forums, blogs, Padlet, Slackbot, and various social media were utilized to connect MOOC students for interactive discussions as well as to build learning communities. A social interaction environment might elevate student self-monitoring and foster their motivation. Discussion forums for asynchronous conferencing were commonly provided within the MOOC platform.

Feedback Tools

Aligned with findings mentioned above, feedback is critical for student SDL. Formative and summative assessment technologies were used to help students' self-monitoring. As an example, Andrew from the UK employed learning analytics to monitor students' learning and continue to improve his MOOC.

Limitations of the Study

There were at least three key limitations of this research that future MOOC researchers and interpreters of this study should be aware of. First, MOOC instructor information was collected primarily from several key MOOC providers such as Coursera, FutureLearn, and edX. However, MOOCs that were not in English, like XuetangX, were typically not included. Hence, there is an English language limitation here. In addition, while the survey response rate was acceptable for an opt-in survey (Cho & LaRose, 1999), it was just 10%; however, the response rate (18%) was much higher when only those opening the email invitation were considered. Naturally, higher response rates would have provided more robust data from which to draw conclusions about self-monitoring and other SDL skills and competencies. Finally, this study only examined MOOC instructors' strategies used to facilitate student self-monitoring; we did not confirm whether the strategies reported by the MOOC instructor participants in this study were actually effective for their learners. As noted below, we are currently addressing this final limitation in a follow-up study.

Discussion and Significance of this Study

This study examined the design and delivery of MOOCs to facilitate students' self-monitoring skills. Despite the limited MOOC design and teaching experiences of the participants, their previous traditional classroom teaching experience as well as their blended or online teaching experience played a role in informing their MOOC design to facilitate student self-monitoring. The results of this study indicated that MOOC instructors facilitated students' self-monitoring through both internal feedback and external feedback. The internal feedback was related to their cognitive and metacognitive processing, which included monitoring their learning strategies and thinking about their thinking (Garrison, 1997).

These instructors relied on many techniques to foster SDL. For instance, to facilitate learners' cognitive learning processes, strategies such as quizzes for self-assessment, progress indicators, tutorials on technology use, learning tips, navigational aids for the course, instructional modeling, and various other resources and supports were reported by MOOC instructors. Important to this study, self-assessment and progress indicators encouraged learners to review and monitor their learning process. Such results concurred with the findings reported a few years ago by Kulkarni et al. (2013).

Regarding facilitating metacognitive processing, MOOC instructors encouraged students to think critically by providing reflection questions and assistance in building a learning community. This finding is in line with the implications of a study by Parker et al. (1995) who discovered that encouraging reflection can improve learners' SDL skills. Similarly, scholars such as Schraw (1998) have argued that reflection is crucial in building student metacognitive knowledge and self-monitoring skills. Likewise, Boud, Keogh, and Walker (2013) emphasized the importance of using reflection to transfer the learning experience to novel settings and situations.

External feedback motivates students as well as helps them with their self-monitoring. The participants in this study reported that the feedback from MOOC instructors and TAs can help MOOC learners identify key issues. Furthermore, research indicates that peer-assessment can benefit both feedback providers and feedback receivers (Barak & Rafaeli, 2004; Dochy et al., 1999).

The second primary focus of this study related to the use of technology to facilitate self-monitoring. As indicated earlier, MOOC instructors leveraged a variety of technologies to facilitate self-monitoring. These technologies included: (1) synchronous communication technologies, (2) asynchronous communication technologies, and (3) feedback tools.

Each of these diverse technologies served different purposes. First, the results indicated that these technologies support creating a learning community. MOOC instructors stated that the synchronous technologies such as Google Hangouts and YouTube Live as well as asynchronous communication technologies such as discussion forums, blogs, social media, etc., served as communication technologies that could support students' social learning. Such results were in line with the findings of Blaschke (2012) and Junco, Heiberger, and Loken (2010) who found that using social media supported student SDL. In addition, the findings support Candy's (1991) idea that SDL is realized in collaboration and interaction. Suffice to say, the surveys, interviews, and content analyses shed light into key aspects of learner SDL skills and processes when enrolling in MOOCs.

Conclusions and Future Directions

The findings of this study provide many useful insights for instructors and instructional designers into MOOC design and delivery to facilitate student self-monitoring for SDL. In addition, it was apparent that various technologies supported self-monitoring were also identified. As such, software designers and programmers as well as other involved in MOOC platform development and associated funding might also benefit from this research. The findings of this study also offer implications for educators designing programs to enhance MOOC retention and completion rates, albeit indirectly.

This study was just the first step in the process of developing the tools and techniques for enhanced learner SDL. Many more studies in this area are now desperately needed. As part of such efforts, we plan to expand the current research study with additional MOOC instructor participants. At present, we are in the midst of another in-depth study examining students' perceptions of effective self-monitoring strategies to hopefully verify as well as expand upon the strategies mentioned by the instructors. Importantly, our results thus far confirm as well as extend the findings detailed here.

From what we have witnessed during the past decade, there is little chance of MOOCs abating in the near future. In fact, MOOCs have expanded to more than 100 million learners enrolling in over 11,000 MOOCs in 2018 alone (Shah, 2019). The time is ripe, therefore, for investigating whether cognitive and metacognitive processes needed in MOOCs can be enhanced and whether such skill enhancements might transfer to other learning-related settings and situations. In effect, the goal is for self-monitoring skills to transfer to other formal as well as informal learning environments and situations; especially as additional forms of open and distance learning emerge and evolve.

In the meantime, much needs to be done. MOOC researchers might want to explore different forms of instructional scaffolds and supports for SDL, whereas educators might want to design and evaluate innovative training programs for SDL in this age of massively open online teaching and learning. Designers of MOOC platforms as well as MOOC vendors might evaluate MOOC retention and completion rates resulting from the introduction of new technology tools and features for self-monitoring, self-management, and motivation. Whatever the direction, the future is sure to be exciting!

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