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# Unlocking the Potential in a Gamification-Based MOOC: Assessing Autonomous Learning and Self-Directed Learning Behaviors

## ABSTRACT

Massive open online courses (MOOCs) have significantly advanced online education. Yet, MOOC instructors still grapple with the ongoing challenge of low learner engagement while striving to foster autonomous and self-directed learning (SDL). Integrating gamification into these courses could be a promising solution. However, the extent to which gamification shapes autonomous and SDL behaviors within MOOCs remains underexplored. This mixed-methods sequential explanatory study investigates the interplay between MOOC, gamification, autonomous learning, and SDL behaviors to harness the potential of online education. We address this research void by delving into the intricate relationship between gamification and learners' engagement in autonomous learning and SDL behaviors. Drawing upon self-determination theory (SDT) as a theoretical framework, we scrutinize how gamified MOOCs influence intrinsic motivation and SDL behaviors. Our study utilizes questionnaires and structured interviews to comprehensively examine the users' experiences within a gamified MOOC. The findings suggest that thoughtfully integrated gamification elements not only enhance learner engagement but also stimulate autonomous learning and SDL behaviors. However, it is crucial to approach the integration of gamification thoughtfully, ensuring a balance that promotes intrinsic motivation without undue reliance on extrinsic motivators. These findings hold significant implications for educators, course designers, and policymakers leveraging gamification to enrich online learning experiences and cultivate self-directed educational pathways. They offer valuable insights for educators, course designers, and policymakers aiming to leverage gamification for enriching online learning experiences and nurturing self-directed educational pathways in MOOCs.

## KEYWORDS

autonomous learning, gamification, MOOC, self-directed learning

## INTRODUCTION

Massive online open courses (MOOCs) have revolutionized contemporary education by offering unprecedented access to knowledge and learning opportunities on a global scale (Al-Imarah and Shields 2019; Czerniewicz, et al. 2017; Gameel and Wilkins 2019). These digital platforms have transformed traditional education models by eliminating geographical constraints and providing learners with convenient (Ahmad et al. 2022; Mellati and Khademi 2020), cost-effective (Nissenson and Shih 2016), and flexible access to high-quality educational resources (Costello, Soverino, and Bolger

2022; Guest et al. 2021; Liyanagunawardena et al. 2019). However, the widespread adoption of MOOCs has brought to light significant challenges, most notably high dropout rates and the struggle to sustain learner engagement throughout the course (Jiang and Peng 2023; Khalil and Ebner 2014; Wei, Saab, and Admiraal 2023). To address these challenges, educators and researchers have sought innovative strategies to enhance MOOC effectiveness and promote autonomous learning and self-directed learning (SDL) behaviors (e.g., Agonács et al. 2020; Garrison, 1997; Ivone and Jacobs 2022; Lan and Hew 2020; Zhu, Bonk, and Doo 2020).

The incorporation of gamification in MOOCs has emerged as a potentially transformative approach to enhance learner motivation and engagement (Borrás-Gené, Martínez-Núñez, and Martín-Fernández 2019; Jarnac de Freitas and Mira da Silva 2023). Gamification entails applying game design elements and principles in non-game contexts (Afrilyasanti and Cahyono 2022; Fiş Erümit Yilmaz 2022; Landers 2014; Ofosu-Ampong 2020; Woodcock and Johnson 2018). Gamification offers the promise of creating dynamic, interactive, and enjoyable learning experiences, fostering intrinsic motivation and participation (Buckley and Doyle 2016; Rojas-López et al. 2019; Saputro et al. 2019). Gamification in MOOCs, additionally, is rooted in the concept that learners are more intrinsically motivated when they perceive their actions as autonomous, connected to their personal goals, and aligned with their interests (Borrás-Gené, Martínez-Núñez, and Martín-Fernández 2019; Cheng 2021; Mena et al. 2019; Torres-Toukoumidis, González-Moreno, and Palma-Ruiz 2021).

Despite the growing recognition of gamification's potential to transform MOOCs, there exists a notable gap in the existing literature. While numerous studies have investigated the impact of gamification on learner engagement and course completion rates, the deeper effects on autonomous learning and SDL behaviors within MOOCs have been largely overlooked. This oversight is striking, given the multifaceted nature of online learning environments (Aparicio et al. 2019; Borrás-Gené, Martínez-Núñez, and Martín-Fernández 2019; Saputro et al. 2019; Torres-Toukoumidis, González-Moreno, and Palma-Ruiz 2021). While increased engagement and completion rates are essential indicators of success (Jiang and Peng 2023; Wei, Saab, and Admiraal 2023), understanding the intricate interplay between gamification and learners' capacity to self-regulate, set goals, and manage their learning autonomously is critical. In an era where SDL is increasingly valued, it is puzzling that gamification's role in nurturing and enhancing these vital skills remains underexplored (Azevedo and Marques 2017; Conole 2016; Shah and Khanna 2022). The lack of attention to this critical aspect of online learning is particularly perplexing when we consider the potential synergies between gamification, emphasizing motivation and engagement, and the development of autonomous and SDL behaviors. The existing body of literature highlights the need for in-depth scrutiny of how gamification interfaces with and shapes critical aspects of online learning, including autonomous learning and SDL behaviors. It prompts us to question whether gamification, while effectively increasing initial learner engagement, also acts as a catalyst for the development and sustenance of autonomous learning skills throughout a MOOC. Moreover, it challenges researchers and educators to examine the impacts of gamification on SDL behaviors, including learners' ability to set and achieve personal learning goals, adapt to diverse learning resources, and persist in their educational pursuits. To achieve these aims, we formulated two research questions (RQs):

RQ1: What are users' experiences and responses to the integration of gamification elements in a MOOC?

