Dimensions of MOOCs for Quality Design: Analysis and Synthesis of the Literature

Yuki Ichimura
yichimura@st.gsis.kumamoto-u.ac.jp
Doctoral Student
Graduate School of Instructional Systems
Kumamoto University
Kumamoto, Japan

Katsuaki Suzuki
ksuzuki@kumamoto-u.ac.jp
Professor & Chair
Graduate School of Instructional Systems
Kumamoto University
Kumamoto, Japan

Abstract Designing Massive Open Online Courses (MOOCs) involves new challenges for instructional designers. In particular, the unknown number of participants and the range of diverse needs are major sources of difficulty. Currently, there is little research available informing the quality of MOOC design in order to support the learners' active engagement. In the previous studies, the researchers describe elements and the process of MOOC design differently; theoretical MOOC design, therefore, has not been defined from pedagogical and technological perspectives. This study comprises an analysis of the current MOOC-related literature with a particular focus on the course design of MOOCs. Synthesizing the findings of previous studies, important and common design dimensions are highlighted for future course design. Accordingly, the taxonomy of MOOC types is analyzed first, and is followed by an investigation of design frameworks. Notable results include critical elements of MOOC design across the unique MOOC learning environment, from the basic structure of MOOCs to innovative technological affordance.

Key words: MOOCs, Design, Literature Review,

INTRODUCTION

It has been less than five years since Daniel (2012) described “Massive Open Online Courses” (MOOCs) as an "educational buzzword of 2012". During this short period of time, the number of MOOCs has continuously grown, and according to Class Central (2015), 4200 courses have been created at 550 universities. Enrollment numbers reached 35 million in 2015 which was almost double from the previous year. These high numbers appear to indicate that MOOCs draw great interest both in educational institutions and with learners around the world (Yousef, Chatti, Schroeder, Wosnitza & Jacobs, 2014).

On the other hand, "research in MOOCs is still an emerging field" (Yousef et al., 2014, p.9). For example, the "quality design of MOOC environments has not yet been clearly defined" (Yousef, et al., 2014, p.44) and guidelines based on theoretical grounds are needed for better decision-making (Alario-Hoyos, et al., 2014). Furthermore, the learge class size and unique affordances associated with new technologies can potentially generate difficulties for instructors when they design and teach lessons (Conole, 2013). The challenges include difficulties in evaluating students, absence of immediate feedback, and lack of student participation (Hew & Cheung, 2013). The design of MOOCs inevitably involves a complexity of pedagogical, technological, and organizational issues. (Conole, 2013; Alario-Hoyos, et al., 2014). However, despite these issues, many researchers continuously search for new models for MOOCs. Therefore, the current situation necessitates a comprehensive design framework underpinning the quality of MOOCs. For this reason, the purpose of this study is to synthesize current research into MOOCs design dimensions in order to highlight what is important for the future quality of MOOC design.

RESEARCH DESIGN & METHODS

The researchers firstly analyzed past systematic reviews of the MOOC literatures. The previous sresearchers conducted systematic reviews using multiple sources: academic databases, such as ERIC, Scopus, and so on, relevant academic journals such as Distance Education, International Review of Research in Open and Distributed Learning (IRRODL), Google Scholar, and other relevant sources such as Educause Library. The current study located seven papers comprising systematic literature reviews. MOOC-design related topics are synthsized and summarized.

Secondly, a "forward referencing process" was conducted as used by Liyanagunawardena et al. (2013) and Veletsianos & Shepherdson (2016). In this literature search process, the researchers examined all the papers that were cited in the original seven studies.

Additionally, the Scopus database search was employed in the period between from 2008 to 2016 to identify relevant studies using the key words of " MOOC" and "design". The results are discussed below.

RESULTS

MOOCs Taxonomy

"xMOOCs" and "cMOOCs" Many papers have classified MOOCs into two groups, namely "xMOOCs", which stands for "extend" and "cMOOCs", which stands for "Connectivism". Ebben and Murphy (2014) analyzed MOOCs from the chronological framework, and identified cMOOCs as the first phase of MOOCs, and xMOOCs as the second phase, when MOOCs had gained rapid popularity. Grounded in connectivism (Downes, 2012), cMOOCs make use of the affordances enabled by networked online technology, in which the learners take a central role in activity design, assessment, and self-organized learning (Ebben & Murphy, 2014; Kennedy, 2014; Yousef et al., 2014). Additional distinctive features of the cMOOCs are the openness in the broad categories, including design, content, curriculum, delivery, registration, and open technology (Jacoby, 2014 ; Kennedy, 2014).

