Deconstructing Design of MOOCs: Using 10 Dimensions Model

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Abstract: As designing quality of Massive Open Online Courses (MOOCs) has been a concern, we have created the 10 Dimensions Model, by synthesizing elements of MOOCs. Through the development of the model, fundamental and comprehensive understandings of the design process were sought out. In this study, close examination on five existing MOOC was carried out, using this model and the revised Bloom's taxonomy. The result illustrated issues in activity level and sequencing of the module, which impacts MOOC courses as a whole. Future directions of the study were discussed.

Keywords: MOOCs, Instructional Design, 10 Dimensions Model, Bloom's Taxonomy

Introduction

Massive Open Online Courses (MOOCs) have been evolving since the first launch of the course in 2008. It appears that the new forms of courses have emerged endlessly. New technological development is not the only actors of the evolution, but the researchers and instructors' exploration in this unique online pedagogy is. In search of understanding varieties of MOOCs, some previous researchers used taxonomy and classified MOOCs. However, our previous research suggested taxonomy itself did not address the complex design combinations and choices in details. MOOCs quality is underpinned by complex issues (Bonk, Reeves, Lee, & Reynolds, 2018).

From our review of the past related research in MOOCs and their course design, we have proposed 10 Dimensions Model (Ichimura & Suzuki, 2016). The model comprehensively covers the elements that comprise MOOCs. By using this model, this proposed study analyzed the existing MOOCs, such as courses provided by the Japanese MOOC organizers, JMOOC, Coursera, edX and The European Multiple MOOC Aggregator (EMMA). Different design types of these MOOCs from the multiple countries were deconstructed in detail. For example, their general structure, pedagogy, communication method, assessment, and technology use are one of the dimensions examined in this case study. The analysis of the process is still underway. The result reports the contrast of the design options in each dimension and the analysis of the instructional design, discovered in the examined courses.

10 Dimensions Model

MOOCs have occasionally been analyzed by types of the courses, comparing their differences and using acronyms, such as cMOOCs, xMOOCs, and pMOOCs. (Reeves & Hedberg, 2014; Yousef, Chatti, Schroeder, Wosnitza, & Jacobs, 2014). Reeves & Hedberg (2014) associated pedagogy of cMOOCs (conncectivism) with knowledge integration, in contrast to that of xMOOCs with knowledge duplication, and pMOOC (project or problem-based) with knowledge production. Yousef et al. (2014) analyzed learning tools and assessment methods of different MOOC types. These taxonomies articulated conceptual differences among types of MOOCs, nevertheless, they did not inform how actual instructional components or learning activities are differently structured in detail (Ichimura & Suzuki, 2016). Therefore, the given information is not enough for instructors and designers to make design decisions. To understand MOOC design more fundamentally and comprehensively, in the previous study, we reviewed the MOOC-related literature and synthesized the available conceptual frameworks from the past study. We synthesized the findings into 10 Dimensions Model (Ichimura & Suzuki, 2016), which comprehensively maps design elements, composing MOOCs, as shown in Figure 1.

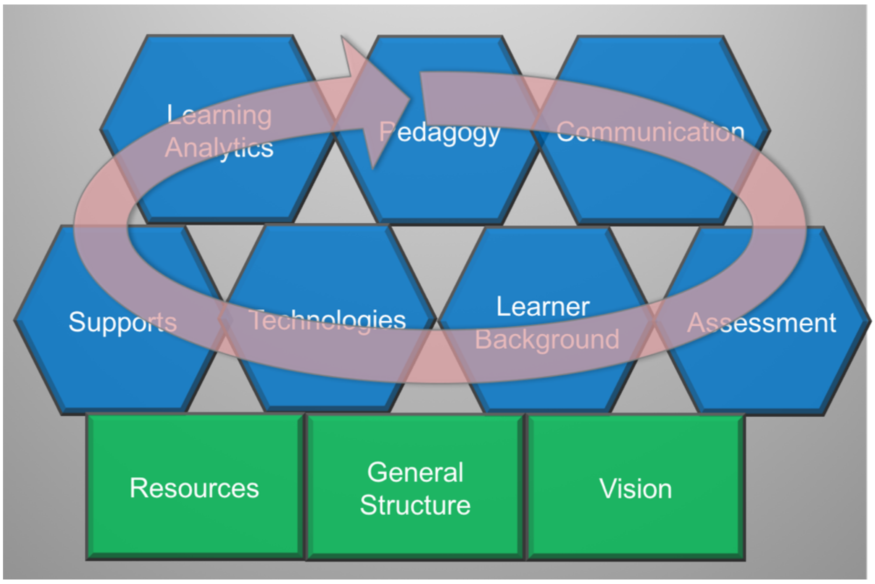

Figure 1. Ten dimensions of MOOC design （Ichimura & Suzuki, 2016）

The three elements on the bottom layer consisting of "Basic Design Decisions," including "Resources," "General Structure" and "Vision." Multiple subcategories are included in each dimension as shown in the second left column in Table 1. For example, “General Structure” includes course name, platform, target learners, level, pace, and accreditation. “Vision” include the objectives and competency.

