Are Learners Satisfied with their MOOC Experiences? Assessing and Improving Online Learners' Interactions

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With the prevalence of the COVID-19 pandemic, most students study remotely online, which can unleash the benefits of massive open online course (MOOC) platforms. MOOC platforms offer various advantages over traditional education, such as no geographic constraints, no time restrictions, easy accessibility, and lower costs in several ways to access the material. Still, it is inevitable that there still remain significant challenges that hamper the development and popularity of MOOCs. Interactions and collaborated learning remain as vital weaknesses. In this paper, we are interested in improving MOOC interactions by investigating learners' experience with current popular MOOC platforms with a survey. We conduct a task analysis on three popular MOOC platforms, Coursera, LinkedIn Learning, and Canvas, to analyze whether and how they include key interaction functions. We found that learner-instructor and teamwork interaction affect users' experience most. Based on our findings, we propose a set of comprehensive guidelines, called IN-MOOC, to facilitate interpersonal interactions on MOOC platforms. In summary, IN-MOOC provides comprehensive and hierarchical guidelines to improve users' experience via enhancing interpersonal interaction on MOOC platforms.

CCS Concepts: • **Human-centered computing** → Human computer interaction (HCI); Interaction design.

Additional Key Words and Phrases: MOOC, interaction improvement, guidelines

1 INTRODUCTION

The COVID-19 pandemic has resulted in a physical shutdown of many schools and universities worldwide. Consequently, the teaching- learning process has been forced to evolve hastily from traditional classroom setting to a mixture of traditional plus online learning mode, including the use of Massive Open Online Courses (MOOCs). MOOCs are online course platforms supporting a large number of participants with open access via the web [11]. Although MOOC platforms have existed for a long time, they have rarely been used as the primary form of secondary or tertiary education [10]. In this perspective, improving the interactions and usability of online learning platforms is of crucial importance.

Nevertheless, in spite of the various advantages of MOOC platforms, it is inevitable that there still remain obvious challenges that hamper their development, popularity, and completion rates [18]. Particularly, we summarize the weaknesses on current MOOC platforms into three aspects: (a) the interactions between learners and instructors cannot be guaranteed frequently and satisfactorily by MOOC platforms due to technical inconvenience as well as unreasonable system design [22, 23]; (b) there are insufficient techniques and support for teamwork and group interactions, as a result, learners often find difficulties in group study and team learning [12]; (c) MOOC platforms suffer from high

dropout rates and high barriers to persistence [10], which might be derived from great challenges on collaborative learning support.

As many studies emphasize the importance of *interactivity* and *collaboration* elements on MOOC platforms [8], this work takes a further step on evaluating and improving learners' satisfaction of MOOC platform interaction and collaboration. Particularly, we conducted a survey and a task analysis study, from which we observed that the interpersonal interactions are important from a learner's perspective but are less satisfying. Therefore, we mainly investigated two research questions: (1) **RQ1**: *How can we improve the learner-instructor interactions in MOOCs ?* (2) **RQ2**: *How can we improve teamwork interactions in MOOCs?*

Built on the survey results and task analysis on three MOOC platforms, our findings suggest that the current MOOC platforms cannot replace the physical learning environment in terms of better interactions, but they perhaps can be improved. There is an urgent need not only to evaluate the usability of current online learning websites, but also to provide comprehensive guidelines to facilitate users' interactions in MOOCs. To this end, we propose general guidelines on the basis of two aspects: (a) learner-instructor interactions; and (b) teamwork interactions. **This work aims to propose a set of comprehensive guidelines to enhance interpersonal interactions on MOOC platforms.**

2   RELATED WORK

Interaction is of crucial importance on MOOC platforms. Gibson [9] suggested that student satisfaction is determined by the attention students receive from the instructors and from how the platforms to meet their needs. In addition, Foley [6] proposed 12 *golden rules* for the use of technology in education, in which the 7th and 11th note that interaction and teamwork are essential to support MOOC platforms. Marks et al. [15] identified the student-content interaction as one of the most important factors in learning online. Furthermore, interpersonal interactions (i.e., instructor-student and student-student interactions) have been identified as significant influences on students' perceptions of online courses [5]. For instance, Conole [4] provided a framework, which contains communication and collaboration factors to support instructors to make pedagogically informed design decisions. Similarly, [7] identified 10 dimensions which affect MOOC satisfaction, including interactivity, collaboration, content, learner support technology, etc. As a summary, [8] studied six different MOOC platforms with respect to four types of MOOC interaction and collaboration, including learner to learner, learner to instructor, learner to platform and learner to content. Following this approach, we conduct the review from three aspects, namely user and system interaction, learner and instructor interaction and teamwork interaction, respectively.