In contrast to cMOOCs, xMOOCs are associated with behaviorist and cognitivist approaches (Conole, 2013; Yousef et al., 2014), using didactic and transmission models of teaching. xMOOCs helped generate the expansion of MOOCs, when the first Stanford xMOOC was launched and "extended" the traditional lectures to the online course (Jacoby, 2014). xMOOCs are associated with initiative businesses, such as Coursera, edX and Udacity which accommodate the massive scale of participants. The growth of learning analytics, wired in the platform, is also highlighted as a tool, thereby informing researchers about the learners' behavior and learning patterns on the MOOC platforms (Ebben & Murphy, 2014).

Although multiple papers focused the distinctions between xMOOCs and cMOOCs, Veletsianos and Shepherdson (2016) argued that the distinction between the two categories has become unclear due to the ongoing exploration of new MOOC design. Furthermore, they discussed that MOOCs could not be classified simply into the two groups, and the simple classification between xMOOCs and cMOOCs would cause a pitfall concealing the differences of the individual course deign.

Alternative MOOC Types In fact, there have been increasing attempts to experiment with new MOOCs models. Yousef et al. (2014) listed a variety of alternative MOOC types, including smOOCs (small open online courses), bMOOCs (blended MOOCs), aMOOCs (alphaMOOCs), and pMOOCs (project-based MOOCs). The authors categorized the key concepts of the MOOC groups, with comparison of content, communication and assessment. Figure 1 comprises analysis of Yoursef al. (2014) with some input from the previous papers.

Wide ranges of learning theories were used as the foundations of the courses examined by the Yousef et al (2014). On the other hand, comparison of them shows no clear distinction in the learning tools equipped, such as video-based lecturers, blogs, forums, social-network, lecture slides and PDF, except that bMOOCs had face-to-face instruction and communication. Similarly, all the courses used online tests, quizzes, and multiple choice questions for the student assessment. Peer-assessment was used by the cMOOC completely, while xMOOC and bMOOC used this assessment method partially. In summary, these classifications of MOOC types inform the instructors' intentions using a variety of learning theories, instructional models, and philosophies. Despite the wide conceptual differences, only

minor distinctions appeared in the use of learning tools, the delivery of instructions, and the assessment methods.

MOOC Types	Learning Theory	Key concepts	Content	Communication	Assessment	Learning Tools
cMOOCs	Connectivism	Openness Autonomy Diversity Interactivity Complexity	Open Participatory teaching Flexible Distributed	Open Networking Outside the MOOC platform Use of social media	Self-assessment Peer-assessment (E-assessment)	· Video lecturer · Blog forum social network · Lecture Note · Power Point and PDF
xMOOCs	Behaviorism Cognitivism Constructivism	Limited openness Corporate start ups: Coursera edX Udacity Learning Analytics Certificate	Pre-set course content Teacher-defined Video Lecture Short assignment	Limited interactions In MOOC platform Discussion board	Learning analytics E-assessment--- Quiz Test (Peer-review)	· Video lecturer · Blog forum social network · Lecture Note · Power Point and PDF
aMOOCs	alpha MOOCs	Dual model of cMOOCs and xMOOCs Collaboration				
bMOOCs	Social constructivism	Blended model Collaboration Competency-based	In-class and online instruction Self-paced Pre-definition of learning plans	In-class and online instruction Real time Online	E-assessment (Peer-assessment)	· Video lecturer · Blog forum social network · Lecture Note · Power Point and PDF · Face-to-face
smOOCs	Social constructivism (Connectivism) (Cognitivist)	Small Open Online Courses			E-assessment (Self-assessment)	· Video lecturer · Blog forum social network · Lecture Note · Power Point and PDF
pMOOCs	Project-based MOOCs					

Figure 1 MOOCs Types and the Key Features of the Design (Edited from Yousef, et al, 2014)

Dimensions of MOOCs Design

In addition to the classifications, grouping the MOOC types, deeper examination into design of MOOCs would be needed in order to enhance the quality of learning. There are critics on MOOCs, related to instruction and learning design that are "a gap between the reality and practice; teachers lack the skills needed to harness the power of new technologies"(Conole, 2013, p.13). Other critics point high drop out rates, learner confusion and frustration, heavy workload and didactic pedagogy (Conole, 2013). MOOCs instructors faced with difficulties caused by the knowledge gap in their practices, and addressed the challenges of teaching unknown scale of students in the open online settings (Grover, Franz, Schneider and Pea, 2013). Further more, some researchers addressed that there was no clear definition on design of MOOCs (Yousef, et al., 2014). That is, there is little understanding in designing MOOCs that the instructors consult with. Recently, there have been more research papers available in relation to MOOCs design, however, many of the papers reported their experiences of creating MOOCs, and made suggestions from their cases. Only a small number of papers examined comprehensive concepts and approaches for instructional design of MOOCs. Figure 2 comprises key findings .

