
Incorporating Collaborative Learning Into xMOOCs: A Proposal of Future Research Directions

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Abstract

Facilitating collaborative learning in Massive Online Open Course (MOOC) has been a key research interest in recent years. Studies so far have shown promising signs of improving learners' retention and engagement in MOOCs by incorporating collaborative learning and social interaction onto the platform. While a few works have found improvements in certain aspects of learning with existing collaborative features in MOOCs, further investigation is needed on how they should be designed and incorporated. In this paper, we provide a brief literature review of peer learning on MOOCs, propose research gaps in this area, suggest future directions on this topic based on previous literature and reports, and conclude by outlining our focuses and plans in this research area.

Author Keywords

Collaborative learning, MOOCs, design considerations

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H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

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Introduction

In traditional classrooms, learning usually takes place either between the student and the instructor or among students themselves. The latter, usually known as collaborative or peer learning, is an important and fundamental aspect of the human learning process advocated by many psychologists such as Piaget and Vygotsky [15]. Since the advent of computer-supported collaborative learning (CSCL), computers have been touted as an ideal technology to support peer learning in the knowledge building discourse due to the affordances of these learning environments [16].

The idea of Massive Open Online Course (MOOC) as we know now is originated from the open learning movement in the late 1990s. There are two main types of MOOC: connectivist MOOC (cMOOC) and extended MOOC (xMOOC). cMOOCs emphasize the collaborative learning, discussion, and knowledge creation process in majority of the learning activities, while xMOOCs adopt a more traditional instructivist approach, offering lectures, quizzes, and assignments as the main learning activities. Up until today, xMOOCs have attracted millions of learners to participate and many researchers to develop innovative learning and teaching strategies.

While xMOOCs have been successful in attracting a large number of learners, they experienced a number of challenges such as low learners' retention and engagement throughout the course [10]. Besides, xMOOCs have also been relatively less effective in leveraging massive numbers of learners at scale. Even though a lot of works have been done in this area, very few offer conclusive suggestions to resolve these issues in the MOOC platform [10,13,14].

One such work from this year's CSCW (2015) studied the learners' motivation, behaviors, and perception in MOOCs. It suggested that the incorporation of social interaction and peer learning could improve learners' retention and engagement [17]. Indeed, previous literature in developmental psychology and CSCL has shown improvements in engagement when peer learning and social interaction were introduced in the learning process [2,9,11,15].

Despite these promising signs, a recent report suggests that existing discussion forums in MOOCs might be a barrier to the overall learners' engagement in the course [7]. At the same time, results from recent research have suggested that existing collaborative features have been inadequate in supporting effective peer learning in the MOOC context [3,4,17]. In spite of its potential, it remains unclear how collaborative activities can be incorporated effectively in the MOOC context.

We see the design and incorporation of collaborative learning into an instructivist-based online learning environment at scale (xMOOCs) as an interesting and unsolved research problem in this area. In the following sections of this paper, we will first briefly review existing work on collaborative learning in MOOCs before identifying research gaps in this area. We then propose potential directions for research and outline our plans and focuses for our future work.

Existing Work on Peer Learning in MOOCs

In this section we review existing work on peer learning in MOOCs according to the features they engender, starting from discussion forums, social networks, and synchronous discussions. Based on our knowledge, this

paper is the first to review related works on different collaborative features at the same time.

Discussion Forums

A number of works have been done in studying the use of existing features and specific learners' subpopulations in MOOCs forums. Coetzee et al. studied the use of reputation system in MOOC forums by conducting a study with 1101 participants on edX, with almost half of them in the fully-featured forum with reputation system and another half in forum without [4]. The reputation system was implemented in the form of giving points and badges to the useful posts. Dependent variables such as retention, final grade, participation, and sense of community were measured. By the end of the study, they found that the use of forums is correlated with higher grades and retention, and reputation system improves the response times and the number of responses per post, showing that giving rewards improve learners' motivation in forum participation. However, it has no significant effect on grades, retention, and subjective sense of community.

Another study by Huang et al. investigated the behaviors and engagement patterns of superposters in MOOC and how their presence affects the behavior of other learners in the forums [8]. Forum data from 44 different Coursera courses were gathered and analyzed to determine measures such as the length and quality of posts, response time, final grades, number of upvotes, and the overall activity of the forums. Unsurprisingly, superposters display above average engagement in MOOCs, enroll in more courses, and have better grades. While response time and the number of upvotes were not the best, superposters in

general possess better performance on the two metrics than average posters. Their contributions were also rated more useful and did not affect the overall activity and forum health.

A recent qualitative study that investigated students' general motivation, behavior, and perception in MOOCs has uncovered several downsides of forums [17]. From the interviews, the authors found that the obscurity of the forum interface contributes to its overall lack of use. The researchers also found that forums were ineffective in interactive communication, and most forum posts were either unanswered or not addressed in a timely manner. In another report analyzing the use of discussion forums in several MOOCs, the authors proposed that the use of forums might be a barrier to the overall learners' engagement in the course [7].

Social Networks

Besides forums, some MOOCs also use external social networks such as Facebook, Twitter, and MentorMob to facilitate peer interaction. Alario-Hoyes et al. studied the impact of external and internal (such as forums) social tools use in MOOCs [1]. They found that most participants preferred forums more than external tools possibly due to the exposure of personal information in external tools, and concluded that all tools serve slightly different purposes in learning.

