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The Design and Implementation of Massive Open Online Course (MOOC) For Highway Engineering Course

Norhidayah Abdul Hassan[1], Che Ros Ismail[1], Noor Azean Atan[2]*, Mohd Nihra Haruzuan Mohd Said[2]

[1]Faculty of Civil Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia
[2]Faculty of Education, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia

ABSTRACT

Developments in information technology have implications for education in engineering disciplines. Massive Open Online Course (MOOC) is a means of providing education without incurring high costs. This article is on the design and implementation of UTM-MOOC Highway Engineering course. It hopes to provide useful information on flexible education in UTM that is in line with New Academia Learning Innovation (NALI) framework.

Keywords: MOOC, NALI, Open Learning, UTM-MOOC

INTRODUCTION

Massive Open Online Course (MOOC) was first developed in 2008 by the University of Manitoba for an online course known as Connectivism and Connective Knowledge (CCK08) (Sandeen, 2013). This course was led by George Siemens of Athabasca University and Stephen Downes of the National Research Council (Kocaleva, Petkovska, & Zdravev, 2014). 'Massive' denotes a large or an unlimited participation while 'Open Online Course' indicates online course which open access is via web (Sandeen, 2013). MOOCs integrate social networking and accessible online resources, facilitated by leading practitioners in the field of study. MOOC use a variety of materials such as readings, videos and problems, to provide user build learning community for students, teaching assistants and professors (Pappano, 2012). MOOC is an online programme with no fees and with

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E-mail addresses:
hnorhidayah@utm.my (Norhidayah Abdul Hassan),
cheros@utm.my (Che Ros Ismail),
azean@utm.my (Noor Azean Atan),
nihra@utm.my (Mohd Nihra Haruzuan Mohd Said)
* Corresponding author

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no special requirement besides having access to the internet (Kay, Reimann, Diebold & Kummerfeld, 2013). The programme is open to public and there are no predefined expectations or formal accreditations (McAuley, Stewart, Siemens & Cormier, 2010). MOOC normally takes a few weeks for its completion, with assignments, homework and final examinations given as a means of assessments. The assignments should be done through collaborative learning (Devgun, 2013) monitored by a discussion board (Pappano, 2012).

A Brief Overview of MOOCs

There are two kinds of MOOCs, namely, xMOOCs and cMOOCs (Kocaleva, Petkoyska & Zdravev, 2014) with clear distinctiveness in terms of embedded pedagogy. xMOOC is more toward Profit Corporation and centred on business model. The approach taken is more on traditional method where the teacher is the most relevant and dependable reference of knowledge and information. This type of MOOC privileges the knowledge transfer and duplication. Embedded pedagogical approaches highlight behaviourism (Guàrdia Maina, & Sangrà, 2013), which means that, xMOOCs is based on very old and outdated behaviourist education, depending primarily on information transmission (Bates, 2012). On the other hand, cMOOC promotes knowledge creation and generation, created earlier than the known counterparts and interprets connectivist principle to the design of the course. This type of MOOC normally focuses on beginners' personal learning environments and beginners' networks, while their basic education is social constructivism and connectivism (Guàrdia et al., 2013).

In 2012, MOOCs entered the mainstream with three major platforms known as Coursea, Udacity and edX shown in table 1, (Wang & Gao, 2014). edX is a non-profitable organization led by MIT professors who initiated partnership between MIT and Harvard and it is currently in alliance with a number of universities (Sandeen, 2013). Udacity and Coursea, are for-profit organizations founded in California and led by Stanford University professors. In 2013, Coursera had almost 3.7 million students enrolled, as it affords plenty instructional and assessment tools, course development support, format guidelines, marketing and customer and technical support (Sandeen, 2013). This organization uses a dispersive model and comrade with famous brand universities in the United States, and sixteen new institutions such as Columbia, Brown and Ohio State (Kolowich, 2012). Besides, Coursera normally provides upper department and professional curriculum (Attis, Koproske, & Miller, 2012). Until 2013, Coursera had offered courses in Artificial Intelligence Planning, Global History Since 1760, Fantasy and Science Friction, Introduction to Finance, English Common Law and Healthcare Innovation and Entrepreneurship (Gaebel, 2014). Udacity, tends to provide a large proportion of basic courses, notably in Mathematics and Science as it has diligent manufacture method. It has the most vertically integrated

course design, i.e. with a high degree of instructional design, integrated feedback and assessment tools (Sandeen, 2013). The third platform, edX, with its start-up with a non-profit concept, formed comrade with universities that afford knowledge, and in 2012, it acquired a new member, Wellesley that became a second liberal art college to jump on MOOC bandwagon (Gaebel, 2014). Besides, Peking University and Tsinghai University also announced the desire to join edX in 2013 (Guo, et al., 2014). Although edX provides fewer degree programs compared to Udacity, it contributes to course and assessment design based on students' interactions with the course and their outcomes (Sandeen, 2013).