User and system interaction in MOOC [16]. Kim et al. [12] conducted research on exploring graduate students' perceptions and preferences for online credit courses. As a result, they recommended that online course providers engage in more course interactions and assist students in attaining learning objectives and establishing peer relationships. Additionally, Backs et al. [2] qualitatively examined online learners' self-efficacy with respect to instructional strategies and course supports. They reported that available instructional strategies of course support can promote self-efficacy. These course support activities involve assistance using the library, counseling services, and technical assistance with a Learning Management System (LMS) [2].

Learner and instructor interaction in MOOC [14]. Recent research has attempted to approach the problem from the instructor's perspective [26], using an interview study of 14 MOOC instructors in which grounded theory was used to uncover the complex processes, motivations, and challenges associated with teaching an online course. In addition, Lin et al. [14] conducted semi-structure interviews with six instructors. Both of these studies reveal that when instructors implemented MOOCs, a pattern of action emerged, involving six phases—prepare, design, develop, launch,

deliver, and evaluate. Also, Shin [21] argued that although online instructional videos are ubiquitous, it is not easy to gauge learners' experience and level of understanding from the instructors' perspective.

Teamwork interaction in MOOC [17]. An increasing number of researchers have started to examine social interaction and group work for learners in MOOCs [3, 13, 17, 24, 27]. Seaton [20] developed an incentive-based system to encourage social interactions between students, namely NECSUS, which was incorporated into an existing short independent study course. Zheng [24] revealed that higher engagement and retention are demonstrated among students in social media than MOOC forums. In addition, Koutsakas [13] investigated the role of a Facebook group, which acted as a complementary communication and collaboration platform to the Udemy Q&A forum [13]. The study showed that a Facebook page had the potential to play an essential role in supporting the collaborative learning communities for the next generation of MOOCs.

Summary. Because interaction is important on MOOC platforms [5], we categorize the existing literature relevant to MOOC interactions into three lines, including user-system interaction, learner-instructor interaction, and teamwork interaction. As the MOOCs get increasingly popular recently, however, we find *there is a lack of study about if prevalent MOOCs can satisfy users' interaction demand in online learning*. Therefore, our work aims to investigate what affects users' online learning experience, how to enhance users' interactions in MOOCs, and illustrate our findings and discussions.

3   USER STUDY OF MOOC PLATFORMS

We conducted survey to understand MOOC users' experience on MOOC platforms, under approved PSU IRB protocol "STUDY00016845". The survey was comprised of four multi-choice questions about users' satisfaction of interactions on MOOC platforms. We expected to learn how users are satisfied with their overall experience on MOOC platforms and what the key factors. According to the related work, we were interested in the learner-instructor interaction and teamwork interaction. In the first two questions of the survey, we expected to get an overall review of users' general feedback about MOOC platforms. Specifically, those questions were to understand which aspects users are most satisfied with and unsatisfied with. Each participant was allowed to choose at most four choices for each question, which would help us understand the users' feedback comprehensively. The third and fourth questions focus on the most important factors that affect how users interact with instructors and how team members interact with each other. The results can help us understand the interaction limitation on existing platforms and guide our study accordingly.

3.1   Survey Results

3.1.1   Population and Overall Survey Results. Because the MOOC platforms serve a range of users and we targeted at a general understanding to help users get a better interaction experience, we did not collect information such as gender, age, ethnicity, location, education or marital status. We collected 52 valid responses of our survey. The results of the most satisfying and unsatisfying module about MOOC platforms are show in Figure 1 and 2 respectively.

3.1.2   Learner and Instructor Interaction Survey Results. This question is a multiple-choice question. Participants were allowed to choose appropriate answers without number limitation. The results are shown in Figure 3. The top two modules that participants most care about are "Timely Response" and "Individual Feedback".

