# The Feature and Diversity of Learners' Performance on Different MOOC Forums in the Online Learning Era: A Perspective of Self Determination Theory

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# ABSTRACT

Scholars have long delved into the realm of MOOCs. However, with the proliferation of diverse platforms hosting course videos, it was realized that learning experiences may vary across these platforms. Hence, this research explores the forums within two distinct online learning platforms: the formal MOOC and the informal video-sharing platform. According to self-determination theory, it is assumed that different motivations influence the behavior of learners on different platforms. Through the content analysis and social network analysis, the research reveals that learners' performance on formal platform displays a decentralizing trend, emphasizing knowledge transfer and mutual encouragement. The variances in knowledge production behaviors among these learners should be duly acknowledged. For future development of online learning platforms, the characteristics of content and learner behavior in informal forums require attention and integration.

## **KEYWORDS**

MOOCs, Online Learning, SDT, Social Network Analysis, Content Analysis

# INTRODUCTION

With the conclusion of the COVID-19 pandemic, educational institutions globally transitioned from an emergency state to normalcy. A profound consequence of this exigency has been the swift ascent of online learning (Morgan et al., 2022). Online learning, characterized as a pedagogical approach enabling self-directed learning via digital tools and the internet (Yildirim & Usluel, 2022), has found its pinnacle in massive open online courses (MOOCs) delivered through platforms like Coursera, edX, and Chinese University MOOCs (Course163.com) (Carrera & Ramírez-Hernández, 2018). Concurrently, on video-sharing platforms like YouTube, Twitter, and Bilibili, some educators and students upload MOOC videos, fostering informal learning.

Online learning necessitates significant learner autonomy (Q. Li et al., 2022), with motivations and experiences varying across platforms. MOOC students are subject to external motivations (Woodgate et al., 2015), given course certification, credit hours, and grading standards, aligning

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This article published as an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/) which permits unrestricted use, distribution, and production in any medium, provided the author of the original work and original publication source are properly credited. with self-determination theory (SDT) (Deci et al., 1989). In contrast, students on video-sharing platforms rely heavily on intrinsic motivation (Mustafa et al., 2020; Rini & Sridiyatmiko, 2022), as these platforms offer only video viewing and comment-sharing functions. Recent research highlights motivation disparities among online learners (Al-Harthi & Ani, 2023).

To understand these variations, we explored two platform categories. MOOCs and video-sharing platforms diverge in design objectives and functional modules. Both feature forums, making them ideal for comparative analysis.

Insights gained from these disparities can inform online learning improvements, including video design, platform enhancements, and deeper learner engagement, benefiting course design, system development, and instructional practices. Ultimately, this enhances students' learning experiences and outcomes (Mohan et al., 2020; Moore & Blackmon, 2022; Wei & Taecharungroj, 2022).

In the second section, the article reviews the theoretical and practical prerequisites involved in current research and explains why current research is important. In the third section, we explain the sample size and implementation process of the study. The fourth section presents the results of social network analysis and content analysis. In the fifth section, we discuss the characteristics of different platforms and compare their differences to point out the direction of future construction and development.

## LITERATURE REVIEW

## **Theoretical Framework**

SDT posits that individuals harbor three distinct psychological needs and situates individual motivation along a continuous spectrum progressing from controlled regulation to autonomous regulation (Deci & Ryan, 2008). Internal regulation, sometimes referred to as intrinsic motivation, denotes actions driven by personal interest and enjoyment. In contrast, external regulation entails behaviors and actions performed to attain rewards or avoid punishment (Deci & Ryan, 2000).

Learning engagement is generally defined as students devoting resources and effort toward achieving their learning objectives (Schunk & Mullen, 2012). Previous research has delineated three general categories of engagement: behavioral, emotional, and cognitive engagement. Behavioral engagement refers to students participating in learning activities, emotional engagement pertains to students experiencing or expressing emotions, and cognitive engagement involves students investing mental resources in their learning (Fredricks et al., 2004), manifesting comprehension, transfer, or divergent thinking about knowledge (Rotgans & Schmidt, 2011).

