IN-MOOC: Guidelines for Improving MOOC Platform Interactions

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With the prevalence of the COVID-19 pandemic, most students study remotely online, which fully unleashes 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 to access in several ways. 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. We conduct a task analysis on three of the most popular MOOC platforms, Coursera, LinkedIn Learning, and Canvas, to analyze whether and how they include key interaction functions. In addition, we conduct a case study to better understand the drawbacks of current user experiences. Based on our findings, we propose a set of comprehensive guidelines, called IN-MOOC, to facilitate interactions in MOOC platforms. In summary, IN-MOOC provides comprehensive and hierarchical guidelines to explain and design better online learning interactions.

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

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

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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 an online course platform supporting a large number of participants with open access via the web [8]. Although MOOC platforms have existed for a long time, they have rarely been used as thes primary form of secondary or tertiary education [7]. In this perspective, improving the interactions and usability of current online learning platforms is of crucial importance.

MOOC platforms offer numerous advantages from the learners' perspective, which can summarized into four aspects: (a) there are no geographical restrictions in accessing MOOCs; (b) individual time and course schedules are very flexible in MOOC platform courses; (c) besides, acting as the complement of higher education, MOOCs have lower financial and qualification barriers; (d) more initiative is offered to learners with respect to choosing courses and scheduling the

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personalized learning process supported by the MOOC platforms. Especially during the epidemic period of COVID-19, more people are shifting to remote online learning.

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 [17]. Particularly, we summarize the weaknesses on current MOOC platforms into four areas: (a) the interactions between learners and instructors can not be guaranteed frequently and satisfactorily by MOOC platforms due to technical inconvenience as well as unreasonable system design [23, 24]; (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 [9]; (c) MOOC platforms suffer from high dropout rates and high barriers to persistence [7], which might be derived from great challenges on collaborative learning support; (d) instead of only gaining knowledge of course contents, some learners care more about establishing interpersonal networks with other students who have similar interests or learning from peers during the real-time conversations and in-depth discussions [16].

In an effort towards understanding and facilitating MOOC interactions, we conducted task analysis and qualitative case studies. 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. We sense there is an urgent need not only to evaluate the usability of current online learning websites, but to also provide comprehensive guidelines to facilitate the interactions from the user perspective. To this end, we will propose general guidelines on the basis of three aspects: (a) customization-oriented interactions; (b) query-oriented interactions; and (c) collaboration-oriented interactions. **To the best of our knowledge, we are the first to propose a set of comprehensive guidelines for better interactions in MOOCs.**

2 RELATED WORK

In this section, we first lay the theoretical foundation that demonstrates interactions in MOOC platforms are of importance, then we examine the MOOC platform interactions with respect to three specific aspects.

Interaction is of crucial importance on MOOC platforms. Gibson [6] suggested that student satisfaction is determined by the attention students receive from the instructors and from the platforms to meet their needs. In addition, Foley [5] proposed 12 *golden rules* for the use of technology in education, in which the 7-th showed that interaction is essential and the 11-th presented teamwork is essential, both supporting the interaction and teamwork are vital on MOOC platforms. Marks et al. [12] identified the student-content interaction as one of the most important factors in learning online. In addition, interpersonal interactions (i.e., instructor-student and student-student interactions) have been identified as significant influences on students' perceptions of online courses [4]. As a summary, Northrup et al. [15] investigated types of interactions that students perceived to be important for e-learning. Specifically, interaction attributes and indicators include content interaction, conversation and collaboration, intrapersonal/metacognitive, and support. Three aspects seem to be important, which we cover in turn.

User and system interaction in MOOC. Kim et al. [9] conducted research on exploring graduate students' perceptions and preferences for online credit courses. As a result, he 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 the Learning Management System (LMS) [2]. Also, Murphy et al. [13] studied how students use tools of the Internet

and computers in their learning and to what degree the students self-regulate their learning with the help of online learning tools.