3.1.3   Teamwork Interaction Survey Results. The results of module importance in teamwork interaction are shown in

Figure 4. This is a multiple-choice question. Participants are allowed to choose appropriate answers without number
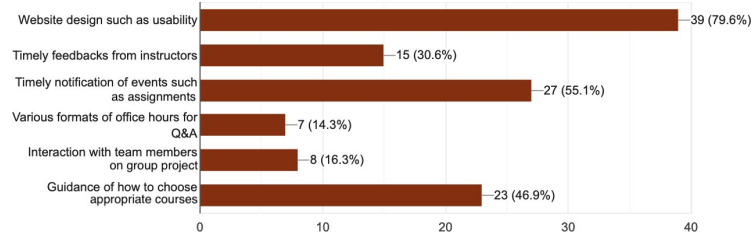
Fig. 1. Results of survey question 1: "Overall, which are you satisfied with the interaction in MOOC? Up to 4".
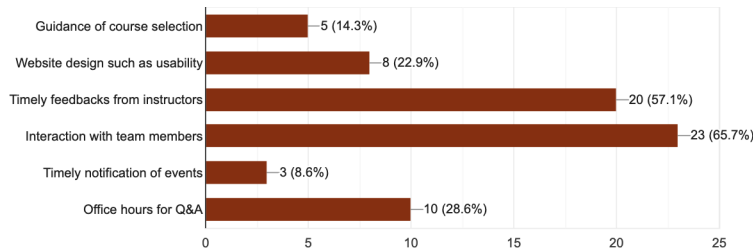
Fig. 2. Results of survey question 2: "Overall, which are you unsatisfied with the interaction in MOOC? Up to 4".
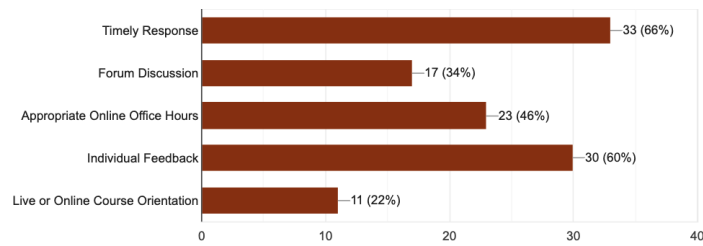
Fig. 3. Results of survey question 3: "Which factors are most important when you interact with instructors in MOOC?".

limitation. The modules that participants care about are "Comments, Notebook, and Idea Sharing", "Timely Group Communication", "Teamwork Management Module", and "Visualization of Teamwork Update" in a descending order.

Fig. 4. Results of survey question 4: "Which factors are most important when you interact with team members? (Multiple Choice)".

3.2 Analysis

3.2.1 Population Analysis. The surveys were mostly sent via the authors' social networking links. As three authors are graduate students, the participants were mostly limited to the a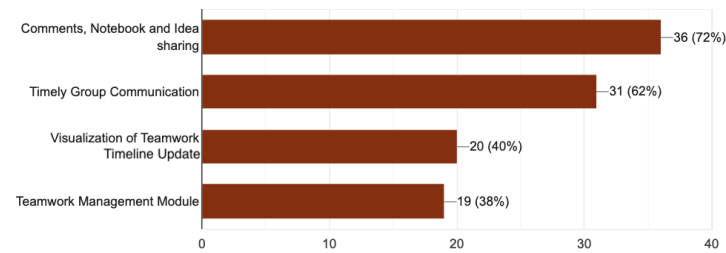uthors' network, and thus. while we did not take demographic data, most of them are probably students. Indeed, most users on MOOC platforms are students [12]. Though there likely a bias of participants, the results still could reflect convincing results.

3.2.2 Overall Evaluation Analysis. From the survey results of Question 1 and 2 shown in Figure 1 and 2 respectively, users are more satisfied with the service and features embedded in the MOOC platforms, e.g., website usability, course selection guidance, and notification of events, which belong to the user-system interaction part. As for the interactions between people, e.g., the learner-instructor interaction and the teamwork interactions, the satisfactory percentage is low and the unsatisfactory percentage is high. Especially, only 16.3% of participants are satisfied with the team member interaction and 65.7% of participants are unsatisfied with that. The timely feedback and office hours for Q&A from instructors also greatly affect learners' satisfactory.

3.2.3 Learner-Instructor Interaction Analysis. More than half of the participants (66%) think a timely response is the most important when they interact with instructors on MOOC platforms. Individual feedback is the second most important, which 60% of participants prefer/note. To some degree, the common point between individual feedback and timely response is the communication between people. Online learners expect a closed information loop including evaluation and response.

