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Development of a Theoretical Framework of MOOCs with Gamification Elements to Enhance Students' Higher-Order Thinking Skills: A Critical Review of the Literature

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Abstract

Aim/Purpose	This study aims to develop a theoretical framework for enhancing students' higher-order thinking skills (HOTS) by integrating massive open online courses (MOOCs) with gamification elements.
Background	There is a growing demand to develop students' innovative thinking abilities through MOOCs, focusing on higher-order thinking skills (HOTS), which are essential for 21st-century challenges. While gamification has shown potential in enhancing HOTS, its integration within MOOCs to improve these skills remains underexplored. Enhancing students' HOTS through MOOCs combined with gamification is crucial for developing advanced skills like analysis, evaluation, and creativity. Therefore, there is an urgent need for a robust theoretical framework that effectively merges MOOCs and gamification to enhance students' HOTS.
Methodology	This research used a qualitative research approach employing critical analysis techniques. The research procedures were guided by the SALSA framework. A total of 19 articles from the SCOPUS and Google Scholar databases were selected based on specific criteria: articles published between 2013-2023, articles with keywords such as MOOCs, gamification, higher-order thinking, or engagement, and articles written in English. Thematic analysis was conducted to identify common themes in the selected articles. The proposed framework was developed by drawing upon well-established theories in the fields of educational

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	technology, online learning, collaborative learning, connectivism, student engagement, and Bloom's taxonomy.
Contribution	This study not only synthesizes existing research on MOOCs but also presents a holistic and integrated framework for leveraging learning theories, gamification elements, student engagement dimensions, and HOTS to enhance the effectiveness of MOOC-based education. The proposed framework aims to provide researchers and educators with a comprehensive model for integrating gamification elements into MOOCs to enhance students' higher-order thinking skills. By utilizing this framework, educators can design more engaging and effective online courses, while researchers can further investigate the impact of gamification on learning outcomes and student engagement.
Findings	This study proposes a framework that integrates three main components: connectivism, online collaborative learning, and gamification principles. Implementing these components in the MOOC learning environment aims to enhance digital higher-order thinking as proposed by Churches and improve students' feelings and perceptions towards MOOC learning.
Recommendations for Practitioners	By recognizing the unique challenges of maintaining students' attention in the context of MOOC learning, practitioners can incorporate gamification elements into MOOC learning environments to enhance students' HOTS.
Recommendations for Researchers	Researchers can further explore the understanding and measurement of the dynamics of interactions and engagement within MOOCs. Additionally, they should aim to identify which gamification elements effectively capture students' attention and contribute to their overall engagement.
Impact on Society	By focusing on HOTS, especially through gamification, society can anticipate a generation of individuals with improved critical thinking, problem-solving, and innovative capabilities. Furthermore, the implementation of connectivism in MOOCs can promote a global exchange of knowledge, resulting in diverse perspectives and a shared pool of information. This, in turn, will contribute to a more interconnected and collaborative world to address complex challenges.
Future Research	The future direction of research in MOOC learning contexts should prioritize guaranteeing and fostering student engagement. It should also involve exploring the potential of gamification within MOOCs and refining instructional designs to specifically enhance higher-order thinking skills. By addressing these critical aspects, researchers can contribute to the ongoing evolution of online education and ensure its effectiveness and relevance in the ever-changing landscape of digital learning.

Keywords: higher-order thinking, MOOCs, gamification, student engagement, online collaborative learning

INTRODUCTION

Higher-order thinking skills (HOTS) are essential in the 21st century, emphasizing abilities such as analyzing, evaluating, and creating. Research has shown that HOTS also requires logical thinking, critical thinking, and reasoning skills (Marshall & Horton, 2011). To promote students' HOTS in an online learning context, this study proposes a framework that uses Massive Open Online Courses (MOOCs) and gamification.

A MOOC is a digital learning platform developed by higher education institutions to offer large-scale courses for active learning (McGovern et al., 2020). The term 'MOOC,' coined by Georges Siemens and Stephen Downes in 2008 (Kovanović et al., 2015), combines connectivism theory and online collaborative learning theory to provide connective knowledge in an online environment. MOOCs were initially designed to facilitate interactions among many participants and use online tools for a more dynamic learning experience than traditional methods. Over time, they have become a globally recognized method of online learning (Shah, 2020).

MOOCs offer many advantages, such as enhancing educational equity through technology and overcoming geographical barriers in traditional teaching and learning (Alamri, 2022). During the initial stages of the COVID-19 outbreak, MOOCs played a crucial role in extending educational resources and maintaining the quality of teaching and learning (Alamri, 2022).

As MOOCs evolve, there is a growing need for students to develop innovative thinking abilities, including HOTS (Serevina et al., 2019). HOTS are critical for students to reach their full potential and meet the demands of the 21st century (Wilson & Narasuman, 2020). Bloom's (1956) taxonomy highlights the importance of HOTS in education, and in recent years, gamification has emerged as a method to enhance these skills (Bourke, 2021). Studies have shown that gamification has a positive impact on improving students' HOTS (Angelelli et al., 2023; Yeh et al., 2017).

