

Learning Engagement and Peer Learning in MOOC: A Selective Systematic Review

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Abstract. Massive open online courses (MOOCs) improve learning; but their low completion rate remain problematic. Peer learning has been proposed as a method to increase learning engagement in MOOCs, thereby decreasing the dropout rate. However, the effectiveness of peer learning in promoting learning engagement in MOOCs remains underexplored. This systematic review aimed to examine the effect of peer learning on learning engagement in MOOCs. Eight articles met the inclusion and quality assurance criteria using the PRISMA method. We found that: (1) limited research has analyzed learner engagement within peer learning; (2) learner engagement can be measured through analysis of log, text, and survey data; and (3) peer learning can positively impact learning outcomes in MOOCs (completion rates, quiz completion rates, and quiz scores).

Keywords: MOOC, isolation, dropout, learner engagement, peer learning, peer interaction

1 Introduction

Massive open online courses (MOOCs) offer online learning opportunities to learners all over the world [1], giving them the flexibility to learn whenever and wherever they want [2]. Since the COVID-19 pandemic, MOOCs have become increasingly popular worldwide [3]. However, despite the high enrollment, the completion rate of MOOCs remains low [4]. On average, less than 10% of learners complete a MOOC [5, 6]. Many factors contribute to these high dropout rates, but one important factor that has a direct effect on learner dropout in MOOCs is the feeling of isolation [7, 8].

Feelings of isolation are common in fully online courses and MOOCs [9]. Geographical separation and lack of contact with fellow learners may lead to feelings of psychological isolation [10]. Feelings of isolation in completely online courses are not surprising. However, with an increased emphasis on blended learning in higher education, a sense of disconnection is frequent [11, 12].

One possible solution to the problem of isolation is to reinforce a sense of community [10, 13]. The notion of creating an online community for learning has been explored, suggesting that it can overcome the lack of physical contact between learners [14].

This systematic literature review aims to examine learning engagement using peer learning in MOOCs.

2 Related Works

The growing popularity of MOOCs has led to significant research on various aspects of MOOCs, including learner engagement and peer learning. This section provides an overview of the importance of peer learning in MOOCs and the fundamental description of learner engagement.

2.1 Peer Learning in MOOC

Peer learning is an educational method, where students interact with each other to acquire new knowledge and skills [15, 16]. Generally, MOOCs can provide discussion forums that enable learners to share their opinions and seek clarification on materials [17]. Furthermore, MOOCs often incorporate a peer assessment feature that allows learners to provide feedback and rate their peers' work as a way to learn from each other. Peer learning in MOOCs has demonstrated various benefits, such as increasing learner engagement [14, 18], which can potentially reduce the dropout rate of MOOCs.

2.2 Learning Engagement in MOOC

Learner engagement is defined as the behavioral, cognitive, emotional, and social connections that MOOC participants make with the course content, the instructor, and other learners [19]. Specifically, behavioral engagement refers to students' observable actions and their participation and involvement in educational activities [20].

Cognitive engagement refers to psychological investment in learning [17]. This is reflected in learners' efforts to acquire complex content or skills during the MOOC learning process [21].

Emotional engagement encompasses the positive and negative reactions demonstrated in learning [22]. It refers to students' emotional connections with institutions, instructors, peers, and the MOOC content itself [20].

Social engagement is centered on learner-learner and learner-instructor interactions [19]. Given that engagement can be considered a type of behavior, it is sometimes viewed as a subcategory of the behavioral engagement category. However, in many studies, social engagement is regarded as a fundamental component of students' perceptions and is measured separately from behavioral, cognitive, and emotional engagement [19].

This study investigated learning engagement using peer learning by reviewing eight studies on learner engagement in MOOCs published between 2016 and 2023. The research questions were as follows:

- RQ1: What research methods are used to quantify learner engagement using peer learning in MOOCs?
- RQ2: Does peer learning improve learning outcomes in MOOCs?

3 Methods

To answer the above questions, a systematic review was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 (PRISMA 2020) framework that guided this study [23]. PRISMA framework provides comprehensive tools for reporting transparent systematic review such as checklists and flow diagrams [23].

