WHAT KINDS OF FORUM ACTIVITIES ARE IMPORTANT FOR PROMOTING LEARNING CONTINUANCE IN MOOCS?

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WHAT KINDS OF FORUM ACTIVITIES ARE IMPORTANT FOR PROMOTING LEARNING CONTINUANCE IN MOOCS?

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Abstract

MOOCs, being a new education paradigm, present both opportunities and challenges to educators and learners. On one hand, their massive and open nature allow learners from all over the world to take part in learning their favorite subjects in a flexible manner. On the other hand, the lack of face-to-face engagement also introduces a sense of isolation in students, resulting in a high dropout rate. To this end, online forums are deemed to help overcome the problem by enabling interactions among the learners and facilitating their collaborative learning. Recent research further suggests that with an online forum provided in a MOOC, the presence of instructors may not matter. However, in this study, with an examination of individual-level behavioral data and how much the learners persisted in assignment completion, we provide two important insights: First, online forum indeed plays an important role in motivating learner continuance, in that those who visited the forum completed more assignments. Second, among the different types of forum activities, including visiting, posting, interaction with peers, and interaction with instructors, we find that interaction with instructors emerge as an important factor contributing to more assignment completions in addition to forum posting. Thus, although the importance of online forums in MOOC is re-affirmed, our research cautions the view that the presence of instructors is trivial in MOOCs when online forums are provided. Implications for research and practice are discussed.

Keywords: MOOCs, online forums, instructor-student interaction, continuance, course completion.
1 INTRODUCTION

Massive Open Online Courses (MOOCs) have been experiencing a rapid growth in recent years (Jordan 2014; Konstan et al. 2015). Leveraging the Internet’s open and highly connective nature, MOOCs allow anyone who wants to learn to enrol in courses regardless of where they are and their current education level (Bederson et al. 2015). Educators from all over the world can design and develop materials on knowledge points they are best at and put them online, while learners are able to learn what they are most interested in and at paces of convenience to them. For this MOOCs have been regarded as a “budding revolution” to education and learning with large-scale and disruptive potentials (Christensen et al. 2013).

Yet, despite the massive enrolments in MOOCs, the dropout rates of these courses are astoundingly high as well. According to some estimates, the dropout rates of MOOCs may reach as high as 90% on average (Rayyan et al. 2013; Lewin 2013), with highest completion rate at only 19.2% (Dubosson & Emad 2015). An important reason to this is a lack of face-to-face engagement in MOOCs, which makes it likely for the students to experience isolation and feel being disconnected from others (Waugh & Searle 2014).

One way to combat such feelings of isolation and disconnection, as suggested in the literature, is through the use of an online forum (Comeaux & McKenna-Byington 2003; Dubosson & Emad 2015; Warren et al. 2014). Online forums allow learners to interact with each other thus affording a sense of social presence; not only this, they also facilitate mutual learning among the students, leading to what scholars termed as “collaborative learning” (Palloff & Pratt 2005; Williams et al. 2011). In collaborative learning, contents are co-constructed among the learners. It is even suggested that learning under this mode might be more effective in the absence of an instructor as it encourages students to learn and explore more independently and more bravely (Mitra & Arora 2010). A recent research by Tomkin and Charlevoix (2014) seems to support this notion. By separating students in a MOOC into two groups, one with instructor-student interaction in the forum and the other without, they find that the two groups did not differ significantly in terms of their overall completion rate (taken to be whether they achieved a threshold of 70% grade in quizzes, discussion portfolio in the forum, or final project). It is therefore concluded that “the active involvement of the professor did not matter in this MOOC.” (p.75) The finding has raised interest in the educator community, e.g., it was featured and discussed in education blogs called “Virtual Canuck”1 and “Art of E-learning”2.