Problem Statement

Learning through Massive Open Online Course (MOOC) is a complex process. To overcome this problem instructors should use more effective methods of learning to encourage students to think critically. In MOOC environment, compared to conventional classrooms, students tend to be more active where they will learn independently with the aid of technology while the instructors act as facilitators. The implementation of MOOC that meets the needs of students in Malaysia is just starting to evolve and more engagement with instructors is needed to support the formation of learning through MOOC Malaysia (https://www.openlearning.com/malaysiamoocs). This study aims to design and implement MOOC class for Highway Engineering course. This study has an impact on the national talent development through flexible education in Malaysia. It supports third shift: Lifelong Learning and ninth displacement: a global online learning for Malaysian Education Development Plan (PPPM25).

The Design of UTM-MOOC

Most MOOCs still use the lecture as the main medium (Pappano, 2012) of instruction in addition to assessments and social networking. Figure 1 shows the screen shot from "Introduction to Highway Engineering" (SKAA 2832), one of the MOOCs of UTM with navigation bars on the left.

Figure 1. Screen shot from SKAA 2832 with navigation bars on the left

Lecture Materials

Lecture materials are materials used in MOOCs to conduct lectures to the students taking the courses, comprising lecture notes or slides and lecture videos. The lecture notes or slides in MOOCs are the same as the ones used in conventional classroom lectures in the form of presentations prepared for each week for the lectures. They usually contain

an overview of the topics to be covered and are prepared with software such as Microsoft PowerPoint. Figure 2 below shows the screen shot of the lecture slides from the SKAA 2832.

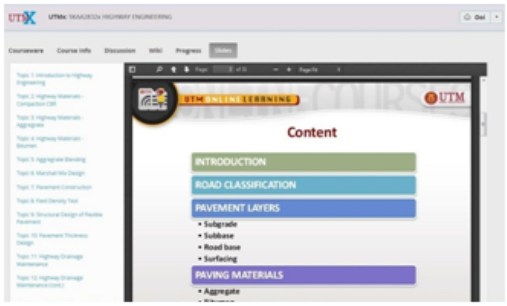

Figure 2. Screen shot of the Lecture Slides from SKAA 2832

Lecture Videos

Lecture videos refer to the set of videos or lecture sequences released each week. They are usually narrated by the lead instructor and are typically short, on average less than 10 minutes (Breslow, et al., 2013). This kind of approach is known as "flipped classroom" approach. Usually lecture notes or slides having similar content with the lecture videos will be available to students. To improve the effectiveness of lecture videos in MOOCs, some lecture videos will use quizzes or assessment problems to ensure that concepts are understood. Typical lecture videos are shown in Figure 3.

Assessments

The assessments used in MOOCs consist of course activities and examinations. They

Figure 3. Screen shot of the Lecture videos from SKAA 2832

are used to assess the progress of students undertaking the course and also to help them in the learning process. Course activities include assignments, quizzes, laboratory activities, tutorials and proposal topics for projects or papers. Most of the time, the course activities in MOOCs are designed in a way which will encourage the students to solve given problems using collaborative learning. For the SKAA 2832, its course activities consist of multiple choices, true or false, text input and also online activities. The online activities are activities where students are required to solve a set of questions and the time taken to finish them. . The screen shot of some course activities from the SKAA 2832 is shown in Figure 4.

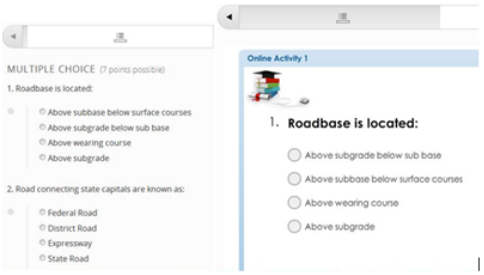

Figure 4. Screen shot of some Course Activities from SKAA 2832

Examinations are similar to course activities. The only difference between examinations and course activities would be that, course activities are for students to apply what they have learn while examinations are to assess the learning progress of the students. Basically, course activities are platforms for students to practice what they learn and examinations are where students show the knowledge they gain from the course and get evaluated.

METHODS

The purpose of this study was to design and implement a UTM course, known as Highway Engineering (SKAA 2832), through a MOOC platform. In addition, this study also aimed to obtain feedback from students, based on four research constructs: students' awareness, preferences, accessibility and readiness to use. A total of 69 of the respondents, comprising Malaysian undergraduates undertaking Highway Engineering (SKAA 2832) course with various backgrounds, participated in this study. The teaching and learning in the course consisted of blended face-to-face teaching lectures, together with online participation through the university's MOOC system. The course ran for 15 weeks, comprising 13 weeks of lectures, and one week each of the mid-semester break and the study week.

RESULTS AND DISCUSSION

Results showed that, 43% of the respondents were male students and 57% was female students with such previous education backgrounds as Foundation, Form Sixth, Matriculation College, Polytechnic Diploma and University Diploma. It was found that, those with the University Diploma formed the largest number of respondents (30 students), very closely followed by those from Matriculation College (29 students). Five of the respondents had Polytechnic Diplomas; four students were from Form Sixth and one from Foundation. The results of the study also revealed that, 61% of the respondents scored excellent CGPA from 3.50 to 4.00 while 33% of them earned CGPA of 3.00 to 3.49. Only a small percentage of the respondents (6%) earned CGPA of 2.99 and lower.