Combining gamification with MOOCs is crucial for improving HOTS because it involves higher-level thinking processes (Anderson et al., 2001). Therefore, designing a MOOC learning model with gamification elements is essential. However, few studies have explored enhancing HOTS through MOOCs with gamification. This research aims to propose an effective theoretical framework for enhancing students' HOTS using a MOOC platform integrated with gamification elements.

Finally, analyzing detailed information from previous research on each component of the proposed theoretical framework was crucial for conducting this study.

LITERATURE REVIEW

To achieve the objectives of this research, it is necessary to examine detailed information on each element from previous studies. This section also covers the history, evaluation, and background of each research component in this study.

MASSIVE OPEN ONLINE COURSES (MOOCS)

In recent years, MOOCs and information and communication technologies (ICT) have transformed how teachers and students interact in education (Albelbisi et al., 2021). During the COVID-19 pandemic, MOOCs positively impacted expanding higher education options and improving the quality of teaching and learning (Alamri, 2022).

MOOCs were first proposed in 2008 by Siemens and Downes (Kovanović et al., 2015). They are online courses that provide unrestricted access to educational resources via the Internet. These courses include traditional teaching materials, like lectures, readings, and quizzes, as well as interactive components, such as user forums and social media discussions. This collaborative learning approach fosters supportive interactions among participants, making MOOCs a significant development in online education (Herath & Herath, 2020).

Over time, MOOCs have evolved into two main types: connectivist MOOCs (cMOOCs) and extended MOOCs (xMOOCs) (Yeager et al., 2013). cMOOCs focus on connecting students for collaborative problem-solving, while xMOOCs follow a more traditional instructional structure with defined course goals and teacher-led knowledge acquisition (Rodríguez et al., 2017).

Despite their advantages, such as being free, accessible worldwide, and enhancing cognitive skills through student-teacher interactions (Aljaraideh, 2019), MOOCs face several challenges. These include concerns about course quality, high dropout rates, lack of course credits, ineffective assessments, complex copyright issues, and the need for proper hardware for participation (Zawacki-Richter et al., 2018). High dropout rates are a significant issue, with only a small percentage of participants completing courses compared to traditional learning (De Notaris et al., 2021). Geographic and physical factors also reduce interactions among participants, weakening engagement and collaborative problem-solving (Hu et al., 2023).

Engagement has been identified as a key factor in the high dropout rates in MOOCs, as highlighted in a systematic review by Ortega-Arranz et al. (2022). While existing research focuses on reducing dropout rates and improving course quality through instructional design (Borrella et al., 2022), there is a notable gap in how MOOCs can improve students' higher-order thinking skills (HOTS). As the job market and society evolve, developing HOTS is crucial for success, and MOOCs offer a valuable opportunity for this. However, there is limited research on the best instructional designs for fostering HOTS in MOOCs.

INSTRUCTIONAL DESIGN

Instructional design encompasses a structured approach to developing optimal learning environments using a systems-based methodology. Its goal is to maximize efficiency and effectiveness in facilitating education for students (Jiang et al., 2021). The significance of instructional design in the teaching-learning process is pivotal for achieving pedagogical and performance objectives.

Gagné (1965) proposed nine instructional design principles in his book *The Conditions of Learning*. These principles include gaining the learner's attention, informing them of objectives, stimulating recall of prior learning, presenting the learning stimulus, providing guidance, eliciting performance, offering feedback, assessing learner performance, and enhancing retention and transfer. These principles have served as a foundational framework for educational practices (Reiser, 2018). However, it is important to recognize their behaviorist roots.

Gagné's (1965) principles reflect a linear and systematic instructional approach that focuses on gaining attention, presenting stimuli, and providing feedback. However, in the evolving landscape of online learning, this approach may fall short of fully leveraging the potential of digital platforms.

One notable limitation arises from the linearity of Gagné's (1965) principles, which may not align with the non-linear nature of online learning environments. MOOCs and digital learning platforms afford learners the flexibility to navigate content adaptively (Arpaci et al., 2020). In this context, connectivism, which emphasizes networks and connections in the learning process, takes precedence (Chatti et al., 2010). Connectivism, as a newer theory rooted in constructivism (Campbell & Tran, 2023), leverages technology as the medium of instruction where knowledge is conceptualized as interconnected nodes, reflecting non-linear flow. This contrasts with the rigid structure implied by Gagné's (1965) principles.

Furthermore, constructivism posits that learners actively construct understanding through interaction and collaboration, challenging the traditional role of the instructor as the sole source of knowledge delivery (Narayan et al., 2013). In contrast, Gagné's (1965) principles place a heavier emphasis on systematic information presentation. The evolution of instructional design, particularly in online contexts, requires a shift towards more learner-centered and participatory approaches (McCombs, 2015).