However, can we make a conclusion yet? Given the importance of online forums, can their presence substitute for the involvement of instructors in MOOC? Answering these questions is important because it may shape how online forums are employed and how instructors perceive their role in MOOCs, being an emerging education and learning paradigm that is not yet well-understood. In this study, we closely examine a course offered on a major worldwide MOOC platform. As with most MOOCs, the course was open to learners from all over the world. The main learning means is through watching a series of carefully designed short videos, and students were evaluated based on their completion of the

1 http://terrya.edublogs.org/2014/03/13/does-teaching-presence-matter-in-a-mooc/
2 http://artofelearning.com/2014/03/17/scaling-higher-education-the-teacher-presence-conundrum/
corresponding assignments given. An online forum was provided in which students can interact with the instructors and their peers by asking questions and providing answers. Our dataset from the course consists of objective behavioral records of more than 20,000 students, including their interactions with the MOOC system while taking the course (e.g., watching the videos) and their activities associated with the forum (e.g., visiting the forum, posting, interaction with peers, interaction with instructors). We focus on investigating the effects of the participants’ forum activities while controlling for their other behaviors that occur during the MOOC. This is because previous research has highlighted the importance of online forums in online learning including MOOCs (Comeaux & McKenna-Byington 2003; Dubosson & Emad 2015; Warren et al. 2014), but the specific kinds of forum activities that matter are not well understood. For the dependent variable, we examine the number of assignments completed by the students taking the MOOC to capture their continuance in the course.

Our analyses show that students who visited the online forum completed significantly more assignments than those who did not. This provides support to the importance of online forums in MOOCs (Dubosson & Emad 2015; Warren et al. 2014). However, when the different forum activities, including visits to the forum, postings, interactions with peers, and interactions with instructors, were analyzed against the number of assignment completions, only forum posting and interactions with instructors demonstrate a significant effect. This suggests that compared to visiting the forum and interacting with peers, interacting with the instructors and posting in the forum make more difference in student continuance (indicated by how many assignments they completed). In particular, the results underscore the importance of instructor presence in promoting individual’s MOOC continuance even when an online forum is provided.

Our research may contribute to research and practice related to MOOC in non-trivial ways. In particular, leveraging on MOOC data that “opens the door to understanding student learning and interactions from a data-driven perspective in ways not previously possible” (Tomkin & Charlevoix 2014, p.71), our research underlies the importance of instructor engagement with students, apart from posting, in the forum to motivate their continuance. This is in contrast to previous research that insinuates a low importance of instructor presence in MOOCs (Tomkin & Charlevoix 2014). The difference in the results may be attributed to several factors. First, in contrast to Tomkin and Charlevoix (2014) that assessed MOOC outcome in terms of the overall ratio of students who met a cut-off requirement, we examined the number of assignments completed by the students in a progressive manner. Second, our research analyzed the data at an individual-level in contrast to an aggregated level. Third, we delineate between different forum activities in the analysis while also controlling for other student behaviors in the MOOC (e.g., video operations performed).

Our research puts a caution to making the conclusion too early that instructor presence does not matter in MOOCs (see the discussions in the education blogs “Virtual Canuck” and “Art of Learning”). This may depend on which outcome is examined, e.g., meeting a cut-off requirement vs. number of assignments completed, or also possibly the nature of courses (which future research may explore). From the student perspective, completing assignments is a process of applying and consolidating knowledge learnt, which is a primary goal of education. Thus, motivating students to complete as many assignments as possible is important by itself regardless of whether they met a required grade/level. To
achieve this goal, our research suggests a two-pronged approach – encourage students to come to the online forum to make posting and have instructors actively engaging the students in the forum.

In the next section, we present a review of the literature on MOOCs.

2 LITERATURE REVIEW

The concept of MOOC was first proposed by Canadian scholars Dave Cormier and Bryan Alexander in 2008, and its pertinence and popularity were recognized within just a few years with the New York Times declaring 2012 as the year of the MOOC (Bederson et al. 2015).

MOOCs possess both similarities and differences compared to their online learning predecessor. As with earlier online learning, MOOCs afford learners the freedom to decide what, where, and when to learn (Bouhnik & Marcu 2006). Although there have been sizeable studies conducted in the context of online learning, MOOCs present a revolutionary form of online learning with their own unique features. First, the scale of student enrolment creates a new and different human-computer interaction setting (Bederson et al., 2015), in which abundant data about learner behaviors is afforded for scientific research. The second characteristic of MOOC is the highly structured course experience. Learners participating in a MOOC start learning on a given day, watch videos on a weekly basis, complete homework assignments, and gain a real grade with real deadlines. The highly structured learning framework of MOOC may help alleviate students’ confusion and dissatisfaction with online learning to some extents (Bouhnik & Marcus 2006; Shroff et al. 2008). In previous online learning environments, learners often complain they find it difficult to take on the responsibility of directing their own learning (Piccoli et al. 2001). Under the structured framework of MOOCs, learners are able to learn relevant concepts structured around a subject matter in a progressive manner (mainly through watching well-designed short videos), and obtain evaluations about each knowledge point learnt (through completing corresponding assignments); this also provides an opportunity to conduct research on students’ learning outcome in an objective and more systematic manner.