Learner and instructor interaction in MOOC. Recent research has attempted to approach the problem from the instructor's perspective [27], using an interview study of 14 MOOC instructors in which grounded theory was utilized to uncover the complex processes, motivations, and challenges associated with teaching an online course. In addition, Lin et al. [11] 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. Especially, various interactions happen in the deliver stage, including "Intra-MOOC Interaction" (e.g., online forums and assessments), and "Extra-MOOC Interaction" (e.g., email and social media), and "Monitor and Improve the Quality" such as using direct observation, analytic data provided by their platform, or feedback from learners [11]. 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. Thus, Shin's paper explored instructor and learner perceptions of in-video prompting where learners answer reflective questions while watching videos. Results revealed that some learners thought prompts were useful checkpoints for reflection while others found them distracting. Also, different prompting strategies had different effects on the learning experience and the usefulness of responses as feedback [21].

Teamwork interaction in MOOC. An increasing number of researchers start to examine social interaction and group work for learners in MOOCs [3, 10, 14, 25, 28]. 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 [25] revealed that higher engagement and retention are demonstrated among students in social media than MOOC forums. In addition, Koutsakas [10] investigated the role of a Facebook group, which acted as a complementary communication and collaboration platform to the Udemy Q&A forum [10]. 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. Last but not least, Nelimarkka [14] proposed social help-seeking within MOOC courses. This can be implemented either via MOOC platform tools such as a forum and chat, or through external social platforms (e.g., Google Hangout, Facebook groups). Their survey also showed that social help-seeking strategies are conducive to reduce the drop rate of courses [14].

Summary. Since the interaction is of significant importance on MOOC platforms [4–6, 12], we categorized existing literature relevant to MOOC interactions into three lines, including user-system interaction, learner-instructor interaction, and teamwork interaction. However, we find ***there is a lack of comprehensive guidelines for improving MOOC interactions covering all these aspects***. Therefore, in this work, we aim to propose a set of guidelines based on the results of task analysis and case studies on multiple MOOC platforms.

3 TASK ANALYSIS

We chose three popular MOOC platforms: Canvas[1], Coursera[2] and LinkedIn Learning[3]. Based on the discussion as above, top ranking modules are selected to test the three selected MOOC platforms. The evaluation standards and their notations are shown in Table 1.

[1]Note that we use Penn State University Canvas portal for analysis: https://canvas.psu.edu/
[2]https://www.coursera.org/
[3]https://www.linkedin.com/

Table 1. Evaluation Standard and Notations

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

According to the evaluation standards, we examined Canvas, Coursera and LinkedIn Learning. The test results are shown in Table 2.

Table 2. Task Analysis Comparison of Top 3 Popular MOOC Platforms

	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. 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 the three aspects.

The Task Analysis results show that none of these popular platforms are doing perfectly in terms of the three aspects of interactions. 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.

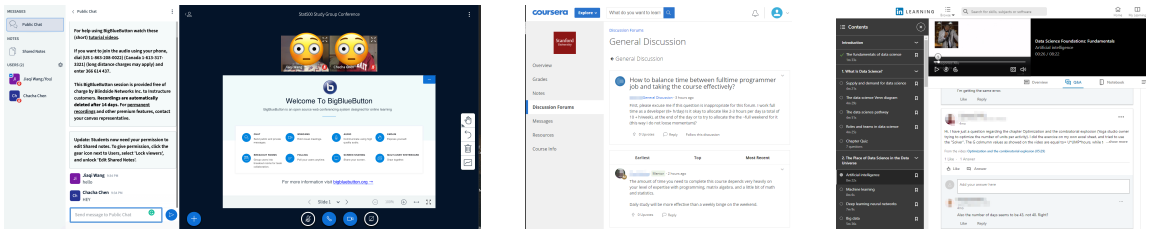
4 CASE STUDY

In this section, we conduct case studies on three MOOC platforms respectively.

4.1 Canvas

Canvas is a popular online learning system for many educational institutes. Canvas supports various types of interactions for learners and instructors. From the learner 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 interaction, Canvas is more mature compared with Coursera and

LinkedIn Learning. It provides related modules such as announcements and discussions. For teamwork interaction, Canvas has several related features, which is significantly better than Coursera and LinkedIn Learning. 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 1(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. There are “Discussion”, “Conference” and “Collaborations” in this module as well. All of these still cannot solve the idea sharing, visualization of teamwork update and timely group communication very well.



(a) (b) (c)

Fig. 1. (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.