3.1 Search Strategy

Multiple databases were used to ensure a comprehensive search of the scientific literature, including Scopus, ERIC, and ProQuest. These databases were carefully selected based on their relevance to the research questions and their capacity to provide a diverse range of scholarly resources.

A search was conducted using a range of search keywords paired with the Boolean operators AND and OR. The keywords were selected to locate any studies that focused on the research questions. The broad search string used in this study was designed to be comprehensive and included keywords related to peer learning, MOOCs, and learner engagement [19]. Specifically, the search string used was as follows: (“peer learning” OR “peer recommender” OR “social interaction”) AND MOOC AND (“learner engagement” OR “student engagement” OR “behavioral engagement” OR “cognitive engagement” OR “emotional engagement” OR “social engagement”). In total, 20 papers containing the search string within the title and abstract were identified in the search.

3.2 Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were used to select suitable studies for this review. The articles were selected based on the following inclusion criteria: (1) published between 2016 and 2023, (2) published in journals or conferences that have gone through a peer-review process, and (3) related to the impact of peer learning on learner engagement in MOOC.

Books, review articles, dissertations, and posters were excluded, as were studies that were published before 2016, were published in non-peer-reviewed journals or conferences, and were not related to behavioral engagement, or cognitive engagement or emotional engagement or social engagement. The summary of the inclusion and exclusion criteria is shown in Table 1.

3.3 Selection Process

The article selection process consisted of three main stages: identification, screening, and inclusion. The PRISMA flow diagram in Fig. 1 provides an overview of this process.

During the identification stage, a specific publication period from January 2016 to March 2023 was set to limit the search timeframe. To ensure a high-quality standard, the search was restricted to peer-reviewed journal or conference articles. Lastly, to eliminate any redundancy or duplication, all duplicate copies of the studies were removed, reducing the search to 14 papers.

The second stage was screening. The first screening was conducted based on the title, abstract, and keywords to ensure that the selected articles were relevant to the impact of peer learning on learner engagement in MOOCs. This reduced the number of studies to 11. After conducting the initial screening of potential studies, a second screening process was conducted to assess each study's eligibility more deeply based on the full text of the article. The objective of this second screening was to verify that the study was related to behavioral engagement, or cognitive engagement or emotional engagement or social engagement. Finally, eight relevant articles were selected as studies included in our systematic literature review.

Table 1. Inclusion and exclusion criteria.

	Inclusion criteria	Exclusion criteria
Publication Year	Papers published from January 2016 to Mars 2023	Papers published before 2016
Source Types	Peer-reviewed journal or conference papers	Non-peer-reviewed journal or conference papers (e.g., books, editorials, dissertations, reviews)
Topic	The impact of peer learning on learner engagement in MOOC	Not related to behavioral engagement, or cognitive engagement, or emotional engagement or social engagement.