3.2.4 Team Member Interaction Analysis. Compared with the survey results about the interaction between learners and learners, we find the proportion for each aspect is from 38% to 72%. That indicates than participants have higher needs when they interact with team members. If we consider "Comments, Notebook and Idea sharing" and "Timely Group Communication" as one group, we find that the information exchange via communication in teams is extremely important on MOOC platforms. This also indicates one of the possible reasons why most participants are unsatisfied with the interaction among team mates.

3.3 User Study Conclusion

The survey was used as our main method to collect data about how participants think of current MOOC platforms. According to the results, there are two highlighted findings: (a) what participants are most satisfied with is user-system interaction; (b) interpersonal interaction, including learner-instructor interaction and team member interaction, affect people's experience on MOOC platforms and there is still a huge room to improve. Based on what we find, we examine three popular MOOC platforms to see how the key factors behaved in the next section.

4 TASK ANALYSIS OF SELECTED MOOC PLATFORMS

4.1 Description of Selected MOOC Platforms

4.1.1 Canvas. Canvas[1] is a popular online learning system for many educational institutes. From the learner's perspective, Canvas has features such as providing reading materials, submitting assignments, checking feedback, and contacting instructors. However, it has very limited customized modules for individual learners. For the learner-instructor inter-action, Canvas is more mature compared with Coursera and LinkedIn Learning. It provides related modules such as

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[1] https://www.instructure.com/canvas

announcements and discussions. For teamwork interactions, Canvas has several related features. Specifically, Canvas provides "Conferences", "Collaborations", and "Chat" for students in the same course. "Conferences" provides a platform for students to have a video chat, share slides, and create polls. Figure 5(a) shows a screenshot of the "Conferences" function. "Collaboration" provides a platform for students to work on a file via online Office tool. "Chat" only works when users are logged in the Canvas system in the same course. Chat messages are restricted to group chats, messages are sent to all the students in the same course. There is also a module called "Groups". When users are assigned into groups, all the assigned groups will be shown in this module.
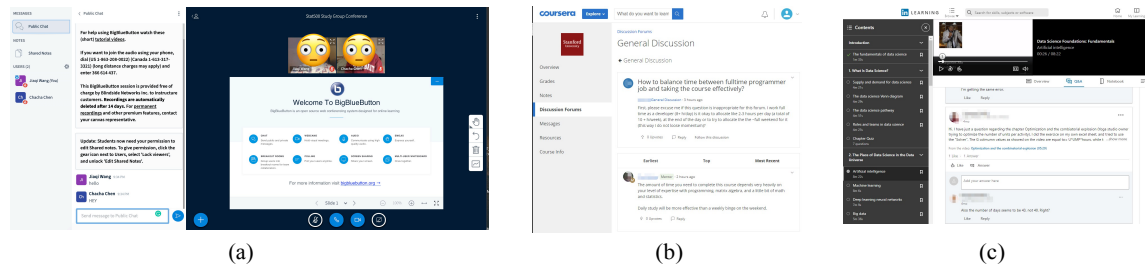

(a)   (b)   (c)

Fig. 5. (a) Canvas: Video Chat, note sharing, polling, and slide sharing via "Conferences"; (b) Coursera: Discussion between learners and instructors in discussion forums; (c) LinkedIn Learning: Discussion between users in Q&A.

4.1.2   Coursera. Coursera [2] is a commercial online course platform. Its website usability is designed to be more user-oriented. For learner-instructor interaction, Coursera is heavily dependent on the discussion forums shown in Figure 5 (b). Coursera does not provide modules for users to interact with each other to protect privacy potentially besides discussion forums. The connection between users is rather weak, and there is no way to try to set up a stronger connection between classmates within the system. Similar to Canvas, Coursera does not support idea sharing, visualization of teamwork update, and timely group communication.

4.1.3   LinkedIn Learning. Compared with the other two MOOC platforms, LinkedIn Learning [3] does not support many educational activities. For user-system interaction, courses on LinkedIn Learning are usually short, which are friendly to users and provide more flexibility. In learner-instructor interaction and teamwork interaction, LinkedIn Learning does not provide enough modules for users and instructors. The interaction between people on LinkedIn Learning is also heavily dependent on a "Q&A" module similar to "Forum Discussions" shown in Figure 5 (c).