4.2 Coursera

Coursera is a successful 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 1 (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 very well.

4.3 LinkedIn Learning

Compared with the other two MOOC platforms, LinkedIn Learning does not support as 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 good 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 1 (c). Timely response does not work well via “Q&A” or “Forum Discussion”.

4.4 Summary

Based on the case study results, we can find that user-system interaction part of the three platforms all works fine and satisfies users to some extend. 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.

5 IMPLICATIONS AND GUIDELINES

Based on the related work, the task analysis, and case studies, we now present IN-MOOC, which includes a set of systematic guidelines in an hierarchical manner, with an effort to facilitate better MOOC interactions. It is worth noting that although a plethora of work has been done to analyze the interaction on MOOC platforms, limited research is proposed to holistically improve MOOC platform interactions from the aspects of all stakeholders.

The proposed systematic guidelines for MOOC platform interactions are illustrated in Figure 2. In specific, IN-MOOC is categorized into three parts: customization-oriented interaction, query-oriented interaction, and collaboration-oriented interaction. The customization-oriented interaction parts emphasize the interaction between MOOC learners and systems; the query-oriented interaction parts focus on learner-instructor interactions in courses; and the collaboration-oriented interaction parts introduce tools contributing to team work and team incentives on MOOC platforms. Note that our IN-MOOC guidelines do not strive toward an enumerated collection of all interaction techniques. Instead, IN-MOOC guidelines seek to provide an organized frame for research related to online learning to explain and design better interactions on MOOC platforms.

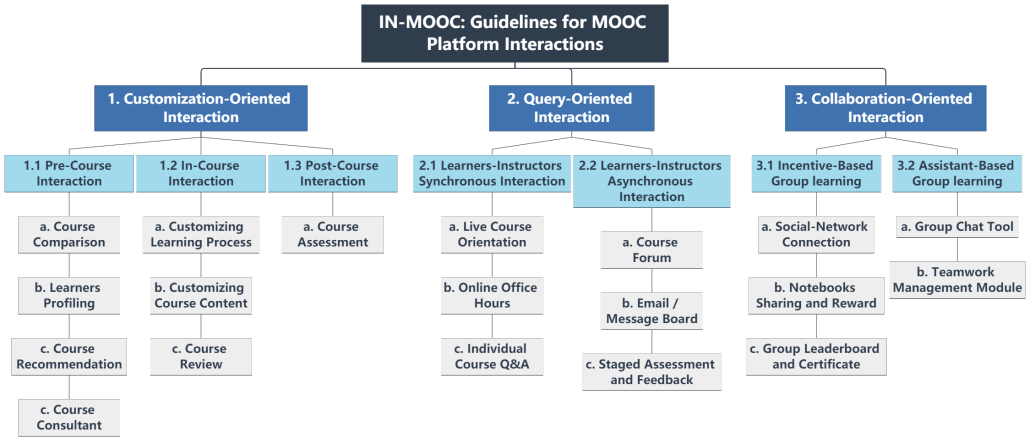


Fig. 2. The Framework IN-MOOC: Guidelines for MOOC Platforms Interactions

Moreover, the IN-MOOC guidelines are theoretically supported by the ABCS framework [18], which encourages the analysis and design of systems to examine the anthropometrics, behavioral, cognition and social factors of user characteristics needed to be considered in designing interactive systems. We introduce IN-MOOC guidelines as below.

5.1 Customization-Oriented Interaction

Customization-oriented interaction part includes a set of tools that help interactions between learners and MOOC systems. Furthermore, we organize the customization-oriented interaction part in a temporal manner, which consists of pre-course interaction, in-course interaction, and post-course interaction.

5.1.1 Pre-course Interaction. The pre-course interaction guidelines aim to improve learners' experience in interacting with MOOC platforms. Our IN-MOOC guidelines incorporate four interactive parts for pre-course interactions, which are illustrated next.

Learners Profiling. IN-MOOC leverages data mining techniques to describe each learner's profile. In other words, the MOOC platforms could track each learner's online behaviors (e.g., keystroke, course history, etc.) for his/her preference analysis with learners' permission, so that MOOC platforms can provide more targeted services for learners. The learners' profiles include "Demographic Information", "Social Network Isnformation", "Interested Subjects', "Comment History", "Keystroke Tracking", "Course Participation History", and etc.