RQ2: To what extent does gamification influence autonomous learning and SDL behaviors among participants in a MOOC?

## LITERATURE REVIEW

**Gamification in education**

Gamification in education has garnered significant attention as a pedagogical approach aimed at enhancing learner motivation and engagement (e.g., Buckley and Doyle 2016; Ofosu-Ampong 2020; Woodcock and Johnson 2018). This approach involves infusing game design elements into non-game contexts, creating interactive and immersive learning experiences. Advocates assert that gamification has the potential to reshape traditional learning paradigms, drawing on psychological theories such as self-determination theory (SDT) (Merriam 2001; Ryan and Deci 2000). According to SDT, individuals exhibit higher intrinsic motivation when they perceive their actions as autonomous, aligned with their personal objectives, and connected to their interests (Hu and Zhang 2017; Johnson and Davies 2014; Simons 2000).

Gamification leverages a diverse array of game mechanics to enhance learner engagement and foster a profound sense of achievement. These game mechanics encompass a range of elements such as points, badges, leaderboards, rewards, and narrative-driven scenarios (Ofosu-Ampong et al. 2020). Learners earn points, badges, and compete on leaderboards for completing tasks. Rewards can range from virtual items to additional content access, with narrative-driven scenarios enhancing the learning experience. Research has shown these components boost learner engagement and motivation across educational contexts (Fiş Erümit and Yilmaz 2022; Palaniappan and Noor 2022; Rojas-López et al. 2019). It is important to acknowledge that some scholars argue that gamification may lead to a reliance on extrinsic motivation, meaning learners engage primarily for rewards rather than genuine interest in the subject matter (Prakash and Manchanda 2021; van Roy and Zaman 2018). This transition from intrinsic to extrinsic motivation raises concerns about the sustainability of learner engagement once gamification elements are removed (Hu and Zhang 2017; Ryan and Deci 2000). Additionally, critics call for a more nuanced understanding of gamification's effectiveness, emphasizing the necessity of assessing its impact on diverse learner populations and contexts, particularly in terms of autonomous learning and SDL behaviors (Palaniappan and Noor 2022; Rojas-López et al. 2019; Shi and Cristea 2016). Our research aims to address these complexities and contribute to a more comprehensive understanding of gamification in education, particularly within MOOCs.

**Gamification in MOOCs**

The integration of gamification in MOOCs has garnered considerable interest due to its potential to address challenges associated with learner engagement and attrition. MOOCs have greatly expanded access to education, yet they grapple with inherent difficulties, including high attrition rates and learner disengagement (Al-Imarah and Shields 2019; Czerniewicz et al. 2017; Khalil and Ebner 2014). The vast scale and open nature of MOOCs, while enhancing accessibility, can result in a lack of personalization and interaction, contributing to higher student dropout rates (Lan and Hew 2020). Research consistently highlights concerns about the effectiveness of MOOCs in providing meaningful learning experiences due to high attrition rates, while acknowledging that some learners prioritize partial engagement over course completion (Wei, Saab, and Admiraal 2023). In response to these challenges, educators explore using gamification in MOOCs to improve engagement and completion rates. However, it's vital to examine if gamification, while effective, may lead to a shift away from intrinsic interest in the subject matter and towards extrinsic motivation (Hu and Zhang 2017; Simons 2000).

The potential transition from intrinsic to extrinsic motivation raises concerns about the sustainability of learner engagement once gamification elements are removed (Jiang and Peng 2023;

Zhu, Bonk, and Doo 2020). Critics urge a nuanced evaluation of gamification's effects on diverse learners and educational settings, particularly regarding autonomous learning and self-directed behaviors. While gamification enhances engagement, its potential drawbacks, such as oversimplifying complex topics, require further scrutiny to ensure depth of learning (Pozo-Sánchez, Lampropoulos, and López-Belmonte 2022; Shi and Cristea 2016). Furthermore, there are concerns about equity, since learners with different backgrounds and access to technology may experience gamified MOOCs differently, potentially exacerbating educational inequalities (Gameel and Wilkins 2019; Klemke, Eradze, and Antonaci 2018; Tang and Qian 2022). Understanding the intricate relationship between gamification and these facets of online learning is crucial for enhancing the effectiveness of MOOCs while mitigating potential negative consequences. Gaining insight into the nuanced interplay of gamification's benefits and drawbacks is paramount to the ongoing development and improvement of MOOCs.