Considerable research has delved into the influence of motivation on engagement across diverse contexts. For instance, studies by Skinner et al. (2008) suggested that students with high levels of intrinsic motivation exhibit greater levels of emotional engagement. Recent reviews, such as the one conducted by Amarilla et al. (2022), also indicated that motivation positively impacts behavioral engagement in online environments. In the realm of cognitive engagement, researchers have drawn similar conclusions, asserting that learners with internal motivational regulation exhibit higher levels of cognitive engagement in courses (Lan & Hew, 2020; Rotgans & Schmidt, 2011).

## **MOOCs Forums**

Since the emergence of MOOCs, attention to forums has remained ceaseless (Kop et al., 2011; Ramesh et al., 2014). Some researchers contend that these forums serve as the exclusive space within MOOCs' learning environment for autonomous participation and text-based dialogue, holding value as a showcase of learner-generated content (Ezen-Can et al., 2015). Consequently, researchers have scrutinized learners' behavior in these forums from various angles. Coetzee et al. (2014) and X. Wang et al. (2016) interpreted the number of post views and submissions as indicators of engagement, thereby revealing the relationships between engagement, performance, and retention. Meanwhile, Wen et al. (2014) and Dillon et al. (2016) delved into learners' expressed emotions in these forums and their impact on course selection and student participation.

Furthermore, other studies have focused on the interactions among learners in MOOC forums. Almatrafi and Johri (2019) argued that these forums facilitate learners' connection-building, mitigating their sense of isolation to some extent. Deng et al. (2019) comprehensively analyzed the social interactions of varying degrees in forums, considering factors such as postcontent, course category, and instructional mode. Yang et al. (2017) constructed a social network of learners' behavior in MOOC forums and examined the network structure characteristics. B. Wu and Wu (2021) utilized social network analysis to discuss knowledge transfer among different user types, asserting that emotionally inclined users are more likely to engage deeply in interactions.

## Forums of Video-Sharing Platforms

In contrast to MOOC platforms naturally serving as learners' territory, early scholars regarded video-sharing platforms as primarily for entertainment purposes (Cheng et al., 2013). Although these platforms held significant educational potential, they only began to function as educational resources when an increasing number of course videos were uploaded to them (Rahmatika et al., 2021). According to research by Dolores and Mañana-Rodriguez (2021), MOOC videos gradually appeared on video-sharing platforms like YouTube and garnered nearly a million views over a decade. Some researchers attempted to complement MOOCs with video-sharing platforms by offering personalized course videos for different classes, harnessing their educational capabilities (McGovern & Baruca, 2013). Recognizing the autonomous learning characteristics of video-sharing platforms, researchers embarked on a series of investigations. Khan et al. (2018) focused on factors influencing university and high school students' utilization of YouTube for science, technology, engineering, and mathematics course learning, finding that both high school and college students proactively seek video-sharing platforms for learning. Mustafa et al. (2020) discovered that the majority of medical students actively employ video-sharing platforms to learn medical knowledge and engage in online learning. The research of Ratnasari and Hendriyani (2022) revealed that 80% of students perceive using video-sharing platforms for learning as effective. Rahmatika et al. (2021) examined the effectiveness of video-sharing platforms as an educational medium from the perspective of educators.

In this context, numerous researchers have focused on the research of educational video comment sections. In terms of theory and technology, Madden et al. (2013) established an analytical framework in the early days for the examination of comments on video-sharing platforms. Kavitha et al. (2020) proposed an algorithm for automated evaluation of YouTube comments. In empirical research, Izquierdo-Altarejos et al. (2023) analyzed video comments on music theory courses on YouTube, confirming the potential for novices to grasp foundational music concepts through these videos. In empirical research, Marone and Rodriguez (2019) analyzed video comments on music theory courses on YouTube, confirming the potential for novices to grasp foundational music concepts through these videos. Olowo et al. (2020) explored the potential of video-sharing platforms as interactive spaces for educational activities, noting the positive impact of such interactions on learning outcomes for the new generation of high school students. C. S. Park et al. (2021) conducted content analysis of comments on instructional videos on YouTube, unveiling age, gender, and ability-based discrimination. Xu (2022) analyzed the interaction within comments on health education videos on the Chinese video-sharing platform Bilibili, revealing the significant influence of interactive behaviors on learners' impact. Y. Zhang et al. (2023) uncovered the relationships between different knowledge dissemination strategies and interactive behaviors through comment section data analysis. H. Chen et al. (2021) focused on the behavior of "class representatives" in the educational video comment sections, users who synthesize and present the content from videos in a textual and graphic manner within the comments, highlighting their constructive role in bridging knowledge gaps.