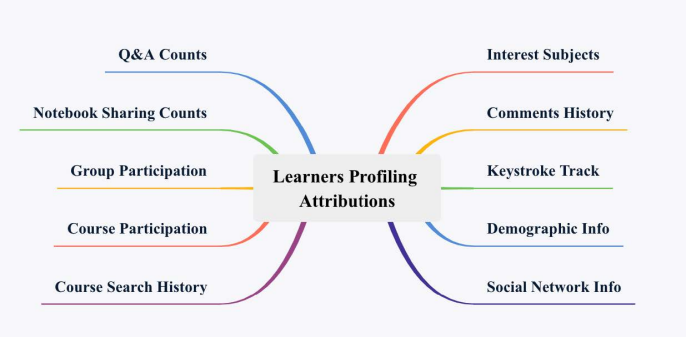


Fig. 3. Learners Profiling Attributions

As shown in Figure 3, by adopting these learners profiling information, IN-MOOC constructs the personalized information for each learner, and further generates learners' recommendations accurately and efficiently. That would help with the course recommendation systems on MOOC platforms.

Course Recommendation. Following the learners' profiling function, the function of course recommendation for learners needs to be added to MOOC platforms. The benefits are two fold. For one, effective course recommendations can help learners view more related courses and potentially obtain more knowledge in their interested field. For another, if recommended courses are accepted by learners, it will boost the MOOC platforms' popularity (and perhaps revenue) and further improve retention rate. For example, if a learner is taking a basic machine learning course, MOOC platforms can automatically recommend a later advanced machine learning course. Besides, MOOC platforms can also recommend potential interesting courses to learners by analyzing similar learners and their social network information.

Course Comparison. Another disadvantage of existing MOOC platforms is that courses with similar or even same titles and contents are difficult to compare from the user's perspective. Therefore, it is would be useful to provide a course comparison tool in existing MOOC platforms to help learners obtain convenient comparisons and support course selection decisions.

Custom Service. During the course searching process, it is common that learners meet a variety of problems such as unable to distinguish two similar courses. Therefore, it is important to offer custom service to satisfy learners' demands. To tackle this problem, the IN-MOOC guidelines support the addition of a custom service for learners. Specifically, this service can be designed in three approaches. In a cost-effective method, MOOC platforms can adopt phone-answering robots to answer a set of preselected frequent questions set for the MOOC platform; similarly, chat robots can also be employed in the MOOC websites through chat channels. Furthermore, in a more flexible yet cost-expensive way, the MOOC platforms could offer telephone support during work hours.

5.1.2 In-course Interaction.

Customized Learning Process. Ritter and Schooler examined that the learning curves conform to *the power law of practice*, which is also ubiquitous in cognitive psychology [19]. Because different learners will often follow different learning curves, it is important to provide customized learning process for different learners, which can best fit various learners' preferences. IN-MOOC offers suggestions on customizing learning process from the following aspects: (a) the course designers should program the course into more flexible schedule instead of the fixed process for all learners; (b) the courses should allow learners to skip some classes or modules that they are already proficient in.

Customized Learning Content. As analyzed in [26], many learners might not care much to complete a full course. Instead, they prefer to obtain the knowledge modules that they are most interested in or unfamiliar with. Therefore, IN-MOOC guidelines suggest that courses on MOOC platforms should be designed as modularized resources, which is motivated by both diverse learners' demands and various learners' learning rates.

Course Review. Even though the courses are well-designed, the learners' course performance might still be poor due to forgetting, which is described in the ABCS framework [18]. Inspired by the PQ4R approach (Preview, Question, Read, Reflect, Recite, Review) [22], which is a way to improve learning performance, our IN-MOOC guidelines suggest that a periodical *Reflection* and *Review* session should be integrated into the course design. The design purposes are from two considerations. *Reflection* session emphasizes on connecting fresh knowledge of the MOOC courses to learners' own existing knowledge graph, which is conducive to learners' understanding as well as reciting. Additionally, the *Review* session aims to reactivate learners' memories of the knowledge periodically through reinforcement and use.