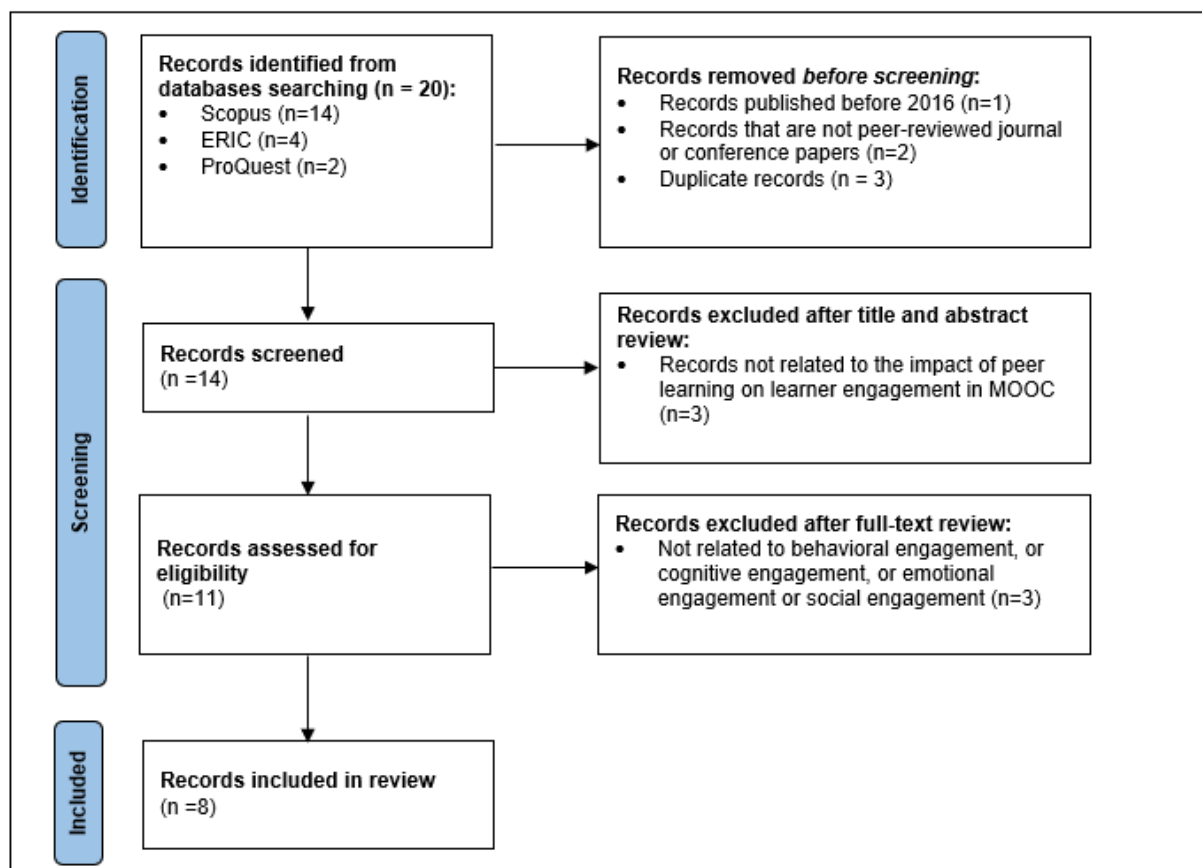


Fig. 1. PRISMA Flow Diagram [23]

4 Results

Previous studies have identified four distinct dimensions of learner engagement: behavioral, cognitive, emotional, and social engagement [19]. Table 2 summarizes the articles discussed in this review.

Table 2. Synthesis of the information extracted from the studies.

Authors	Research method	Data type	Learner engagement				Impact on learning outcomes
			Behavioral	Emotional	Cognitive	Social	
[24]	Mixed	Log, Text	-	-	-	X	Yes
[25]	Quantitative	Log	-	-	-	X	Yes
[26]	Quantitative	Log	-	-	-	X	Yes
[27]	Quantitative	Text	-	-	X	X	No
[28]	Qualitative	Text	-	X	-	-	No
[29]	Quantitative	Survey	X	X	-	-	No
[30]	Quantitative	Log	X	-	-	X	No
[18]	Quantitative	Log	X	-	-	X	Yes

4.1 RQ1: What Research Methods are used to Quantify Learner Engagement using Peer Learning in MOOCs?

The three research methods commonly used in the literature are qualitative, quantitative, and mixed methods [32]. Qualitative methods involve non-numerical data such as interviews and observations to obtain descriptive data. Quantitative methods use tools, such as surveys, experiments, and statistical analysis, to gather numerical data. The mixed method combines both qualitative and quantitative methods for a more comprehensive understanding.