## **Comparative Results of MOOCs and Video-Sharing Platforms**

Acknowledging the shared development histories and presentation formats of MOOCs and video-sharing platforms (Shah, 2021), it is vital to note that examinations by Dolores and Mañana-Rodriguez (2021), concerning MOOC videos on YouTube, and the research of Jain (2023), comparing an Indian literary classic across print, MOOCs, and YouTube, were largely noncomparative and language-centric. These inquiries overlooked the crucial distinctions between MOOCs and video-sharing platforms in the realm of learning. The common lens of video content analysis, as demonstrated by Pickering and Swinnerton (2019), led to the misconception of homogeneity, primarily stemming from higher education institutions employing MOOC video courses via platforms like YouTube. Nevertheless, considerable variances persist in the learning dynamics between MOOC and video-sharing platforms. Thus, this research posits two hypotheses, subsequently substantiated through an analysis of educational videos on both platforms.

- Hypothesis 1: The content of learners' comments on MOOC platforms and video-sharing platforms differs significantly.
- Hypothesis 2: The social interaction of learners on MOOC platforms and video-sharing platforms exhibits distinct characteristics.

## METHODOLOGY

#### Samples

This research included two platforms, namely China University MOOC (CUM) and BiliBili. CUM is a MOOC platform highly favored by numerous universities, where various institutions and educators publish their series of courses for students from diverse communities. Many universities consider students' credits on this platform as a necessary condition for obtaining a degree. On the other hand, BiliBili is a video-sharing platform originally focused on anime and electronic games (Jung & Zhou, 2019), beloved by a vast number of young people. In recent years, with the increasing prevalence of students' online learning habits, an expanding number of video courses have been uploaded to Bilibili and widely viewed. According to research, considering the rise of Bilibili, there is a significant overlap between its main user group and the current college students (R. Wang, 2022).

We conducted searches with the keyword "philosophy" on CUM and BiliBili, selecting series courses with the highest participation/view counts for forum data collection. This choice arises from the lesser spontaneity in selecting philosophy courses in university and the platform's preference for task-oriented video viewing. For example, college students may choose history as their elective course of interest, while online course learners may choose Photoshop (a famous drawing software) courses to meet their temporary job needs.

## Procedures

Once the analysis courses were determined, we developed a Python web scraper to collect data from the forums of the two videos. Users participating in the discussions were coded accordingly. Users on CUM were coded in the order of appearance as M#1-M#382 (with M#4 being the instructor), while users on BiliBili were coded sequentially as B#1-B#1315.

The analysis conducted in the research primarily revolved around two aspects. To address research Hypothesis 1, the forums of both courses were subject to content analysis using web tools based on an open-source Python toolkit (Weiciyun.com). This tool, with a client-server architecture, featured a graphical interface and provided various functions including segmentation, content analysis, topic analysis, and sentiment analysis, along with integrated graphing capabilities.

	Views	Participants	Participation (%)	Core Users*	<b>Core</b> (%)
CUM	170,715	381	0.223%	15	3.937%
Bilibili	2,513,241	1315	0.052%	319	24.259%

#### Table 1. Learners' engagement of two platforms

Note. \*Core Users are participants who act more than 10 times in forum.

Due to the lack of explicit word separation in Chinese, the text data sets from various discussion forums were first preprocessed to remove stop words and special characters. After preprocessing, the text was segmented to determine which characters should be grouped together for analysis. The Jieba library facilitated these two steps, being an efficient tool for dictionary and text segmentation. Following segmentation, the data sets were converted into numerical features for word frequency statistics and co-occurrence analysis. This step utilized functions from the Sklearn library.