Recognizing that many people take up MOOCs but drop out half-way, there have been budding research that attempts to investigate what factors could reduce drop-out and promote retention or course completion, though such research remains relatively sparse. Adamopoulos (2013) unveils a number of factors that influence MOOC completion, including student evaluation of the professor(s), difficulty and workload of the MOOC, and the use of online forum. Xing et al. (2015) design a temporal modeling approach that attempts to identify students who are at risk of dropping out of a course. Delving into the notion that online forum plays an important role in retaining students in a MOOC, Tomkin and Charlevoix (2014) examine whether instructor interaction with students in the forum influences the MOOC completion rate. They conclude that such instructor involvement does not matter. Our study examines this issue at an individual-level using students’ progressive completion of assignments to indicate their continuance in the MOOC. Our approach can be considered as more fully tapping on the opportunity afforded by MOOC to use students’ real behavioral data instead of perceptual measures for investigating their learning-related behavior and outcome.
3 DATA

We obtained our data from a MOOC about the subject “Big Data” on the MOOC platform of Coursera, a for-profit educational technology company founded by computer science professors Andrew Ng and Daphne Koller from Stanford University. Coursera is one of the three most famous MOOC platforms in the world. It works with universities to make some of their courses available online, and offers courses in various fields including physics, engineering, humanities, medicine, biology, social sciences, mathematics, business, computer science, and other subjects.

The course of focus on Coursera in this study included in it short video lectures, online assignments, and a discussion forum. After students registered for the course, they were able to start learning through watching video lectures, checking the course syllabus and announcements on the course’s wiki page, completing course assignments, and visiting and interacting with others in the forum. When watching the video lectures, students were able to perform operations such as pausing the videos, changing the play-speed, and jumping to a specific position in the videos. Students might visit the forum to read postings made by the instructors and their peers, post questions or opinions, and interact with others. There were in total ten assignments that students needed to submit for this MOOC. Thus, the data contains the objective behavioral records of students in the forum, clickstreams of their operations performed while watching the video lectures, and their assignment completions. Below we describe the core measures employed in this study.

3.1 Core variables

*Number of assignments completed* is used to reflect the extent to which a learner persisted in the MOOC (i.e., continuance). In our study, students attempted a total of ten assignments for completing the course. Each assignment is a test of how much they learnt from a subtopic and were able to apply the knowledge for problem solving. Learners were motivated to accomplish each task (i.e. an assignment) because only if they finished certain number (specifically, seven) of the assignments could they achieve the overall learning goal and receive a certification from the Coursera. The use of this measure is consistent with previous literature that adopted the quantity of homework completed to evaluate student engagement in online learning (Cheng et al. 2004; Robinson & Hullinger 2008; Glass et al. 2008).

*Forum visits, postings, interactions with peers, and interactions with instructors* capture the different activities that learners performed in the forum. *Forum visits* measure how many time a learner visited the course forum; *postings* measure the number of postings they made to the forum (e.g., asking a question, sharing a knowledge point); *interactions with peers* capture instances of learner participation in the forum that involved other students (e.g., two learners discussed about a knowledge point in a video); *interaction with instructors* capture instances of learner participation in the forum that involved the teaching staff including the professor and teaching assistants (e.g., student asked a question and obtained a response from the professor).

3.2 Control variables

We controlled for a number of variables that could affect the analyses:
Number of video lectures watched is measured as the number of distinct video lectures that a student has watched while taking the MOOC. A large number of video lectures watched may reflect a learner's seriousness to continue in the course, thus is important to control for.