Moreover, integrating gamification principles in instructional design aligns with constructivist ideals. Gamification introduces challenges, rewards, and interactivity, transforming the learning experience into a dynamic and engaging process (Dichev & Dicheva, 2017). This departure from Gagné's (1965) more prescriptive approach allows for a holistic consideration of individual learning styles and preferences.

In conclusion, while Gagné's (1965) instructional design principles have contributed to the field, their behaviorist underpinnings may limit their applicability in the dynamic landscape of online learning.

Recognizing the importance of connectivism, constructivism, and gamification opens up possibilities for more adaptive and interactive instructional design practices that cater to the diverse needs of contemporary learners.

Gamification

Gamification involves incorporating game elements into non-game environments, with a primary focus on designing interfaces, patterns, models, and principles, as highlighted by Deterding et al. (2011). Existing research has demonstrated the positive impact of gamification on MOOCs, improving completion rates and fostering higher levels of student activity, satisfaction, and motivation compared to courses without gamification (Rincón-Flores et al., 2019). Furthermore, research conducted by Serice (2023) suggests that a well-designed gamified learning context can improve students' cognitive and emotional abilities, problem-solving skills, collaborative skills, and resilience when facing challenges.

Moreover, gamification has been recognized for its positive influence on student engagement; a factor often correlated with increased MOOC completion rates (Hone & El Said, 2016). Participants in MOOCs that incorporate gamification elements tend to exhibit higher levels of activity, satisfaction, and motivation compared to those in courses without gamification (Rincón-Flores et al., 2019). Chang and Wei's (2016) study aimed to identify the most effective gamification design elements for engaging students in a MOOC learning environment. The research listed several game mechanics, such as virtual goods, redeemable points, leaderboards, wordless pictures, trophies, and badges, that positively affect participant engagement. Conversely, poor game mechanics were identified as a potential reason for students failing to achieve learning objectives (Chang & Wei, 2016).

In 2022, Huang et al. conducted a study using business simulation games (BSGs) to explore the relationship between student engagement, learning achievement, HOTS, and BSGs. The results affirmed that BSGs can enhance students' engagement, encompassing behavioral, cognitive, and emotional dimensions, and foster HOTS, particularly creativity, critical thinking, and problem-solving.

It is crucial to note that the effectiveness of gamification in MOOCs is contingent on the thoughtful integration of suitable game design elements, specifically mechanics, dynamics, and emotions, as identified by Hallifax et al. (2019). Appropriately designed gamification elements can significantly boost student motivation, while poorly designed choices may yield the opposite effect. To achieve an efficient gamification design in MOOC courses, it is essential to thoughtfully incorporate these design elements into the overall course structure.

Higher-Order Thinking Skills

HOTS (Higher-Order Thinking Skills) are commonly associated with Bloom's (1956) Taxonomy. The taxonomy initially outlined six major categories in the cognitive domain: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. In 2001, the levels were slightly renamed and reordered as Remember, Understand, Apply, Analyze, Evaluate, and Create (Anderson et al., 2001). The revision of Bloom's (1956) Taxonomy aimed to address the evolving behaviors, actions, and learning opportunities facilitated by technological advancements.

Churches (2007) introduced a new version called Bloom's Digital Taxonomy, which aligned with the 2001 revision. This version includes verbs that address various forms of learning and creation, reflecting the demands of the digital age.

Improving students' HOTS is considered one of the educational objectives of higher education institutions (van Velzen, 2017), especially their abilities to analyze, evaluate, and create. There are several approaches to improving students' HOTS, and one of them is digital game-based learning, which has the potential to support the enhancement of students' HOTS (Tangkui & Keong, 2021). Thus, gamification can be applied as an online learning tool to improve students' HOTS.

It is important to design a MOOC learning mode combined with gamification design elements to enhance students' HOTS. The efficient theoretical framework should be analyzed and designed based on theories related to HOTS, as well as the principles of MOOCs and gamification. Additionally, there is a lack of studies investigating the improvement of HOTS using MOOC education sources with gamification elements and whether MOOC platforms can have a positive effect on improving students' HOTS. Hence, this research proposes an efficient theoretical framework for enhancing students' HOTS through a MOOC platform integrated with gamification design elements.

Analyzing and explaining the findings of each component of the proposed theoretical framework from previous research contributes to forming research questions and helps the researcher select a suitable methodology to answer them.

RESEARCH QUESTIONS

This study aimed to address the following research questions:

- What are the main learning theories utilized in MOOCs?
- What are the core principles of gamification design elements implemented in educational settings?
- What dimensions define students' online engagement in MOOCs?
- What are the notable theories associated with higher-order thinking skills in education?
- How can a theoretical framework be structured to incorporate gamification elements and higher-order thinking in MOOCs?