For sentiment analysis, which determines whether each sentence is positive, the tools used interfaces provided by Textblob library. Finally, topic modeling based on latent Dirichlet allocation (LDA) was performed using the Gensim library. The study experimented with settings of 3 to 10 topic centers and found that for Bilibili, 6 topics yielded the best performance, while for CUM, 5 topics were optimal.

To address research Hypothesis 2, user interactions within the discussion sections were subjected to social network analysis. Modeling and mathematical calculations were conducted using the University of California network (UCINET), and Gephi was employed for visualizing social networks.

Specifically, the study first used tabular tools to extract the number of interactions between different users, establishing a relational matrix. UCINET was used to analyze this relational matrix. In terms of matrix analysis, degree centrality—which measures the number of connections a node has with other nodes—was used to assess whether a user occupies a key position in the network. Core-periphery analysis revealed the connection patterns and organizational structure of users within the network. UCINET provided a convenient graphical interface for these analyses. Gephi was utilized for network visualization, employing the Fruchterman-Reingold layout algorithm (gravity coefficient set to 5,000).

It is important to note that BiliBili features a unique discussion interaction function known as "danmaku," which allows learners to send real-time comments that appear over the video while it plays. This feature has been extensively discussed in numerous studies, highlighting its significant social engagement value (H. Chen et al., 2021; R. Wang, 2022; Yin & Fung, 2017). However, since the CUM platform lacks this feature, to ensure the fairness of the comparative analysis, we did not incorporate the textual content and interactions from this feature into the analysis. Therefore, it can be considered that the analysis results are relatively conservative in assessing learners' engagement on Bilibili.

## RESULTS

## Learners' Engagement

The research collected the total views of courses on different platforms, the number of forum participants, and core users (as shown in Table 1). "Core users" refers to users who speak more than once in the entire forum. After stepwise analysis, we believe that 10 times is a suitable standard, relative to the playback volume of the two platforms.

	Bilil		CUM				
Words Classes N Frequency		Words	Classes	N	Frequency		
Philosophy	n.	587	0.04337	Thought	n.	291	0.02357
Teacher	n.	200	0.01478	Confucius	n.	166	0.01345
Question	n.	140	0.01034	Philosophy	n.	124	0.01004
Is	Adv.	132	0.00975	China	n.	122	0.00988
Check-in	Verb.	118	0.00872	Society	n.	115	0.00931
World	n.	112	0.00828	Yin-yang	n.	113	0.00915
Reply	Verb.	111	0.00820	Develop	Verb.	111	0.00899
Haven't	Verb.	104	0.00768	Think	Verb.	107	0.00867
Learn	Verb.	93	0.00687	Teacher	n.	97	0.00786
Wisdom	n.	83	0.00613	World	n.	90	0.00729

#### Table 2. Co-occurrence words

# **Content Analysis**

In the Bilibili forum, our analysis uncovered 2,368 effective comments, comprising 70,901 Chinese characters. The average sentence length is 5.72 words, with a density of 27.43%. Notable word associations within the forum are visualized in Figure 1, where "philosophy" occupies a central position, intimately linked with words such as "science" (N=230), "questions" (158), "world" (88), "wisdom" (79), "teacher" (55), and "history of philosophy" (40), as shown in Table 2.

In the CUM forum, an appreciable amount of duplicate content is identified. Post deduplication, the forum features 612 effective comments, totaling 48,798 characters, resulting in a duplication rate of 53.4%. The average sentence length is 20.17 words, with a density of 20.37%. Figure 2 visually conveys word associations, with "thought" assuming a central role, interconnected with words like "yin-yang" (747), "religion" (547), "consciousness" (437), "society" (397), "philosophy" (346), and "concepts" (339).

# **Sentiment Analysis**

In the Bilibili forum, the sentiment analysis reveals that 42.09% of comments are positive, and 22.01% are negative, resulting in an overall sentiment score of 13.8, as presented in Figure 3. In the CUM forum, the analysis shows 63.59% of positive comments and 15.89% of negative comments, resulting in an overall score of 16.61, as shown in Figure 4. The overall sentiment score is an indicator of whether user generated content is positive. The higher the score, the more positive the content tends to be. The research selected two comments with the highest absolute sentiment scores as examples, displayed in Table 3.