An analysis of eight relevant studies revealed that six used quantitative methods to quantify learner engagement in MOOCs [25, 26, 27, 29, 30, 18]. For example, [26] used the frequency of visits and posts made on a discussion board to measure learners' social engagement. The results indicate that learners who engaged in one-on-one discussions improved their social engagement. [27] analyzed learner engagement from both social and cognitive aspects based on forum text data, including discussion posts and comments. Specifically, they applied a social network analysis method to identify different social participatory roles such as leaders, starters, influencers. Regarding the cognitive aspect, the researchers used the content analysis approach to determine low, medium, and high levels of contributions to individual knowledge inquiry (IKI) and group knowledge construction (GKC). [25] used posts, comments, replies, and follows to investigate social engagement among learners in the forum. Their findings indicated that most learners who followed someone actively participated in discussions by writing comments or replying to someone else's comments. [29] used a survey to identify emotional and behavioral engagement of learners. The results showed that commitment was positively related to learner engagement. Finally, in [18] and [30], the authors used K-means clustering on log data to measure learners' behavioral and social engagement in MOOCs. The log data included metrics such as the number of pages the student accessed, the number of quizzes completed, the number of posts on discussions, and the average length of discussion posts. The researchers demonstrated that peer recommendations based on sociodemographic similarities increased learners' engagement in MOOC.

[28] used a qualitative method to measure the emotional engagement of learners. Specifically, they analyzed comments made by learners and found both positive and negative attitudes towards peer reviews.

[24] demonstrated that peer discussion on the forum can enhance social engagement among learners. They employed a mixed-methods research approach using both quantitative and qualitative analyses. The quantitative analysis involved examining the number of discussion forum participants and the number of forum postings per week. The findings revealed that a total of 29,355 posts were generated over a period of 8 weeks by 1691 participants. The qualitative analysis, on the other hand, showed that most of these discussions went beyond superficial comments, and none of them deviated from the focus question. Additionally, the study indicated that the learners were highly engaged in the discussions, even after the course ended, leading towards an evolving community of practice.

4.2 RQ2: Does Peer Learning Improve Learning Outcomes in MOOCs?

Of the eight studies analyzed, four highlighted the impact of peer learning on learning outcomes in MOOCs in terms of completion rates, quiz completion rates, and quiz scores.

[24] found that the average completion rate of the MOOCs studied was significantly higher (36.35%) than the average completion rates reported in the literature. In addition, their results showed that active learners had a completion rate of 59.38% on average.

[25] demonstrated that learners who fully participated in a forum were more likely to complete the course. Furthermore, they indicated that learners who followed someone in a MOOC were more likely to complete the course. Specifically, their findings revealed that over 30% of followers completed the course by completing at least half of the steps.

[26] found that students who engage in one-on-one discussions show improvement in their quiz completion rates by 7% to 10%, as well as a 2% to 10% increase in quiz scores in subsequent weeks. Similarly, [18] found that engaging in discussions improved learners' quiz completion rates and quiz scores.

5 Discussion and Conclusion

This systematic literature review investigates learner engagement in MOOCs through peer learning. Learner engagement is a complex phenomenon to understand; however, it is considered a critical factor in fostering learning and success [31]. The concept of engagement is multifaceted and is based on how students behave, feel, think, and interact with one another. To obtain a comprehensive understanding of learner engagement, researchers should examine all four dimensions of learner engagement: cognitive, emotional, behavioral, and social engagement. Focusing solely on one dimension of engagement may restrict the understanding of learner engagement. Thus, measuring all dimensions is crucial for obtaining deeper insights into learner engagement.

Research should adopt both qualitative and quantitative methods to analyze learner engagement [32]. Using both methods can provide a more comprehensive understanding of learner engagement. Several studies have adopted a mixed methods approach to examine student engagement in MOOCs [33, 24].

Researchers should test the impact of the four dimensions of engagement (cognitive, emotional, behavioral, and social engagement) and multiple outcomes of interest. Specifically, they should explore the relationship between engagement and key learning-related factors such as retention [34] and course performance [26]. By doing so, researchers can gain a more holistic understanding of the learning process in MOOCs.

To conduct a comprehensive exploration of learning engagement in MOOC forum discussions, researchers should examine the interactive relationships between the various dimensions of learner engagement, such as emotional and cognitive engagement [35]. Through this examination, researchers can better comprehend how these dimensions are interrelated and how they jointly impact learning achievement [35].

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