METHODOLOGY

This study utilized a qualitative research approach, specifically a critical analysis technique. According to Singh (2021), critical analysis aims to engage with the text in order to better understand the material and facilitate further discussion on the topic. Therefore, critical analysis was chosen to explore and analyze the theories of MOOC learning, design principles of gamification elements, and dimensions of student engagement in MOOC learning. In order to achieve this, it was necessary to analyze these elements based on previous related research.

The research procedures for this study were based on the SALSA framework (Grant & Booth, 2009), which involved the following steps:

1. **Search: Defining the search string and types of databases**
   The search strings defined for this study were:
   - "MOOCs"
   - "Gamifications"
   - "Higher-order thinking"
   - "Engagement"
2. **Appraisal: Defining the selection criteria**
   The selection criteria for the articles were as follows:
   - Articles published between 2013 and 2023
   - Articles with keywords such as "MOOCs," "gamification," "higher-order thinking," or "engagement"
   - Articles written in English

   Table 1 displays the number of selected articles based on these criteria. Some articles were excluded during the selection process to ensure the validity of the articles selected from the database. These exclusions were based on reasons such as the absence of higher-order thinking in online learning, the non-use of MOOCs as a teaching instrument, and the research not specifically focusing on higher-order thinking improvements.

3. **Synthesis: Extracting common points and developing the proposed framework**
   Thematic analysis was used to analyze the articles and identify the underlying theories in most MOOC research, gamification principles, and dimensions of online engagement. By employing deductive methodology, this approach allows for the systematic identification of commonalities (Alhojailan, 2012) and differences across a large volume of textual data, making it a useful and flexible method for synthesizing information (Sutan et al., 2015) from diverse sources such as academic articles. This phase also led to the development of the proposed framework.
4. **Analysis: Analyzing the proposed framework and drawing conclusions**
   The proposed framework was analyzed and discussed in order to draw conclusions.

Table 1. Number of selected articles

No	Criteria	Number of articles
1	Learning theories related to MOOCs	6
2	Research related to gamification and its principles	5
3	Student's online engagement	8

RESULTS AND DISCUSSION

This section presents the results of the study and discusses the theories and principles behind each research component after critically analyzing the data.

MOOCS LEARNING THEORY

A critical analysis of six articles revealed that most research on MOOCs uses connectivism theory as their theoretical foundation. This theory, also the basis for cMOOCs, has been chosen as a key component of the theoretical framework for this study. Table 2 provides a detailed breakdown of the learning theories proposed in MOOC-related articles.

Table 2. Learning theories of MOOCs

Title	Year	Authors	Learning theory
A HyFlex-flipped class in action learning: A connectivist MOOC for creative problem-solving	2022	Nasongkhla and Sujiva	Connectivism
Evaluation of MOOCs learning design based on connectivism	2022	Anber, Razak and Halili	Connectivism
A theoretical analysis of MOOCs types from a perspective of learning theories	2015	Kesim & Altınpulluk	Connectivism
Self-motivation challenges for student involvement in the open educational movement with MOOC	2015	García Espinosa, Tenorio Sepúlveda and Ramírez Montoya	Connectivism
The pedagogy of personalised learning: Exemplars, MOOCS and related learning theories	2013	McLoughlin	Connectivism
Theories and applications of massive online open courses (MOOCs): The case for hybrid design	2015	Anders	Prescriptive/Emergent Social constructivist Andragogy

Connectivism theory, developed by Siemens and Downes in 2005 (Herlo, 2016), emphasizes that learning occurs through connections, particularly those facilitated by technology (Kesim & Altınpulluk, 2015). It is an effective method for students to gain knowledge by establishing social networks with technologies like media and information streams, which promote an open, real-time, two-way flow of information (AlDahdouh, 2018; Siemens, 2005). McLoughlin (2013) confirmed that in a personalized learning MOOC context, connectivism allows students ubiquitous access to networked technologies in the information era.

Studies show the benefits of integrating connectivism theory in blended learning environments. For example, a connectivism-based instructional design significantly improves students' critical thinking skills (Quadir et al., 2024), a crucial component of higher-order thinking skills (HOTS) (Marshall & Horton, 2011). Routh et al. (2021) found that such a learning environment enhances students' ability to solve complex problems.

In online learning environments like MOOCs, connectivism underscores the interconnected nature of knowledge, where information is distributed across networks (O'Brien et al., 2017). Learners must develop skills to navigate and use these connections effectively. Despite challenges in fostering connections among participants, design elements like discussion forums play a crucial role. Promoting connectivism in MOOCs helps students create cybernetic connections in forums, leading to new knowledge agreements and invigorating the learning community (García Espinosa et al., 2015). Discussion-oriented activities in MOOCs allow participants to engage in higher-order cognitive tasks, highlighting the importance of cognitive engagement (Ferguson & Sharples, 2014). Anders (2015) noted that connectivism in a hybrid MOOC environment positively impacts HOTS and facilitates personalized learning. A HyFlex-Flipped learning context based on connectivism can encourage students to inquire, reflect, and use innovative solutions for real-world problems (Nasongkhla & Sujiva, 2022).