## Thematic Analysis

The research conducted thematic analysis on the forums using the LDA automatic classification method (Ramesh et al., 2014). This entailed 3,000 iterations, featuring a minimum of 2 text features, with 5 topics for Bilibili and 4 topics for CUM. Table 4 presents the topic classification outcomes for both forums. The probability signifies the average likelihood of comments belonging to a particular theme, as depicted in Figure 5, illustrating the distribution of topic numbers within comments.

The results reveal that Bilibili's topic analysis yields moderate accuracy, dividing comments into five categories: "Review," "Content," "Knowledge Transfer," "Interaction and Encouragement," and "History of Philosophy." These categories are uniformly dispersed in the comments. Conversely,



Figure 1. Co-occurrence network of Bilibili

CUM's topic analysis exhibits high accuracy, classifying comments into four categories: "Review," "Confucianism," "Daoism," and "Mencius' Thought," distributed differently within the comments.

# **Social Network**

In social network analysis, graph theory is used to understand and analyze social phenomena (Smith et al., 2009). The results for the Bilibili forum are displayed in Figure 6, and the results for the CUM forum are shown in Figure 7. The network structure in Bilibili does not exhibit a clear social center while, in the CUM network graph, the teacher nodes become the center.

# **Degree Centrality**

Degree centrality pertains to the number of edges connecting a vertex with other vertices. In our analysis, we identified the top 10 users exhibiting the highest betweenness centrality in both network graphs, as detailed in Table 5. Within the Bilibili forum, the user with the highest out-degree and in-degree both registers a value of 4, indicating that they either responded to or received responses

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#### Figure 2. Co-occurrence network of CUM





Neutral

35.90%





#### Figure 4 Sentiment analysis of CUM

#### Table 3 Highest score comments of each platform

Source	Content (Translate from Chinese)	Score	Sentiment
Bilibili	At first, I tried to understand the thoughts of Descartes and Spinoza, constructing absolute universal axioms, and attempting to deduce conclusions. I felt that there was some truth to it, even though I doubted the correctness of the axiomsHume's skepticism about causality made me sense the loopholes in the arguments of the previous philosophers and, at the same time It wasn't until Kant's appearance that he successfully unified the issues of rationalism and empiricism And then came Hegel, and after Hegel, Schopenhauer criticized him. Well, it turns out that philosophy is an endless, unsolvable gameAs a reader, I am sometimes clear and sometimes confused, but this convoluted development is truly fascinating.		positive
	I must say that the teacher's course is quite wonderful, but if you want a more comprehensive understanding, you can read 'Fifteen Lectures on Philosophy.'Also, I strongly recommend turning off the barrage comments!!The barrage content is beyond description and, overall very low qualityEnsuring that you can learn better or experience the content of the course is more importantOf course, I believe that it won't be very difficult for you to make this decision if you've seen the barrage of content yourself.	23	negative
CUM	Certainly, Hegel did recognize the commonalities between the philosophies of Confucius and Cicero, Confucius emphasized that both "governing" and "being human" should be guided by virtueCicero, on the other hand, was results-oriented in his approach. He believed that each form of morality carries a corresponding social responsibility Cicero's concept of "virtue" emerged because he saw the need for virtuous individuals to fulfill these obligations for the construction of society. I believe that Cicero's "virtue" is closer to a kind of "art" or "craftsmanship."	50	Positive
	Mozi's philosophy of non-fatalism differs from Confucius's and Cicero's emphasis on destiny and benevolence. Mozi believed that people can overcome fate and that one should not attribute life's hardships solely to destiny Instead of resigning to fate and considering themselves powerless Mozi's philosophy is about taking control of one's destiny rather than attributing all difficulties to fate and wallowing in self-pity, ultimately leading to self-destruction.	9	Negative

from four other users. Notably, user B#78, with the highest out-degree, also boasts the highest betweenness centrality in the entire network (77), suggesting that user's pivotal role in connecting 77 users. In the CUM forum, the highest in-degree reached 92, while the highest out-degree was 2, signifying the concentration of responses to one user, while other interactions were infrequent. The average betweenness centrality in the CUM forum stood at 0, indicating learner isolation and lack of connections through a specific node. In particular, user M#4 exhibited a unique in-degree value

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#### Table 4. Thematic analysis

Bilibili	CUM				
Theme		Probability Theme		N	Probability
Review	311	71%	Review	135	84%
Content	174	66%	Confucianism	145	80%
Knowledge Transfer	172	71%	Daoism	89	86%
Interaction and Encouragement	221	63%	Mencius' Thought	70	89%
History of Philosophy	169	65%			

#### Figure 5. Themes distribution



of 92, showcasing a continuous stream of responses to that user's posts, yet the user's out-degree remained at 1, implying limited reciprocation with other users.