4.1.4   Comparison Conclusion. Based on the study results, we can find that user-system interaction part of the three platforms all works and satisfies users' needs to some extent. However, the **learner-instructor interaction and teamwork interaction need to be improved**. They lack efficient modules for learners to talk with or get feedback from instructors. What is worse, effective teamwork is extremely hard to perform on MOOC platforms. To solve the observed problems, we propose to provide solutions as demonstrated in the following section.

4.2   Task Analysis Results

We chose three popular MOOC platforms as our task analysis objective: Canvas, Coursera, and LinkedIn Learning. Based on the discussion as above, we select several modules to test the three selected MOOC platforms. The evaluation standards are based on [8] and our notations are shown in Table 1.

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[2] https://www.coursera.org/
[3] https://www.linkedin.com/learning/

Table 1. Evaluation Standard and Notations

Notation	●	◖	○
Definition	Included	Included, but not good	Not Included
Rank	A	B	C

According to the evaluation standards, three authors of this work examined Canvas, Coursera, and LinkedIn Learning and one checked their work. They all had experience using the three platforms. To preserve independence, they examined each platform alone and used the evaluation codes as noted in Table 2. Table 2 shows the final evaluation results that were based on the majority votes.

Table 2. Task Analysis Comparison of 3 Popular MOOC Platforms [needs a key] is filled in good or true or what?

	Modules	Canvas	Coursera	LinkedIn Learning
User-System Interaction	Adequate Course Content Modules	●	●	●
	Timely Learning Assessment	●	●	◖
	Customized Learning Process	○	●	●
	Customer Service for Students	○	●	○
	Course Recommendation	○	●	◖
Learner-Instructor Interaction	Timely Response	◖	◖	◖
	Forum Discussion	◖	◖	◖
	Online Office Hours	◖	○	○
	Individual Feedback	◖	○	○
Teamwork Interaction	Comments, Notebook sharing	◖	○	○
	Visualization of Teamwork	●	○	○
	Timely Group Communication	◖	○	○
	Teamwork Management	○	○	○

Overall, Coursera and Canvas are better than LinkedIn Learning according to our criteria and findings. In terms of user-system interaction, Coursera appears to be the best among the three. Coursera covers all proposed modules. For learner-instructor interaction, Canvas has more support than the other two. For team-work interaction, Canvas has some related modules while both Coursera and LinkedIn Learning provide no support. Our findings indicate all of the investigated platforms can be improved in terms of learner-instructor interaction and teamwork interaction. Hence, on top of the task analysis results, we further conduct detailed case studies to investigate each MOOC platform respectively as illustrated in the following section.

5 IMPLICATIONS AND GUIDELINES

Based on the statistic results of user study, we observed that interpersonal interactions in MOOC platforms need to be improved. More specifically, the learners' top two satisfactory modules are from User-System Interaction as "website design such as usability" (79.6%) and "timely notification of events such as assignments" (55.1%) shown in Figure 3. In contrast, they are most unsatisfied with the modules of "interaction with team members" (65.7%) and "timely feedbacks from instructors" (57.1%) show in Figure 4, which belongs to Learner-Instructor and Teamwork Interaction. This observation can be further validated in the task analysis studies in Section 4. For instance, Coursera and LinkedIn Learning do not contain 6 out of 8 the modules in Learner-Instructor Interaction and Teamwork Interaction. As a result, we aim to further investigate (i) How can we improve the learner-instructor interactions in MOOCs? and (ii) How can we improve the teamwork interactions in MOOCs? respectively.

To address these two problems, we first ranked the survey results and collected the learners' perspective of the top important factors when interacting with instructors and team members. Based on these findings, we proposed possible methods to improve the interpersonal interaction in MOOC platform by referring existing literature and brainstorm with MOOC learners. The methods are summarized in Figure 6. Next, we describe each of the methods in detail.

Fig. 6. Methods to improve interpersonal interactions in MOOC platforms.

5.1 Learner - Instructor Interaction

We investigate the problems and potential methods in learner-instructor interaction into two categories: learner-instructor synchronous interactions and learner-instructor asynchronous interactions.

5.1.1 Learner-Instructor Synchronous Interaction. Learner-instructor synchronous interactions focus on examining synchronous interactions between learners and instructors on MOOC platforms. We present a set of modules that implement real-time communication between instructors and learners.

Online Office Hours. Holding online office hours is an effective approach to connect instructors and learners. Online office hours can be implemented either via a public video/voice class or by individual video/voice appointment between the instructor and learners. Moreover, in terms of techniques to support the online office hours, MOOC platforms can either set up using a built-in website function for video call, or leverage third-party software such as Zoom.