Connectivism is highly prevalent in MOOCs research not just because of its statistical dominance but for two key reasons. First, connectivism aligns perfectly with the MOOC platform, reflecting the theory in distance teaching and learning environments (Corbett & Spinello, 2020). MOOCs, with their large number of participants, form dynamic learning networks. Second, some MOOC design elements are based on connectivism principles, such as autonomy, where students control their own learning (Anber et al., 2022). Participants are encouraged to independently choose technology tools and engage in discussions, blog posts, virtual game environments, and online meetings. These platforms further facilitate connections and contributions, embodying the principles of connectivism (Corbett & Spinello, 2020).

Principles of Gamification

Gamification involves using game design elements in non-game contexts, focusing on aspects like interface, patterns, models, and principles (Deterding et al., 2011). This educational tool aims to enhance students' concentration, motivation, engagement, and overall learning experiences. In this study, gamification is used to demonstrate its positive impact on both MOOC learning (Swacha & Szydłowska, 2023) and the enhancement of students' higher-order thinking skills (HOTS).

Research has shown that gamification positively influences MOOCs by increasing student engagement, which is a key factor in addressing the high dropout rates in MOOC learning (Hone & El Said, 2016). Courses with gamification see improved completion rates, as well as higher levels of student activity, satisfaction, and motivation compared to courses without gamification (Rincón-Flores et al., 2019).

In a gamified learning environment, students are encouraged to acquire knowledge and develop skills through elements like challenges, rewards, points, levels, options, and badges (Alexiou & Schippers, 2018). Studies by Alsawaier (2018) and Hellín et al. (2023) have shown a strong link between gamified learning and increased student motivation, engagement, and academic performance.

Investigating the design principles of gamification that positively impact academic achievement is crucial. A critical review of five articles provides insights into these principles, which are summarized in Table 3.

Table 3. Gamification elements

Title	Year	Authors	Findings	Gamification principles
Engaging MOOC through gamification: Systematic mapping review	2019	Rincón-Flores, Montoya and Mena	• Gamification in MOOCs increased the completion rate, and users were more active, satisfied, and motivated compared to courses that did not offer gamification.	dynamics mechanics components
Does gamification make a difference in programming education? Evaluating FGPE-supported learning outcomes	2023	Swacha and Szydłowska	• Using the MOOC itself is not enough; thus, gamification has had a positive effect on programming learning outcomes. • Combining a gamified programming learning environment with MOOCs is important.	not mentioned
Enhancing student motivation and engagement through a gamified learning environment	2023	Hellín et al.	• The gamification system had a positive impact on students' motivation and engagement in the programming course.	points achievements leaderboards store
Once upon a tip … A story of MOOCs and gamification	2017	Bidarra and Coelho	• Gamification is crucial to the future of MOOCs. However, most attempts seem to be very experimental. • Engagement, motivation, achievement, and game mechanics are important factors that need to be considered in gamification. • Points, levels, badges, rankings, and other means have proved successful in MOOC learning.	mechanics, dynamics, emotions
Proposal of an assessment framework for gamified environments: A case study	2019	Gasca-Hurtado et al.	• Gamification based on the MDE framework in the learning environment can increase engagement, sense of control, self-efficacy, and adoption of new initiatives, as well as increase satisfaction with internal communication.	mechanics, dynamics, emotions

Based on a critical analysis of various studies concerning gamification and MOOCs, it is evident that gamification has a positive impact on the learning process in MOOCs (Bidarra & Coelho, 2017), leading to improved academic achievements and performances among students. Some commonly used design elements in these studies include points, achievements, and leaderboards. Regarding the result of gamification principles analysis, two studies utilized mechanics, dynamics, and emotions, while one study employed mechanics, dynamics, and components. In contrast, one study used gamification elements such as points, achievements, and leaderboards as the principles.

According to the research conducted by Gasca-Hurtado et al. (2019), gamification based on the dynamics, mechanics, and emotions framework has a positive impact on enhancing engagement, sense of control, self-efficacy, and increased satisfaction. Considering the frequency of the "mechanics, dynamics, and emotions" three principles and their positive impacts, the gamification principles – dynamics, mechanics, and emotions – are integral components of the theoretical framework in this research, aiming to integrate with MOOCs to enhance HOTS.

'Mechanics' in gamification pertains to the settings in the game context designed by the developers, encompassing game goals, rules, game settings, and the types of interactions within the game. As the foundational aspects of the gamified experience, mechanics determine how players interact and how to win or lose the game (Robson et al., 2015). Commonly used mechanic elements include challenges, feedback, and rewards (Khaldi et al., 2023). 'Dynamics,' on the other hand, refers to the types of player behavior that occur during the game, contingent on how players react to the established mechanics. However, dynamics may vary if other spectators or observers participate in the game (Robson et al., 2015). 'Emotions' in gamification denote players' mental affective perceptions and reactions produced during their participation in a game, reflecting how they perceive the mechanics and the dynamic results they generate (Robson et al., 2015).