# **Core-Periphery Analysis**

Core-periphery analysis, a pivotal realm in social network research, endeavors to unveil intricate connection patterns and hierarchical structures within complex networks (Boyd et al., 2006). In the exploration of the core-periphery framework, a frequently employed metric is the density matrix, which serves as a gauge for assessing connection density between core and periphery subgroups.

Our core-periphery analysis of user engagement in Bilibili and CUM forums, detailed in Table 6, underscores the density differences. Structural subgraph 1 in Bilibili boasts a density of 0.417, while CUM's subgraph 1 records a mere 0.009. This signifies a robust internal cohesion but weak external links within CUM's subgraph, contrasting with Bilibili's subgraph characterized by heightened inter-subgroup connectivity.

# DISCUSSION

Opinion expression in forums, with minimal prerequisites, fosters an array of authentic and rich thoughts, beliefs, and knowledge, cultivating a diverse ecosystem (Sharif & Magrill, 2015; Mazzolini & Maddison, 2003). Our research investigates forums across distinct online learning realms, encompassing video-sharing platforms (BiliBili) and traditional MOOCs (CUM). Our



#### Figure 6. Social network of Bilibili forum

objective is to discern variations in students' online learning processes, steered by both internal and external motivations.

# **Characteristics of CUM**

Learners primarily engage CUM for curriculum fulfillment or credit acquisition. While recognizing the importance of internal motivation in MOOC learning (Tilak et al., 2022), we contend that external motivation predominantly governs here. This is manifest in the substantial incidence of forum-based plagiarism, soaring to 50%, with prospects for further escalation upon detailed scrutiny. Educational research highlights the pronounced impact of external motivation on such plagiarism (Anderman & Koenka, 2017; Lee et al., 2021).

Following the removal of duplicate posts, the CUM forum exhibits an average sentence length of 20.17 words and a word density of 20.37%. These metrics indicate active learner participation, bolstered by sentiment analysis, primarily revolving around explicating knowledge-based content. For instance, positive comments, as delineated in Table 2, involve profound discussions of the philosophical ideas of Cicero and Confucius, while negative comments delve into the core tenets of Mozi. This objective expression of knowledge is akin to responding to inquiries, rather than engaging in traditional discourse.

Bilibili				CUM			
User	in	out	Betweenness	User	in	out	Betweenness
B#78	2	4	77	M#4	92	1	0
B#80	2	1	72	M#16	1	2	0
B#177	4	1	65	M#31	1	2	0
B#81	2	3	64	M#35	1	2	0
B#82	2	1	45	M#62	1	2	0
B#589	1	1	42	M#89	1	2	0
B#590	1	1	42	M#90	1	2	0
B#168	2	3	40	M#20	1	2	0
B#588	1	1	40	M#1	1	1	0
B#591	1	1	40	M#2	1	1	0
B#Mean	1.8	1.7	52.7	M#Mean	10.1	1.7	0

## Table 5. Top 10 nodes for each platform

Figure 7. Social network of CUM forum



	Bilibili		CUM		
	Structure 1	Structure 2		Structure 1	Structure 2
Structure 1	0.417	0.000	Structure 1	0.009	0.000
Structure 2	0.001	0.000	Structure 2	0.000	0.000

#### Table 6. Core-periphery analysis of each platform

In the context of network analysis, the forum's structure appears to revolve predominantly around the instructor, with minimal interaction among users. This suggests that posts in the CUM forum mainly serve as responses to the teacher's content and task completion. Similar patterns have been observed in MOOC forums, as documented by Huang et al. (2014) and Mustafaraj (2015). Furthermore, some argue that true online communities cannot thrive in MOOC forums (Gillani et al., 2014).