Individual Course Q&A. However, for specific courses that are too difficult to understand by some learners, individual course Q&A sessions are suggested for inclusion on MOOC platforms. Because individual Q&A is highly personalized between various learners, instructors, and courses, our IN-MOOC suggests that this function could be embedded as a paid module on MOOC platforms.

5.1.2 Learner-Instructor Asynchronous Interaction. IN-MOOC involves asynchronous interaction between learners and instructors. This part aims to support "not-urgent" communication between learners and instructors. Particularly, we summarize two types of asynchronous interactions here: course forum and staged assessment and feedback from instructors.

Course Forum. Course forums are common and popular among MOOC platforms. There are two main approaches for discussion forums. On one hand, some MOOC platforms incorporate build-in discussion forums into their system. On the other hand, other MOOC platforms combine a third-party discussion forum into their course resources.

Staged Assessment and Feedback. According to the ACT-R theory [1] and nearly all learning theories, the staged assessment and feedback from instructors are strongly encouraged to be embedded into MOOC platforms. Nevertheless, the feedback from the instructors or teaching assistants should based on learners' personalized conditions. To this end, instructors can leverage data analysis tools rather than manually handling a mass of learners' feedback. For instance, the history of exam scores for individual learner can be automatically generated to track progress.

5.2 Teamwork-Oriented Interaction

Teamwork-oriented interaction focuses on the interactions among a group of learners. Specifically, it emphasizes the mutual collaboration and incentives that exist in teamwork. Here, we consider the strategies to improve the team performance, and further improve the individual learning performance by interacting with team members. There are a set of factors that can influence team performance by defining the social context of the members in the ABCS framework [19], such as team structure and social distance. We particularly focus on leveraging mutual support and surveillance, which uses the nature of relationships between team members for influencing team performance. Consequently, we propose methods for improving teamwork interactions along two different team relations: incentive-based group learning and assistant-based group learning.

5.2.1 Incentive-Based Group Learning. Incentive-based group learning modules are designed to motivate learners in both learning process and MOOC platform retention via team work. Particularly, we divide them into social-network connection, notebook sharing, and a group leaderboard.

Social-Network Connection. MOOC platforms can be considered as an opportunity to interact with others [25], because some learners might feel socially isolated in online learning. In addition, learners may prefer studying MOOCs with friends instead of online strangers. Therefore, IN-MOOC guidelines present a social-network connection module. The social-network connection can benefit both learners and platforms, as illustrated in Figure 6.

Group Leaderboard. IN-MOOC also suggests an optional group leaderboard module. Group competition can boost the group performance by motivating learners with shared status and achievements of other groups.

5.2.2 Assistant-Based Group Learning. Assistant-based group learning part emphasizes on helping group members by teamwork. We categorize it into a group chat tool and teamwork management modules.

Group Chat Tool. Currently, MOOC platforms set up communication tools mainly through forums or message board for group chat, which is inefficient. To handle this issue, IN-MOOC guidelines propose to integrate the group chat module in the MOOC course process. MOOC platforms are suggested to integrate a build-in group chat tool to realize real-time communication inside groups.

Teamwork Management Module. Existing MOOC platforms hardly provide teamwork management tools. To fill the gap, IN-MOOC guidelines propose the teamwork management modules for recording, monitoring, and managing team work. Particularly, it consists of the visualization of a teamwork timeline, a tool for updating project progress, assigning team member roles, and etc.

6 CONCLUSION AND FUTURE WORK

The purpose of our work is to start to provide a comprehensive study on MOOC platform interactions and offer insightful hierarchical framed guidelines to shed light on future research on MOOC platform interactions. To achieve this, we conduct a survey and a task analysis for three MOOC platforms. Then, we propose our solution on how to enhance MOOC platforms' interpersonal interactions including learner-instructor interactions and teamwork interactions. Our solution is framed as hierarchical guidelines named IN-MOOC.

Our study of enhancing MOOC platform interactions with the IN-MOOC guidelines can be further improved in several aspects. First, it is desirable to conduct user studies or interview to investigate users' experiences with the popular MOOC platforms. Second, with the prevalence of a global pandemic and the resulting increase in online learning, we should all be more interested in the effectiveness of online learning compared with traditional face-to-

face learning settings in the context of social distance.

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