Online Engagement Dimensions

There is a significant positive relationship between students' online learning engagement and their motivation, satisfaction, and academic performance (Lee et al., 2019; Rajabalee et al., 2020). After a critical analysis of students' online engagement dimensions, as discussed across eight articles, it becomes apparent that behavioral, emotional, cognitive, and social engagement are the most frequently addressed dimensions (Table 4).

Table 4. A critical analysis of students' online engagement dimensions

No	Authors (year)	Online engagement dimensions					
		Behavioral engagement	Cognitive engagement	Emotional engagement	Social engagement	Collaborative engagement	Affective engagement
1	Linnenbrink and Pintrich (2003)	/	-	/	-	-	-
2	Fredricks et al. (2004)	/	/	/	-	-	-
3	Veiga (2016)	/	/	-	-	-	/
4	M. Wang et al. (2016)	/	/	/	/	-	-
5	Poon et al. (2022)	/	/	/	/	-	-
6	Redmond et al. (2018)	/	/	/	/	/	-
7	Deng et al. (2020)	/	/	/	/	-	-
8	Turk (2022)	/	/	/	-	-	-

Linnenbrink and Pintrich (2003) did not specifically explore online engagement dimensions, while Fredricks et al. (2004) emphasized cognitive and emotional engagement but did not explore behavioral and social engagement extensively. Veiga (2016) primarily focused on cognitive and affective engagement, neglecting dimensions related to behavior and social interaction. However, M. Wang et al. (2016) and Poon et al. (2022) provided a comprehensive examination of behavioral, cognitive, emotional, and social engagement. Redmond et al. (2018) expanded this analysis by including collaborative engagement but did not explore affective engagement. Deng et al. (2020) similarly explored multiple dimensions but omitted collaborative engagement. Turk (2022) concentrated on behavioral, cognitive, and emotional engagement, leaving out social and collaborative aspects. Overall, while there is variance in the dimensions emphasized across the articles, behavioral, emotional, cognitive, and social engagement emerge as the most commonly addressed dimensions in the context of online learning environments.

Behavioral, emotional, and cognitive engagement are consistently highlighted as extensively studied forms of engagement in the literature (Gorgun et al., 2022). In the context of MOOCs, where learning occurs entirely online, and active interaction among students is encouraged, the addition of 'social engagement' in this study becomes crucial. Social engagement encompasses interactions between students as well as between students and instructors.

Behavioral engagement in an online learning setting refers to participants' responses to learning activities and can be observed through indicators such as participation, persistence, and positive conduct. Some students' behavior can be categorized as positive behavioral engagement, such as their attendance, participation in discussion, and resilience when faced with challenging tasks (Kahu et al., 2015). On the other hand, cognitive engagement is defined as participants' mental effort invested in learning activities, encompassing aspects like deep learning, self-regulation, and understanding of the learning content (Hollister et al., 2022). As such, students with high levels of cognitive engagement are more likely to demonstrate higher-order thinking skills within their cognitive abilities (Christenson et al., 2012). Lastly, emotional engagement in the context of MOOC learning is interpreted as the emotional connections between participants and instructors, peers, and the MOOC content itself (Deng et al., 2020). Students' emotional engagement in MOOC discussion forums is significantly related to their academic achievement, and positive emotional engagement contributes to improving learning performance (Liu et al., 2019; Xing et al., 2019). On the contrary, negative emotional engagement can be generated from bad learning experiences and unsuccessful problem-solving during the learning process (Peng & Xu, 2020). In conclusion, these dimensions collectively contribute to a comprehensive understanding of students' engagement in the MOOC learning environment.

COLLABORATIVE LEARNING THEORY

The theory of online collaborative learning (OCL), as developed by Harasim (2012), presents a model that encourages and supports students to innovate, explore creative approaches, and seek the conceptual knowledge necessary for problem-solving rather than focusing on memorizing correct answers. This theory builds upon the foundation of social constructivist theory proposed by Vygotsky (1978), which emphasizes that knowledge is constructed through interactions with others (McKinley, 2015). While constructivist theory emphasizes that students learn based on experiences collected from their environment, social constructivist theory emphasizes knowledge construction through collaboration with peers and teachers. The construction of knowledge can occur anywhere and at any time and is facilitated through group discussions, teamwork, or social media forums (Kapur, 2018).

Harasim (2012) identified the potential advantages of integrating teaching and learning into the Internet and large-scale networked education. Within the OCL framework, group discourse involves three essential knowledge construction processes: idea generation, idea organization, and intellectual convergence. The idea generation phase represents brainstorming, where students gather diverse thoughts. Idea organizing involves students comparing, analyzing, and categorizing ideas acquired through discussions and argumentation. Intellectual convergence is the stage where cognitive synthesis and consensus occur, often manifested through assignments, essays, or other forms of work (Harasim, 2012). The theory promotes collaborative problem-solving through discourse, with the teacher taking on the role of a facilitator or member of the learning community.