Theme analysis reinforces these findings. LDA analysis reveals four primary themes: review, Confucianism, Mencius' ideas, and Daoist thoughts. Aside from the first, which represents learners' ideas, the remaining topics predominantly revolve around knowledge. Responses to these thematic posts tend to be direct and focused on the main post, hindering connections among other posts and fostering learner independence (Fisher et al., 2015). Core-periphery analysis corroborates this disconnection. Nonetheless, some attribute this emphasis on thematic posts to the unique "priority attachment effect" within Chinese culture (J. Zhang et al., 2016). Considering these insights, external motivation regulation emerges as a contributing factor in this scenario.

# **Characteristics of Bilibili**

Learners within the Bilibili forum exhibit distinctions from their CUM counterparts. Given the often-dismissed status of philosophy as "useless" knowledge, it is implied that these learners possess intrinsic motivation, propelling their exploration of wisdom-related subjects. Notably, these learners typically do not major in philosophy. Co-occurrence keyword analysis reveals that "philosophy" frequently accompanies "science," signifying an interest in the latter. Additionally, "da ka" (check-in) is a recurrent term, indicating self-motivated actions.

Intrinsic motivation fosters heightened eagerness and deep learning engagement (Ryan & Deci, 2000). Sentiment analysis reflects Bilibili users' heightened cognitive and emotional engagement. Positive instances showcase learners elaborating on cognitive shifts influenced by various philosophers, demonstrating their passion for the subject. Conversely, negative examples involve learners critiquing barrage comments' quality and offering advice. These portrayals exemplify self-regulated learners who express their thoughts and desire for peer interaction. This expressive style thrives in Bilibili's teacher-free environment, fostering equitable communication and learner self-expression (Brinton et al., 2014).

Self-expression facilitates inter-learner communication and encourages positive engagement. Social network analysis reveals that Bilibili users engage in interactions, creating interconnected paths under common topics, aligning with the findings of Chaturvedi et al. (2023). Consequently, the highest betweenness centrality among Bilibili forum users stands at 77, facilitating connections with 77 peers.

The intricacies of forum dynamics (Boroujeni et al., 2017), beyond statistics, are illuminated through in-depth theme analysis using the LDA method. Learners not only convey knowledge but also exhibit profound comprehension and application. This underscores deep cognitive participation and signifies deep learning experiences. Learners also actively discuss "philosophical history," indicating a quest for adjacent knowledge, supporting cognitive engagement (S. Li, 2021).

Emotional exchange forms another thematic dimension. Learners empathize with diverse experiences and inspire improvement. This challenges prior notions of MOOC forums' community-forming challenges (Almatrafi & Johri, 2019). Q. Wu et al. (2018) contended that

video-sharing platforms foster greater knowledge and thought-sharing. Emotional expressions, Weeks et al. (2015) proposed, accumulate across posts. Through STD, intrinsic motivation drives heightened cognitive and emotional engagement in this process.

# **Differences Between Formal and Informal Platforms**

Distinct disparities emerge between these platforms. Our investigation of the Bilibili and CUM forums affirms our two research hypotheses. First, in terms of content, Bilibili courses garner a broader audience, more comments, and keywords infused with social attributes, contrasting with CUM. Learners on Bilibili engage deeply, with comments reflecting content transfer and extension, implying heightened cognitive involvement. Moreover, Bilibili's comments emphasize encouragement and emotional exchange, fostering emotional engagement, a feature scarcely observed on CUM, in line with past research on emotional contagion (Y. Chen et al., 2019).

Second, social network analysis supports these findings. While both platforms exhibit isolated nodes and peripheral participants (Kellogg et al., 2014), Bilibili's network structure embodies decentralization, in stark contrast to CUM's centralized structure, wherein nodes converge around a central figure (the teacher). These outcomes underline significant disparities in learners' experiences across platforms.