Conole (2013) proposed twelve dimensions for MOOCs classification, including openness, participation, multimedia use, communication, collaboration, the type of learner pathway, quality assurance, reflection, assessment, formality, autonomy, and diversity that designate pedagogical characteristics of MOOCs. In addition to these dimensions, Conole (2013) suggested a deign framework that informed the process of design decisions for course development.

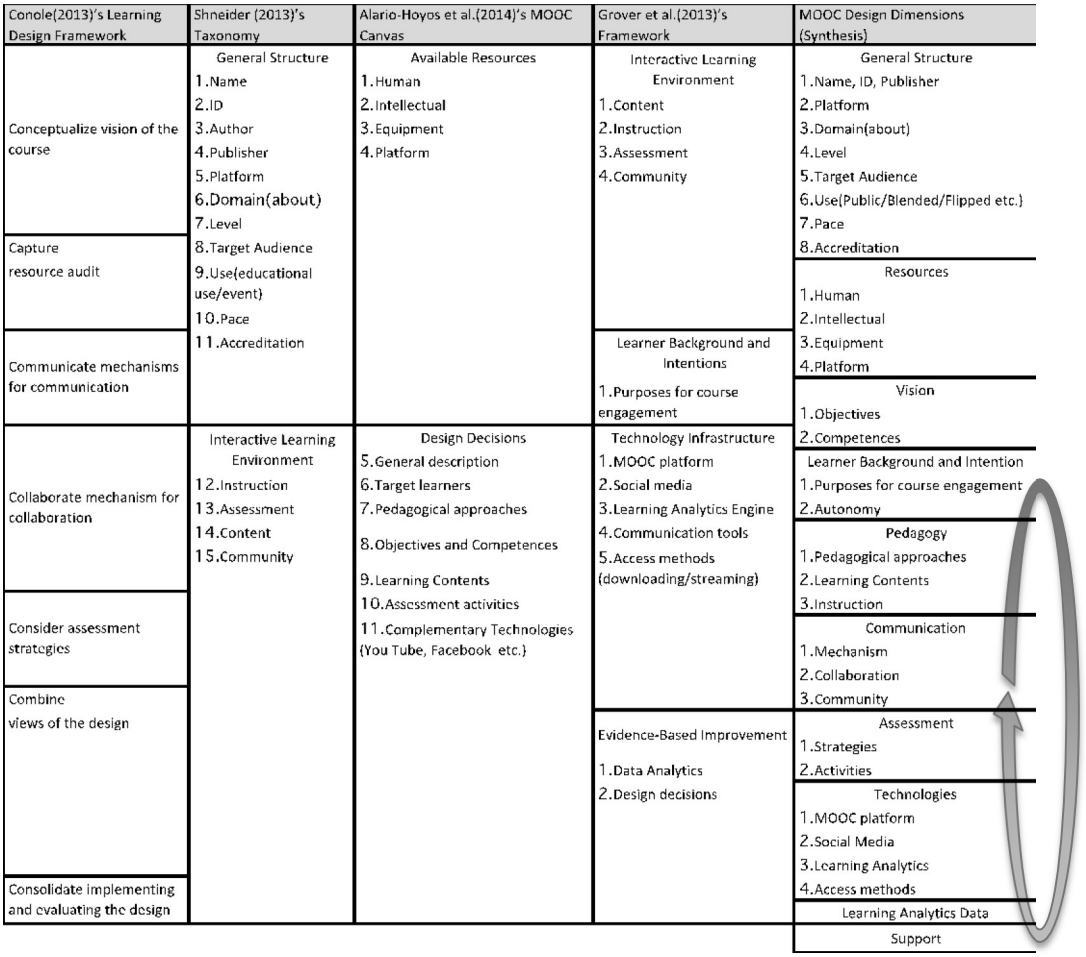

Figure 2 Synthesis of the Design Framework of MOOCs

Another early attempts of conceptual mapping of MOOCs design was made by Shneider (2013), which categorized the two main structures of MOOCs. General MOOC structure listed basic components of MOOCs, such as Name, Platform, Level, Target Audience, and Accreditation, etc. The second structure is the elements of learning environment that the design decision should be made of, including: instruction methods, module and pace, assessment, and community.

The works by Conole (2013) and Shneider (2013) covered mainly pedagogical design elements of MOOCs. Alario-Hoyos, et al. (2014) argued that other issues are inevitably involved in design of MOOCs, such as technological, logistical, and financial natures. Alario-Hoyos et al. (2014) developed a design guide tool, in which the designers fill in their decisions by answering to the questions related eleven issues shown in Figure 2.