5.1.3 Post-course Interaction. Designing course assessments into regular and frequent use is beneficial to learners studying process. As described in the ACT-R theory [1], attention is represented as activation of concepts in its declarative memories, hence learners' regular attention on the course assessment and feedback are conducive to their activation and maintaining of memory processing of course knowledge. Therefore, our IN-MOOC guidelines advise integrating regular and frequent course assessments in designing courses.

5.2 Query-Oriented Interaction

The Query-oriented interaction part includes a group of guidelines that are support interactions between learners and instructors on MOOC platforms. Practically, we divide the query-oriented interaction guidelines into two categories: learner-instructor synchronous interactions and learner-instructor asynchronous interactions.

5.2.1 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.

Live Course Orientation. In traditional face-to-face learning settings, the first class meeting is often designed to present and discuss the course syllabus. Similarly, our IN-MOOC guidelines suggest a first live course orientation to interact with learners' and answer their questions. However, the orientation could be costly for instructors and platforms. Moreover, we can not guarantee the students' participation because the orientation would be a virtual event. Hence, we suggest that two factors could be considered when adopting this strategy. First, the course should be innovative or distinctive so that an orientation is in desired by the learners. Second, a vote or survey of potential queries can be conducted before conducting live course orientation.

Online Office Hours. Holding online office hours is an effective approach to connect instructors and learners. The online office hours can be implemented either via a public video/voice class or by individual video/voice meeting

appointed between the instructors 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 which are too difficult to understand by some learners, the individual course Q&A is suggested for inclusion on MOOC platforms. Because the 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.

5.2.2 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 three types of asynchronous interactions here: course forum, email/message board, 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. For instance, Piazza provides service for MOOC courses to organize their online discussion.

Email / Message Board. In other scenarios where communication volume, frequency, and urgency between instructors and learners are not very high, we suggest a section of email and message board.

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 the progress.

5.3 Collaboration-Oriented Interaction

Collaboration-oriented interaction focuses on the interactions among learner. Specifically, it emphasizes the mutual collaboration and incentives that exist in team work. To better analyze the collaboration-oriented interactions, IN-MOOC is motivated by the two dimensions: *Mutual Support* and *Mutual Surveillance*. Based on the social model in the ABCS framework, there are two branches: incentive-based group learning and assistant-based group learning.

5.3.1 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 group leaderboard.

Social-Network Connection. MOOC platforms can be considered as an opportunity to interact with others [26], 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 4.

Notebooks Sharing. IN-MOOC guidelines suggest adding a notebook sharing module in MOOC platform courses. The reason derives from three aspects: obviously, learners can benefit from writing notebooks, which is conducive to reflect and review their knowledge obtained from MOOC courses; additionally, the sharing behaviors can motivate learners to write notebooks if they can get recognized with rewards from peers; last, reviewing others' shared notebooks is helpful in studying the course material itself.

Fig. 4. Benefits of Social-Network Connections

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.

5.3.2 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 provide a comprehensive study on MOOC platform interactions and offer an insightful hierarchical framed guidelines to shed light on future research on MOOC platform interactions. To achieve this, we conduct a task analysis and a qualitative case study for three MOOC platforms. Then we proposed our solution on how to enhance MOOC platform interactions from three aspects: user-system interaction, learner-instructor interaction, and teamwork interaction. Our solution is framed as hierarchical guidelines named IN-MOOC.

IN-MOOC guidelines provide a systematic and hierarchical solution on how to enhance MOOC platform interactions based on our task analysis and case study results. It is designed into three parts including customization-oriented interaction, query-oriented interaction, and collaboration-oriented interaction. In particular, the customization-oriented interaction part involves a set of modules that help interactions between learners and MOOC platforms. Furthermore, we organize the customization-oriented interaction part in a temporal manner, which consists of pre-course interactions, in-course interactions, and post-course interactions. The query-oriented interaction part gathers a group of modules that are helpful for interactions between learners and instructors on MOOC platforms, from aspect of learner-instructor synchronous interaction and learner-instructor asynchronous interactions. The collaboration-oriented interaction part provides the interaction modules to better improve teamwork efficiencies among learners.

Our study of enhancing MOOC platform interactions with the IN-MOOC guidelines can be further improved from 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 global pandemic, 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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