These findings delineate a dichotomy: Bilibili learners exhibit heightened engagement and connectivity, contrasting with CUM learners whose behaviors align with traditional offline courses. Despite the acknowledged influence of learner interaction and cognitive engagement on online learning outcomes (Lu et al., 2020; B. Wu & Wu, 2021), some contend that teacher involvement substantially enhances learners' comprehension (J. B. H. Park et al., 2015). Thus, we cannot definitively assert significant differences in learning outcomes.

From an SDT perspective, this research posits that variances in learning processes stem from learners' motivation regulation factors, yielding divergent participation outcomes. CUM learners primarily focus on knowledge acquisition, creating knowledge transfer networks through responses to the teacher's queries (B. Wu & Wu, 2021), potentially enhancing knowledge comprehension. The presence of teachers and evaluation mechanisms fosters external motivation, incentivizing course completion.

Conversely, Bilibili learners engage extensively, facilitating profound cognitive and emotional involvement, and encouraging sustained participation across proficiency levels (Anderson et al., 2014). We propose future MOOC platform designs incorporate strengths from both types, fostering collaboration with video-sharing platforms.

Specifically, several measures can be taken.

- 1. Integrating motivational mechanisms, that is, when designing online learning platforms, consideration should be given to integrating internal and external motivational mechanisms to promote learner motivation and participation.
- 2. Enhancing social interaction, that is, encouraging interaction among learners and creating a more decentralized community, learners can encourage and share knowledge with each other (Brinton et al., 2014).
- 3. Promoting knowledge sharing and innovation, that is, encouraging learners to share their insights and innovative thinking on the platform, they thereby form diversity and innovation in knowledge (Cheng et al., 2013; Jung & Zhou, 2019).
- 4. Improving the interactivity of course content by adding more interactive elements, such as discussion areas, real-time Q&A, and group projects, to enhance learner engagement.
- 5. Enriching social functions and utilizing features, such as danmaku, likes, and comments, to enhance learners' sense of participation and community belonging (R. Wang, 2022).
- 6. Strengthening peer instruction, assigning different roles to active users, and utilizing the connections between learners to improve the interactive experience within society (Kellogg et

al., 2014). This synergy can expand educational opportunities, shatter teacher-centric patterns in MOOC forums and provide society with accessible, high-quality online learning experiences.

## Limitations

While this research has provided insights into the learning processes of users on the MOOC platform CUM and the video-sharing platform BiliBili, it is important to acknowledge some limitations. First, the research was conducted within the specific context of Chinese-language MOOC environments. Past research has indicated that learner participation and learning processes can vary significantly in English-speaking cultures (Aldowah et al., 2020; Walji et al., 2016). Therefore, further research is needed to explore differences in learning processes in various cultural environments and platforms, such as Coursera.com, YouTube, and Twitter. Second, this research analyzed a representative selection of two series of courses, and the results may be subject to bias due to individual heterogeneity. Future research should consider analyzing a larger sample size to validate the conclusions drawn in this research. Third, current research has utilized postevent data from course forums, so no other possible influencing variables have been investigated. Future research can obtain variable data such as demographic and SDT through better research design and further reveal differences between different course platforms through cross comparisons.

# CONCLUSION

As MOOCs expand rapidly, online learning platforms are emerging worldwide. However, some courses are not hosted on specific online learning platforms but are placed on video-sharing platforms for learning. Thus, our research aimed to understand the differences between learners' learning processes on MOOC platforms (CUM) and video-sharing platforms (BiliBili).

Content analysis and social network analysis methods were applied, and the results show significant differences. CUM learners tend to use course content to answer questions to fulfill their course evaluation requirements, resulting in a highly centralized social network structure. In contrast, Bilibili learners are inclined to express their views on knowledge, extend and transfer knowledge from the course, and encourage one another. These actions lead to a decentralized social network structure.

The research suggests that the reason lies in the learners' motivation for participating in the courses. Participants on MOOC platforms are primarily externally motivated by the need to fulfill academic requirements, leading to highly goal-oriented behaviors. In contrast, participants on video-sharing platforms are driven by self-motivation, leading to divergent and social behaviors. Consequently, it is recommended that future development should consider integrating the features of video-sharing and MOOC platforms. By doing so, it can encourage more learners to actively engage in online learning.

## **CONFLICTS OF INTEREST**

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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