Students' Awareness of MOOC (SKAA 2832)

Results obtained showed that, 83% of the respondents were aware of the existence of MOOC (SKAA 2832). The means by which such knowledge was obtained are highlighted in Figure 7.

Student Preferences of MOOC (SKAA 2832)

This section described students' preferences for SKAA 2832, such as, content, teaching method, meeting frequency and login frequency. The content most preferred by the students was Power Point with video explanation (40 out of 69 students), followed by video recording of teaching content (34 students). A total of 30 students still preferred Power point presentation medium for MOOC (SKAA2832), while

two students wrote in other options, naming game as their preferred content.

The teaching methods referred to the amount of face-to-face and sessions preferred by students. There were 11 options for the respondents to answer the questions, however, only six options were chosen. Results of the study showed that, 80% of face-to-face and 20% of online participation was chosen by the respondent as the most preferred teaching method for MOOC (SKAA2832). There were 16 out of 69 students who preferred 100% face-to-face teaching method. The lowest option chosen by the students was 60% face-to-face and 40% as preferred teaching methods. It was also found that, the students preferred to meet their lecturers once a week, while some of them and chose once in a semester.

Students' Accessibility to MOOC (SKAA 2832)

This section focused on understanding accessibilities to MOOC (SKAA 2832). Table 1 highlights eight questions related to students' accessibility. The data was analysed based on 5 point Likert scale. The first question showed a mean value of 3.94 or equivalent to a high score mean value, indicating how easy student login was (http://mooc.utm.my/) as provided by UTM CICT and currently managed by UTM CTL. The second question was related to students' behaviour to understand how easy they took notes while watching a video on their digital devices. They responded positively and showed a high score mean value or 3.61, explaining that, the students were able to control video and web pages for personal interest. The third question in this section was to seek the students' views about learning via videos presented in MOOC (SKAA 2832). The result showed a mean value of 3.74 or equivalent to a high score of mean analysis, indicating that, the students were able to understand learning via videos presented in the web site. The fourth question also asked about videos and the students' ability to relate what they already learned from the videos to other information they found from other sources. The result still showed a high score of mean analysis of 3.77, indicating that, the students were able to relate information in videos to other sources such as online reading and books in the university library. The fifth question highlighted a multi task activity while accessing to MOOC (SKAA 2832). A mean score of 3.49 and equivalent to medium value of mean analysis was obtained. The result explained the limitation of multi task activity while accessing the web site. The students were able to watch videos and control web pages, but they could not download or directly save a video to offline mode, while simultaneously creating open discussion among other users. The sixth question highlighted the students' ability to complete a task without distractions. The mean score of 3.48 or equivalent to a medium level of mean analysis was obtained. Students in UTM have access to 5GB quota for learning, while at the same time they could also use their own quota for other purposes such as surfing for entertainment. The seventh and

eight questions showed a medium result of mean analysis. The results related to internet speed provided by the University, where the students could opt for either low-quality videos at a low internet usage or high-quality videos at a high internet usage.

Table 1
Student accessibility of MOOC (SKAA2832)

Items	Scale					Mean	Analysis
	1	2	3	4	5		
Login into SKAA2832 without any issue	3	5	14	18	29	3.94	High
Take note while watching a video on the computer	3	4	24	24	14	3.61	High
Understand course related information when it's presented in video formats	2	4	17	33	13	3.74	High
Relate the content of the video to the information that I have read online or in books	1	3	20	32	13	3.77	High
Multitask while access to MOOC	2	5	28	25	9	3.49	Medium
Complete my task without distractions	1	7	28	24	9	3.48	Medium
Download MOOC content	4	7	23	23	12	3.46	Medium
Watch MOOC video without buffering	3	15	25	15	11	3.23	Medium

Students' Readiness of MOOC (SKAA 2832)

Students' readiness included their participation in paid courses and attachment to other social network sites. The results of the study showed that, more than half or 81% of the respondents agreed, they were interested to participate in the study, due to learning content, learning activities and knowledge. Students' readiness for paid courses indicated an almost balanced distribution, with 54% in agreement and 46% in disagreement indicating they were not yet in a position to accept paid MOOC courses. 78% of the students agreed to use other social networking site such as Facebook and blogs together with MOOC while 22% were concerned with privacy issue pertaining to it.

CONCLUSION

In MOOC, learners were not only students, they were also producers of knowledge, learners in the realization and absorption, based on the coalition of knowledge, reformation and knowledge sharing, thus forming the dynamic development of open learning resources. Advancements in technology can help detect the difficulties faced by learners to further improve knowledge transfer and accreditation purposes.

Significance and Implication of the Study

The findings of this study exposes theoretical gaps in the current MOOC literature. The results and findings from the study may help educators, practitioners and researchers

to understand how to seamlessly integrate MOOC into Malaysian tertiary classrooms.

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