Video operations measure the average number of operations performed by a learner while watching the course video lectures, including pausing the videos, changing the play-speed, and jumping to a specific position in the videos. The variable sums up all such operations that a learner performed, divided by the number of videos he/she watched.

Number of quiz visited, number of wikis visited and number of surveys visited are the number of times a student visiting the course specific pages (e.g. quiz page, wiki page and survey page) which are supporting functions for each course on the Coursera. When a student visited these pages frequently, it may mean that he/she is highly attentive and involved in the course (thus a higher continuance likelihood).

System instability is the sum of error events divided by the number of videos a student watched. Instances of error events are such as when the video player encountered an unexpected error and stopped working, or when there were network disconnections resulting in troubles in downloading the video data. Such system instability issues may have a negative effect on students’ intention to continue in the course, and is thus important to control for.

InSignatureTrack is a dummy variable which identify two different types of learners enrolled in the course (coded as 1 for signature track and 0 otherwise). Signature Track is a special option available in some Coursera courses. Learners can join Signature Track in the first three weeks by making some payments. Joining a course's Signature Track allows them to securely link their coursework to their identity so that they can receive a Verified Certificate issued by the Coursera and the participating university after they completed the course. In order to earn a certificate, students are likely to take the course more seriously and follow a set track in the learning process. Thus, a student who has joined the Signature Track are more likely to continue in the course.

4 ANALYSES AND RESULTS

Our analyses were conducted at the individual learner level. The dataset contains in total 27,343 individuals who registered for this course. Out of these individuals, 7,070 of them never made access to the course after registration, and hence they were not considered for the analyses. Also to ensure meaningful analyses, we selected those learners who finished at least one assignment as our analysis units because we assume that finishing at least one assignment to some degrees implies the learners’ intention to complete the course. Without attempting even one assignment, the individuals might not be serious about the course at all. Consequently, 1,109 learners and their behaviors were employed for our analyses. The average number of assignments accomplished by the sample was 5.809 (SD=3.874). For activities in the forum, these learners on average visited the forum for 25.857 times (SD=48.280), made 0.467 posts (SD=1.113), engaged in 0.460 interactions (SD=1.251) with peers and 0.501 interactions

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3 We did not separately examine these different video operations because they are highly correlated with each other.
Among the 1109 learners, 228 of them posted in the forum and 90 of them interacted with instructors. Table 1 below provides the descriptive statistics of and the correlations among the variables.

<table>
<thead>
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<th>Obs</th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<th>8</th>
<th>9</th>
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<td>0.205***</td>
<td>1.000</td>
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<td>0.153***</td>
<td>0.155***</td>
<td>1.000</td>
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<tr>
<td>Interactions with peers</td>
<td>1109</td>
<td>0.460</td>
<td>1.251</td>
<td>0.203***</td>
<td>0.670***</td>
<td>0.011</td>
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<tr>
<td>Interactions with instructors</td>
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<td>0.501</td>
<td>1.308</td>
<td>0.206***</td>
<td>0.673***</td>
<td>0.040</td>
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<td>0.043</td>
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<td>1.000</td>
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<td>0.105***</td>
<td>0.144***</td>
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<td>0.012</td>
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<td>0.176***</td>
<td>0.088**</td>
<td>0.185***</td>
<td>0.189***</td>
<td>0.006</td>
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<td>0.116***</td>
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<td>0.019</td>
<td>0.011</td>
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<td>0.237***</td>
<td>0.192***</td>
<td>0.068</td>
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<td>0.141***</td>
<td>0.010</td>
<td>0.075</td>
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</table>

Note: *p<.05, **p < .01, ***p < .001.

Table 1. Descriptive Statistics and Correlation Matrix of the Variables

From the correlation matrix in Table 1, we can find that forum visit is quite highly correlated with interactions with peers (0.670) and interactions with instructors (0.673). In addition, the correlation coefficient between interactions with peers and interactions with instructors is very high (0.987). The high correlations among the different forum activities make it inappropriate to conduct the OLS regression, which may provide biased analysis results. Rather, in order to identify which of the forum activities are important in influencing learners’ continuance in the MOOC (reflected in the number of assignments completed), we perform a stepwise regression.