Synchronous Discussions

The use of a real time IRC-based chat room in a MOOC on the edX platform has been studied [3]. Supported by teaching assistants, the chat room interface was implemented in two levels of pervasiveness, first as a chat tab in a dedicated chat page, and second as an embedded chat interface in every page of the course.

They found low chat activity in all the chat rooms and no significant effect on the learners' grades, retention, forum participation, and the subjective sense of community. However, the embedded interface was found to be more effective in encouraging learners' participation.

In one study on small group synchronous discussions with crowdworkers, better outcomes were found when challenging questions were discussed in a group instead of individually, and giving incentives were more useful in general [5]. In another study, more geographical diversity in small group discussions on MOOCs was found to lead to better outcomes in quizzes [12], consistent with previous findings on diversity in higher education [6].

Research Gaps

Although there have been quite a number of studies on the use of different collaborative features in MOOCs, further investigation is needed in considering how to design and incorporate peer learning effectively in the MOOC context. So far, most collaborative features studied in previous work were implemented with user interfaces and features designed in their original context (e.g., chat rooms in IRC and reputation features in normal forums). This probably explains the mixed findings from most of these work, even though some learning benefits were observed.

Furthermore, while some of these studies have identified design implications for the respective collaborative features, it remains unclear if these implications are generally applicable to other features or other peer activities. Moreover, since most of these studies were conducted either with a subset of learners

in the course or with crowdworkers, it is unclear if the findings can be applied directly onto an actual MOOCs as well as to learners with different motivations.

Besides, there is also a lack of research on learners' user experience, behaviors, and attitudes towards collaborative learning in MOOCs. Gaining such understanding could reveal the unique challenges and important factors in designing collaborative learning for the MOOC context. Insights from such understanding would be useful in deriving design implications for incorporating collaborative features in MOOCs.

Future Directions

Summarizing the findings from existing research and reports, we believe the primary issue with collaborative learning at the moment is not with its effectiveness in promoting learning in MOOCs but with how these activities and features should be designed and incorporated in the MOOC context.

To resolve this gap, we propose that MOOC researchers first understand learners' general behaviors, motivation, and attitudes on collaborative learning in MOOCs. Similar to Zheng et al.'s work, a qualitative understanding on this topic would not only give us novel insights on learners' behaviors towards collaborative learning, but also complement the quantitative findings from existing work thus far [17].

At the same time, researchers should also conduct qualitative inquiry with MOOC learners on their user experience of existing collaborative features such as discussions forums. Besides from deriving design implications, such studies could also explain why existing forums have failed to engage learners [7].

In order to derive design implications for collaborative features in MOOCs, it is beneficial to determine the contextual factors that are pivotal to the incorporation of collaborative learning in MOOCs. Here, we describe the factors that are considered important in designing peer learning for higher institutions. During the workshop, we hope to initiate a discussion with the attendees to determine how each factor informs the design and incorporation of collaborative features in MOOCs.

According to the book *Peer Learning in Higher Education* by Boud et al., there are three factors that are particularly important to the design of peer learning in higher institutions [2]. We outlined the three factors below.

Context of the Peer Learning Activities

In broad terms, the context of the peer learning activities primarily refers to the physical and organizational aspects of the course as well as the learners' assumptions and expectations towards them. One aspect worth investigating in this context is the degree of competitiveness and individuality of a MOOC. Besides, researchers should also consider the pedagogical values, beliefs, and philosophy behind the courses. For example, does MOOCs allow learners to determine their own learning values in the course? In a physical classroom, more freedom in determining learning values usually caters to the strength of most peer learning strategies.

Learning Goals and Expected Outcomes

Learning goals and expected outcomes of each course can also influence the design of the peer learning activities. For example, in a marketing course that involves brainstorming and ideas pitching, it is more

useful to implement group discussion rather than one-on-one activities. Along those lines, it is also important to ensure that the expected outcomes from the peer activities are given adequate importance to how the courses are graded. On top of that, we need to understand the compatibility between the learning strategies and assessments when designing collaborative learning in MOOCs. Here, it is interesting to investigate how assessments should be designed to take learners' learning strategies into account in MOOCs in a learning environment that employs collaborative learning.

Resource Implications

Lastly, we should also consider the implications of the available resources from both the course and the learners. This includes the preparation time for the peer activities (staff), available time to participate in peer activities (students), staff development, materials, equipment, and others.

Conclusion

At the moment, our team is focusing on three research goals based on the future directions we laid out. First, we aim to elucidate other contextual factors not mentioned by Boud et al. [2] that are specifically important to collaborative learning in the MOOC context. To achieve this goal, we have conducted an exploratory study to understand learners' general perception towards learning with classmates in MOOCs.

Second, we intend to investigate the characteristics and nature of those factors in the MOOC context. Investigation will be carried out via a combination of survey methodology and literature review on existing MOOC reports and qualitative study.

After recognizing the nature of those factors, we will proceed to understand learners' behaviors and attitudes towards those factors in different collaborative learning environments. We expect to acquire insights that will not only allow researchers to derive design implications for building collaborative features in MOOCs, but also to apprehend learners' hidden expectations and assumptions during the learning process.

In conclusion, through reviewing peer learning literature in MOOCs, we learned that further investigation is needed to design and incorporate effective collaborative learning in MOOCs. We proposed future directions in this area as well as describing factors important to the design of peer learning in higher institutions. In this workshop, we hope to discuss how those factors evolve in a MOOC context and inform the design of collaborative learning in this platform.

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