While most studies on online collaborative learning have focused on affective or cognitive outcomes (Oyarzun & Martin, 2023), researchers have found that OCL learning promotes student engagement through group discussions and improves academic performance (Ng et al., 2022). In addition, prior research has confirmed that using technology to facilitate collaboration among students has a positive impact on student learning, satisfaction, and engagement (Ku et al., 2013).

THE PROPOSED FRAMEWORK

Figure 1 presents a theoretical framework that combines three main components: connectivism by Siemens and Downes (Herlo, 2016), online collaborative learning by Harasim (2012), and gamification principles by Robson et al. (2015). The goal is to enhance higher-order thinking and influence students' perception of learning in MOOCs.

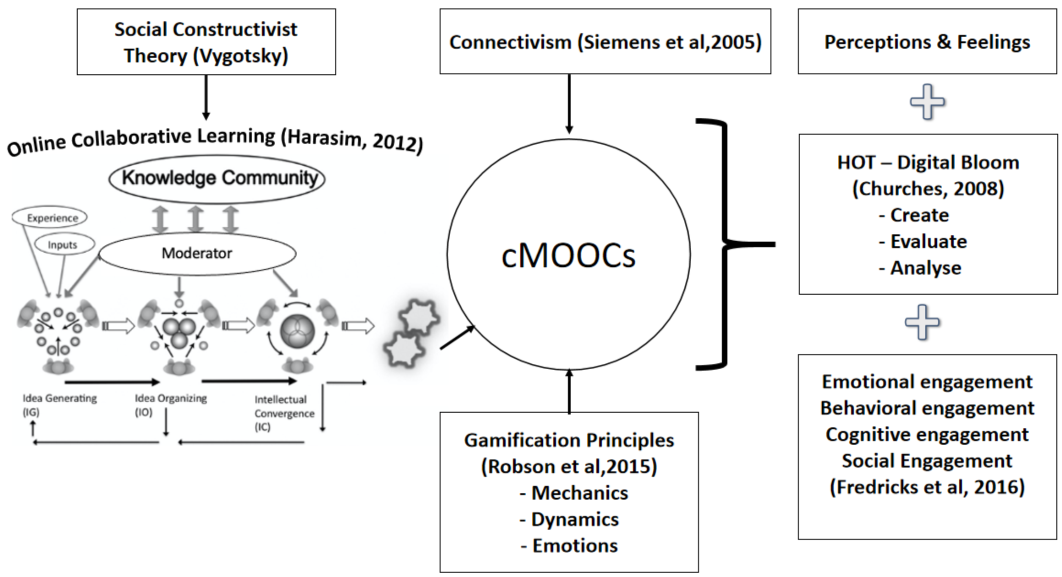

Figure 1. The proposed theoretical framework

This framework serves as a guide for educators to effectively incorporate gamification elements in MOOCs, creating a more engaging and stimulating learning environment. The arrows in the figure represent dynamic and interactive relationships between the components. For instance, the arrow connecting Social Constructivist Theory to Online Collaborative Learning (OCL) emphasizes the role of social interaction and collaboration in knowledge construction within a community. The bi-directional arrows between the OCL elements (Idea Generating, Idea Organizing, and Intellectual Convergence) highlight the cyclical nature of collaborative learning processes. The connection from Connectivism to cMOOCs underscores the importance of networked learning and knowledge sharing in massive online courses. Integrating Gamification Principles into cMOOCs showcases how mechanics, dynamics, and emotions can enhance learner engagement (emotional, behavioral, cognitive, social engagement), perceptions, and feelings, thereby emphasizing the multifaceted impact of gamification on higher-order thinking skills. These arrows collectively ensure that both theoretical and practical elements contribute to a cohesive and effective framework for improving higher-order thinking skills through gamified MOOCs.

Connectivism theory serves as the foundation for cMOOC design and is often proposed in MOOC research. This theory is aligned with the online MOOC learning environment, which emphasizes the importance of connections during the learning process. Additionally, technologies can support learning activities in a cMOOC environment. According to Z. Wang et al. (2018), students can utilize technologies such as Twitter, blogs, or Facebook to build their own learning space or group learning space in the cMOOC environment, connecting students both within and outside of the learning process. Similarly, a discussion forum generates emotional and cognitive engagement, as highlighted by Pietarinen et al. (2014). MOOC platforms often include a discussion forum, which facilitates student interaction and communication, as Wu and Wu (2021) noted.