Stepwise regression is widely applied in the ecological, evolutionary, and behavioral research (Mundry & Nunn 2009). In stepwise regression, the effect of potential explatory variables on the dependent variable can be tested sequentially which is referred to as ‘stepwise’. Variables are sequentially entered into and/or removed from the model. When variables are sequentially entered into the model ('forward selection'), the initial model comprises only a constant, and at each subsequent step the variable that
leads to the greatest (and significant) improvement in fit is added to the statistical model. In 'backward deletion', the initial model is the full model including all variables, and in each step a variable is excluded when its exclusion leads to the smallest (non-significant) decrease in model fit. The final model of these stepwise procedures is supposed to comprise that (sub-) set of the predictor variables that have an effect on the dependent variable and that best explains the response (Sokal & Rohlf 1995; Zar 1999; Tabachnick & Fidell 2001; Quinn & Keough 2002; Field 2005).

Stepwise regression thus fits our purpose of identifying which among the forum activities (i.e., visiting the forum, posting, interactions with peers, interactions with instructors) are most salient in influencing the dependent variable of interest (number of assignments completed), controlling for other variables (such as the number of videos watched and the video operations performed). Specifically, we employed the backward selection model to identity the significant predictor variables with selection criteria of $p \leq 0.05$ (Roger and Nunn 2009). The results (Table 2) show that posting ($b=0.275$) and interactions with instructors ($b=0.201$) are selected in the final model and their effects are significantly positive. This suggests that when the different forum activities, including visits to the forum, postings, interactions with peers, and interactions with instructors were analyzed against the number of assignments completed, only forum posting and interactions with instructors are significant.

| **DV: Number of assignments completed** |
|-------------------------------|-----------------|
| **Variable**                  | **Coefficient (sig. level)** |
| **Controls**                  |                               |
| InSignatureTrack              | 2.028***          |
| Number of videos visited      | 0.092***          |
| Number of quiz visited        | 0.335***          |
| Number of wikis visited       | 0.130**           |
| Number of surveys visited     | -2.057***         |
| System Instability            |                               |
| Video operations              |                               |
| **Independent Variables**     |                               |
| Forum visits                  | 0.275**           |
| Postings                      |                               |
| Interactions with peers       | 0.201*            |
| Interactions with instructors  | 0.3480            |
| $R^2$                         | 0.3434            |

*Note: *$p<.05$, **$p < .01$, ***$p < .001$.

Table 2. Stepwise Regression Results

5 DISCUSSION AND CONCLUSION

Afforded with detailed individual-level behavioral data by MOOC, this study attempts to clarify whether and what types of forum activities in MOOC can promote students’ continuance in terms of completing
more assignments. The focus on this dependent variable has pedagogical significance since it is important to ensure students learn more in MOOCs, given which their open and flexible nature also means that students can give up learning anytime during the process. Specifically, we also hope to further assess the role of instructor interactions with students in the forum in promoting this pedagogical outcome, while considering for other forum activities including the acts of visiting forum, posting in the forum, and interactions with peers. Our results show that instructor interactions with students in the forum matter in promoting student to persist and learn more in the MOOC. Indeed when we consider it together with student interactions with their peers, the stepwise regression analysis shows that the former but not the latter is significant. Thus, our study cautions the view that with the provision of an online forum in MOOCs that facilitates interactions among the students, instructor engagement is not important (Tomkin & Charlevoix 2014) and could even be undesirable (e.g., inhibiting students’ explorative learning, Mitra & Arora 2010). Future research may want to further assess the specific nature and types of instructor engagement that matter/do not matter under specific conditions by considering different kinds of pedagogical outcomes.

There are several limitations in this study that need to be recognized. First, our study investigates a single MOOC, which may limit the generalizability of our findings. Future research with access to multiple MOOCs may assess if our results are applicable to different courses varied by their nature. For instance, the MOOC we investigated (“Big Data”) is a technical course that presents potentially high challenges to the students, which may make instructor interactions with the students particularly salient. Second, while the behavioral data affords objective investigations of student behaviors and their learning outcomes, the psychological mechanisms behind the findings obtained are unclear. Future research may employ methods such as survey and interview to deepen our understanding on this matter. Notwithstanding these limitations, our study serves to provide a better understanding of the importance and the specific types of forum activities that matter in MOOCs.

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