More dynamic analysis was made by Grover, et al. (2013) that focused distinctive elements of MOOCs from the regular online course design. Their design and evaluation framework is based on distributed intelligence perspective, which consists of interaction between the individual and collective learning, enhanced by participatory knowledge distribution. The key dimensions of instruction, learners, technology and learning analytic data are mutually shape each other. Learners chose instructional resources distributed in the interactive learning environment to suit their unique needs. The innovative affordance of new technologies associated with MOOCs, such as learning analytics and social media is included as the key design elements, possibly accommodating diverse needs of learners.

Synthesis of the reviewed paper identifies nine key features in MOOCs design as shown in the right-most column of Figure 2. The basic design decisions are included in "General Structure", "Resources" and "Vision". Next, the dimensions construct learning design is, as Grover, et al. (2013) suggested, interrelation of "Learner Background and Intention", "Pedagogy", "Communication", "Assessment", "Technologies" and "Learning Analytics Data". Although none of the reviewed paper

listed, learner support would be an additional dimension to be addressed, which was added as the last element of the proposed synthesis.

CONCLUSION

In this study, it was found that conceptual mapping in design of MOOCs has been proposed only by a small number of papers. The previous research intended to help the design processes of MOOCs. Nevertheless, they were not evaluated enough by the actual course design practices. The current study has proposed a synthesis of critical elements of MOOCs design. However, it is not yet a set of design guidelines ensuring and improving the quality of MOOC learning. Many researchers suggested that implementing the principles of instructional design, which have been well established in the traditional online learning, would help the effective design of MOOCs (Alario-Hoyos et al., 2014; Grover, et al., 2013). Based on the proposed synthesis, it will be our next focus to building strategies and criteria, adopting and adapting the instructional design principles into the MOOC design as researchers in the field of educational media and technology.

REFERENCES

Alario-Hoyos, C., Pérez-Sanagustín, M., Cormier, D., & Kloos, C. D. (2014). Proposal for a Conceptual Framework for Educators to Describe and Design MOOCs. *J. UCS, 20*(1), 6-23.

Class Cnetral. (2015). *By The Numbers: MOOCS in 2015: How has the MOOC space grown this year? Get the facts, figures, and pie charts.* Retrieved May 2016 from https://www.class-central.com/report/moocs-2015-stats/

Conole, G. (2013). *MOOCs as disruptive technologies: strategies for enhancing the learner experience and quality of MOOCs*. Retrieved May 2016 from https://core.ac.uk/download/files/418/11890896.pdf

Daniel, J. (2012). Making sense of MOOCs: Musings in a maze of myth, paradox and possibility. *Journal of interactive Media in education, 2012*(3).

Ebben, M., & Murphy, J. S. (2014). Unpacking MOOC scholarly discourse: A review of nascent MOOC scholarship. *Learning, Media and Technology, 39*(3), 328–345.

Grover, S., Franz, P., Schneider, E., & Pea, R. (2013). The MOOC as distributed intelligence: dimensions of a framework & evaluation of MOOCs. In *Proceedings CSCL* (Vol. 2, pp. 42-5).

Hew, K. F., & Cheung, W. S. (2014). Students' and instructors' use of massive open online cou rses (MOOCs): Motivations and challenges. *Educational Research Review*, *12*, 45-58.

Jacoby, J. (2014). The disruptive potential of the massive open online course: A literature review. *Journal of Open, Flexible and Distance Learning, 18*(1), 73-85.

Kennedy, J. (2014). Characteristics of massive open online courses (MOOCs): A research review, 2009–2012. *Journal of Interactive Online Learning, 13*(1), 1–16.

Liyanagunawardena, R., Adams, A., & Williams, A. (2013). MOOCs: A systematic study of the published literature 2008–2012. *The International Review of Research in Open and Distributed Learning, 14*(3), 202–227.

Veletsianos, G., & Shepherdson, P. (2016). A Systematic Analysis and Synthesis of the Empirical MOOC Literature Published in 2013–2015. *The International Review of Research in Open and Distributed Learning, 17*(2).

Yousef, A. M. F., Chatti, M. A., Schroeder, U., Wosnitza, M & Jacobs, H. (2014). A Review of the State-

of-the-Art. In *Proceedings of CSEDU2014, 6th International Conference on Computer Supported Education* (pp. 9-20).

Yousef, A. M. F., Chatti, M. A., Schroeder, U., & Wosnitza, M. (2014). What drives a successful MOOC? An empirical examination of criteria to assure design quality of MOOCs. In *2014 IEEE 14th International Conference on Advanced Learning Technologies* (pp. 44-48).