“Resources” represents human and intellectual resources, equipment, and platform, available for course designers. These three dimensions and subcategories are the Basic Design Decisions which are the foundations of course design.

The above seven elements in Figure 1 are "Interactive Learning Environment" (Grover et al., 2013), including "Learning Analytic," "Pedagogy," "Communication," "Supports," "Technologies," "Learner Background" and "Assessment." These seven dimensions are interactive and mutually influence each other.

Research Design & Methods

We observed five MOOCs running in 2016 and early 2017. Observation described the details of 10 dimensions and how each element is defined and delivered by the instructors. The first author registered the selected MOOCs as a learner and observed the courses. The examined courses include: *Programming for Everybody,* taught by University of Michigan on Coursera, *Circuit and Electronics 1* (*MITx 6.002.1x),* taught by Massachusetts Institute of Technology (MIT) on edX, *Denki Kairo (Electric Circuit),* delivered from Japan Massive Open Online Education Promotion Council(JMOOC) on Fisdom platform, *Motivation Management,* from JMOOC on Gacco platform, and *Designing Online Courses with the 7Cs Framework,* from Bath Spa University on The European Multiple MOOC Aggregator (EMMA) platform. The related information was collected from course information, course content, instructional videos, quizzes, discussion boards, linked social media, and other available sources. While observing these courses, the researcher took notes on the spreadsheet categorizing the 10 dimensions in the model.

The revised Bloom’s taxonomy (Anderson & Krathwohl, 2001) guided our analysis framework. For example, during observation and analysis on the dimension of pedagogy, instructional content and learning activities, the action verbs of cognitive process in this framework were used.

Results

Table 1 is an excerpt from the descriptive analysis on the 10 dimensions. The analysis process is still underway, and summary of the key findings are listed below.

Impact of Platform and Technological Affordances

The observed courses are provided through five different platforms from North America, Japan, and the European Union. Comparison between the technological equipment and platforms found major differences, having impacts on the instructional and learning activity design. Main differences of the platforms were found in appearance, layout, equipped function, and structure. Coursera and edX equip the rich additional technological infrastructure. For example, edX’s extended online lab function that enables *MITx 6.002.1x*, to give the participants opportunity, manipulating the knowledge, gained from the lecture videos. On the lab, the learners created and experimented circuit diagrams. *Programming for Everybody* on Coursera integrates “Python Playground" in which learners practice and retry coding on the platform.

On the other hand, *Denki Kairo (Electronic Circuit)* from JMOOC does not have these technological tools to create, that minimize the learning activities into multiple choice quizzes. Nonetheless, platforms with rich technological function are not the necessary and only condition to enrich instructional contents. The EMMA from EU is an experimental platform, still developing its function based on the users' feedback. The appearance of EMMA is rather simple, compared to Coursera and edX. However, in *Designing Online Courses with the 7Cs Framework*, Conole integrates a variety of learning activities, not limited to multiple choice quizzes, by linking external online applications, such as Google Docs. This course utilizes only discussion boards as the weekly task submission tool. The learners upload their tasks and works in the external web services, such as their blogs and Google docs, and post links on the discussion boards. Despite the simple structure, the participants make comments on the classmates' discussion posts actively.

Level of Learning Activity and Assessment Activity

Close analysis of the dimensions of "Vision", "Pedagogy" and "Assessment" was conducted, using an instructional design theory. We chose typical weekly modules of the five MOOCs and analyzed by revised Bloom's taxonomy (Anderson & Krathwoh, 2001). Anderson and Klathwohl (2001) classified the cognitive process of learning in six acts. From the bottom level of the process, they are 1. Remember, 2. Understand, 3. Apply, 4. Analyze, 5. Evaluate, 6. Create. From the examined five courses, we located their objectives, the learning activities, and the questions asked in the assessment quizzes, then categorized them in the verbal forms provided by the model. The results from the classification will report how the levels of activities are differently designed.