Furthermore, the OCL theory shares similarities with connectivism in advocating for innovative approaches and conceptual knowledge exploration rather than rote memorization. Both theories prioritize the highest levels of thinking skills, such as creativity and innovation. Moreover, the utilization of online tools in the context of the OCL theory stimulates collaboration and interaction between learners, according to Robles (2017). The OCL theory also enhances students' critical thinking skills as part of higher-order thinking skills (HOTS), as Alharbi et al. (2022) discussed.

Recent trends in MOOC course design involve incorporating new elements to promote higher-order thinking skills (HOTS) among students (M. Wang et al., 2016). One effective tool in this regard is gamification, which has been shown to have positive impacts on MOOC learning environments. Research indicates that gamification increases completion rates and enhances participant activity, satisfaction, and motivation (Rincón-Flores et al., 2019). It is clear that gamification has the ability to motivate MOOC users and contribute to continuous learning. Additionally, implementing achievement elements such as badges, leaderboards, points, and progress bars has been found to be the most efficient way to gamify a MOOC learning environment (Rohan et al., 2021).

Furthermore, studies have demonstrated that gamification can enhance students' higher-order thinking skills. For example, Tangkui and Keong (2021) conducted a quasi-experimental study that showed the effectiveness of gamification in improving HOTS in a mathematics lesson. Similarly, Nagarajan and Sen (2022) investigated the potential of gamified learning on social networking sites to develop Bloom's (1956) HOTS and found that it led to improved collaboration skills. Angelelli et al. (2023) also found that students in a gamified learning environment demonstrated high levels of creative and critical thinking abilities, as well as positive outcomes in the evaluation and analysis phases. Based on recent research, integrating gamification in a MOOC learning environment is supported for improving students' HOTS. Firstly, this integration can address the challenge of high dropout rates in MOOCs and enhance student motivation and engagement. Secondly, gamification has a positive impact on improving HOTS, filling the gap in research regarding its effects in a MOOC setting.

The proposed framework for integrating gamification in MOOCs includes three key principles: dynamics, mechanics, and emotions. These principles were selected based on a critical analysis of existing literature and are essential to the gamification strategy aimed at enhancing HOTS in the context of MOOCs.

Overall, the proposed framework fulfills the requirements for improving students' HOTS in a MOOC learning environment. It incorporates the three principles of gamification and integrates relevant theories to enhance students' learning experiences, including their engagement and collaboration during the learning process.

CONCLUSION

In this study, the researcher proposes a framework to enhance students' higher-order thinking skills (HOTS) by integrating a gamification platform within a MOOC learning context. The MOOC learning platform is unique compared to other methods and platforms in its ability to facilitate interactions among a large number of participants and create a more engaging and interactive learning environment using online tools. Additionally, the MOOC platform is recognized globally as an effective online learning method (Shah, 2020). However, despite its advantages, the MOOC learning platform also has some drawbacks, such as high dropout rates and low engagement.

Previous research has shown that gamification has a positive impact on improving students' HOTS. It has also been found to have positive effects on students' outcomes in MOOC learning experiences. Therefore, gamification was chosen as a key component in the proposed framework to enhance students' HOTS within the MOOC learning environment. The conceptual framework introduced in this research aims to optimize students' HOTS by thoughtfully incorporating gamification elements into the context of MOOCs. First, gamification in the framework is expected to address the disadvantages of MOOC learning, such as high dropout rates. Second, the three gamification design principles contribute to creating an appropriate gamified learning context with well-designed elements. Additionally, the proposed framework includes the Online Collaborative Learning theory, which improves students' interactions and collaborations during the MOOC learning process within the gamified environment. Lastly, gamification, as the core component of the framework, has positive impacts on both the MOOC learning process and the enhancement of students' HOTS.

In conclusion, the proposed framework aligns with the main research objective of promoting students' HOTS within the positive impacts of gamification in the MOOC learning environment. Furthermore, the framework is based on relevant theories that underpin each component.

Limitation and Future Studies

The study acknowledges certain limitations that need to be considered in future research. One major challenge is the measurement of students' engagement in MOOC learning contexts. This is especially difficult due to the absence of immediate interactions between students and teachers, which are commonly observed in traditional, teacher-centered learning settings. The online nature of MOOCs makes it difficult to gauge students' attention and level of engagement throughout the course. The study recognizes the complexity of measuring the four types of engagement – behavioral, emotional, cognitive, and social – particularly when students are dispersed and participating individually in the course.

Another acknowledged limitation is the uncertainty surrounding whether the instructional design of gamification effectively captures students' attention within the MOOC learning context. While gamification elements have been shown to have positive impacts in online learning environments, ensuring that gamification in MOOCs is designed to engage students remains uncertain.

For future research, it is suggested that these limitations be addressed. Specifically, there is a need to investigate methods that can guarantee and enhance students' engagement and interactions within the unique context of MOOC learning. Additionally, further exploration of instructional strategies incorporating gamification is recommended, with an emphasis on developing detailed methodologies to measure the enhancement of students' higher-order thinking skills in various subjects.

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