Structure of Instructional Sequences

In addition, our observation suggested that the sequences of each module have a great impact on the course design as a whole. Instructional modules are, whether it is weekly or completely self-paced, mostly combinations of instructional videos, quizzes, activity tasks, discussions, and assignments. The length of the instructional videos has been analyzed and discussed by the previous researchers already. In addition, the present study found that the sequence structures were widely different from each course. Some courses are simple and linear manner, while other courses integrate mixed elements of instruction, concept check activities, and exercises, by a strategic manner, that reinforces participants' learning. The result highlights the comparison of sequencing between the MOOCs, and how the structure of each module makes a big difference in MOOCs as products.

Discussion

By using 10 Dimensions Model (Ichimura& Suzuki, 2016), we deconstructed five MOOCs and closely examined the elements of their design. Our observation was conducted as a registered learner; therefore, it limited access to some information included in the model. For example, "Learner

Background "and "Learning Analytic Data" sections are blank in Table 1. Also, the course analysis on the specific subjects, like *electronic circuit*, calls for confirmation by subject matter experts.

Dimensions	**Subcategories**	*"Programming for Everybody"* Coursera	*"MITx 6.002.1x"* edX	*"Denki Kairo (Electric Circuit)"* JMOOC Fisdom	*"Motivation Management"* JMOOC Gacco	*"Designing Online Courses with the 7Cs Framework"* EMMA
General Structure	Name, Platform, Domain, Level, Audience, Use, Pace, Accreditation	Univ. of Michigan, 7 weeks, fixed, Course certification	MIT, Self-pace, weekly sequence	Self-pace, 6-8 weeks, Engineers, Open, Employee Education	Weekly, Fixed test submission dates, Open, General audience	Federico II & Bath Spa Universities, Open, Self-paced,
Resources	Human, Intellectual, Equipment, Platform	14 volunteer mentors	10 Community mentors, Online textbook			
Vision	Objective, Competency	To teach the basic programming.	To introduce engineering.	To analyze phenomenon of the sinusoidal alternating current.	No clear description as objective /competency	To understand, analyze, and apply the framework. Will develop a plan.
Learner Background	Purpose, Autonomy		Global	Company, PD,	Businessman, students, Housewives	Lecturer, Teacher, Retired worker,
Pedagogy	Approaches, Learning Contents, Instruction	Video, Reading, Quizzes, Coding activities	Video, Reading, Online lab activities, Online live session	Video, Quizzes	Video, Quizzes, Discussion, Report	Modules with 5 units, Video, Reading, Tasks, Share, Comment
Communication	Communication mechanism, Collaboration, Community	Discussion Boards in the Platform	Discussion boards, Wiki, Facebook, Twitter, Collaboration	Discussion boards (Q&A)	Discussion boards	Sharing the works, Comment, Twitter, Blogs, Discussion Board
Assessment Strategy	Strategies, Activities	Peer assessment, Graded quizzes, Coding activity, Pass all graded assignments.	Homework 15%, Lab 15%,Exam 70%	Quizzes, Multiple choice quizzes	Peer-reviewed essay report	Completing 70% of the course. Complete button, No formal assessment
Technological Infrastructure	Platform, Social Media, Learning Analytics	Coursera Python playground	edX Online textbook viewer, Online lab	Fisdom platform	Gacco platform	European Multiple MOOC Aggregator, Twitter, Learners' blogs
Learning Analytics Data						
Support	Course Mentor	Mentors,	Tutorial, Mentors, Discussion boards, Wiki	Discussion board	Discussion board	Discussion Board, Feedback function of platform

Table 1. *MOOCs analysis using 10 Dimensions Model (Ichimura & Suzuki,2016).*

Conclusion

Our detailed analysis, using the 10 Dimensions Model (Ichimura & Suzuki, 2016) distinguished the design details of the courses, that have not appeared in the past researchers' MOOC-related taxonomies.

The analysis of learning activity levels, using the revised Bloom's taxonomy illustrated that MOOCs need more various levels of activities, to respond to the diverse needs of MOOC learners. In addition, strategical sequencing of the instructional elements and learning activities is suggested. Similarly, as a general guideline of MOOC design, Bonk, et al. (2018) suggest providing a variation of tasks, interactive learning, and personalizing learning experiences.

From the proposed findings, our next focus is to assess the effects and outcomes of design, suggested by the current study. It is our vision that elaborating the 10 Dimensions Model (Ichimura & Suzuki, 2016) into a design guide and tools substantiated by Instructional Design principles, for the quality of MOOCs.

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