### **Exploring the intersection of gamification, autonomous learning, and SDL in MOOCs**

Within online education, especially MOOCs, autonomous learning emerges as a foundational pillar (Lan and Hew 2020; Onah, Pang, and Sinclair 2022; Zhu, Bonk, and Doo 2020). Within these self-paced, independent educational journeys, autonomous learners exhibit remarkable attributes such as self-regulation, initiative, and the ability to self-direct their learning paths (Hu and Zhang 2017; Ryan and Deci 2000). This autonomous learning paradigm harmonizes with the principles of adult learning theory, which emphatically underscores the pivotal role of self-motivation and active engagement in pursuit of educational goals (Khulaifiyah et al., 2021; Luo, Lin, and Yang 2021). The MOOC environment accentuates the importance of cultivating autonomous learning, not only to sustain learner engagement but also to attain meaningful learning outcomes. Autonomous learners are predisposed to establish clear learning objectives, master time management skills, and demonstrate resilience when confronting academic challenges (Garrison 1997; Ivone and Jacobs 2022; Jiang and Peng 2023). Moreover, autonomous learning closely intertwines with the development of SDL behaviors, empowering individuals to take ownership of their educational odyssey (Khotimah et al. 2022; Luo, Lin, and Yang 2021; Supriyono et al. 2020). These acquired competencies empower learners to navigate the expansive and multifaceted realm of MOOCs adeptly.

Adding gamification elements into MOOCs introduces a nuanced dimension to the discourse surrounding autonomous learning and SDL. Gamification presents the potential to enhance learner engagement and motivation, catalyzing active participation and course completion (Woodcock and Johnson 2018). Badges, leaderboards, and rewards offer instant feedback, strengthening intrinsic motivation. While gamified MOOCs create a sense of accomplishment and an enjoyable learning experience, they sometimes shift motivation from intrinsic to extrinsic (Aparicio et al. 2019; Torres-Toukoumidis, González-Moreno, and Palma-Ruiz 2021). This paradigm shift raises pertinent queries about the durability of learner engagement once gamification elements are withdrawn (Merriam 2001; Ryan and Deci 2000). Concerns persist that learners may prioritize immediate rewards over deep engagement with course content in gamified MOOCs, raising questions about the depth of learning fostered. Critics also argue gamification might oversimplify complex subjects in order to fit gaming formats, potentially hindering comprehension and critical thinking (An et al. 2021; Borrás-Gené, González-Moreno, and Palma-Ruiz 2021; Saputro et al. 2019; Torres-Toukoumidis). In light of these considerations, our research is dedicated to a comprehensive examination of how gamification impacts autonomous learning and self-directed behaviors in MOOCs.

### **The context of the current study**

MOOCs have undeniably transformed knowledge accessibility, enabling learners worldwide to access a vast array of educational content (Ahmad et al. 2022; Al-Imarah and Shields 2019; Mellati and Khademi 2020). However, they grapple with persistent issues, including high attrition rates and learner disengagement (Czerniewicz et al. 2017; Khalil and Ebner 2014). While MOOCs have democratized education, their vast scale and openness can lead to a lack of personalization and interaction, contributing to student dropout rates (Al-Imarah and Shields 2019). To address these challenges, educators and researchers have explored innovative strategies, and one of the most promising is the integration of gamification elements into MOOCs (Cheng 2021; González-Moreno, and Palma-Ruiz 2021; Jarnac de Freitas and Mira da Silva 2023; Torres-Toukoumidis, Borrás-Gené). Gamification has shown the potential to enhance learner engagement and motivation. It draws from psychological theories like SDT, emphasizing intrinsic motivation and alignment with personal goals (Garrison 1997; Ryan and Deci 2000). While gamification holds promise, its impact on autonomous and SDL behaviors in MOOCs remains largely unexplored in the existing literature.

Our study investigates the impact of gamification on autonomous learning and SDL behaviors within a gamification-based MOOC on the LearnovaUM platform (<https://umlearninginnovation.com/>). Specifically, we focus on the “English for IT Professionals” course, which ran from August 23, 2023, to December 15, 2023. The course objectives focus on equipping information technology (IT) students and professionals with essential language skills crucial for success in the field. Specifically, the course aims to enhance participants’ English language proficiency as it pertains to information technology, ensuring they can effectively communicate and navigate technical concepts in English. This free course, offering automatic certification upon completion, integrates gamification elements. Participants engage in asynchronous activities facilitated by expert instructors. Gamification elements, including points awarded for completing modules and quizzes, badges earned for achieving milestones or mastering specific skills, and leaderboards tracking participants’ progress, are strategically implemented throughout the course. Our study aims to provide a comprehensive examination of how these gamification elements influence learning dynamics within the MOOC. By addressing these insights, we seek to enhance online learning platforms and offer a nuanced view on gamification integration in MOOCs, aligning with the evolution of online education.

## **METHOD**

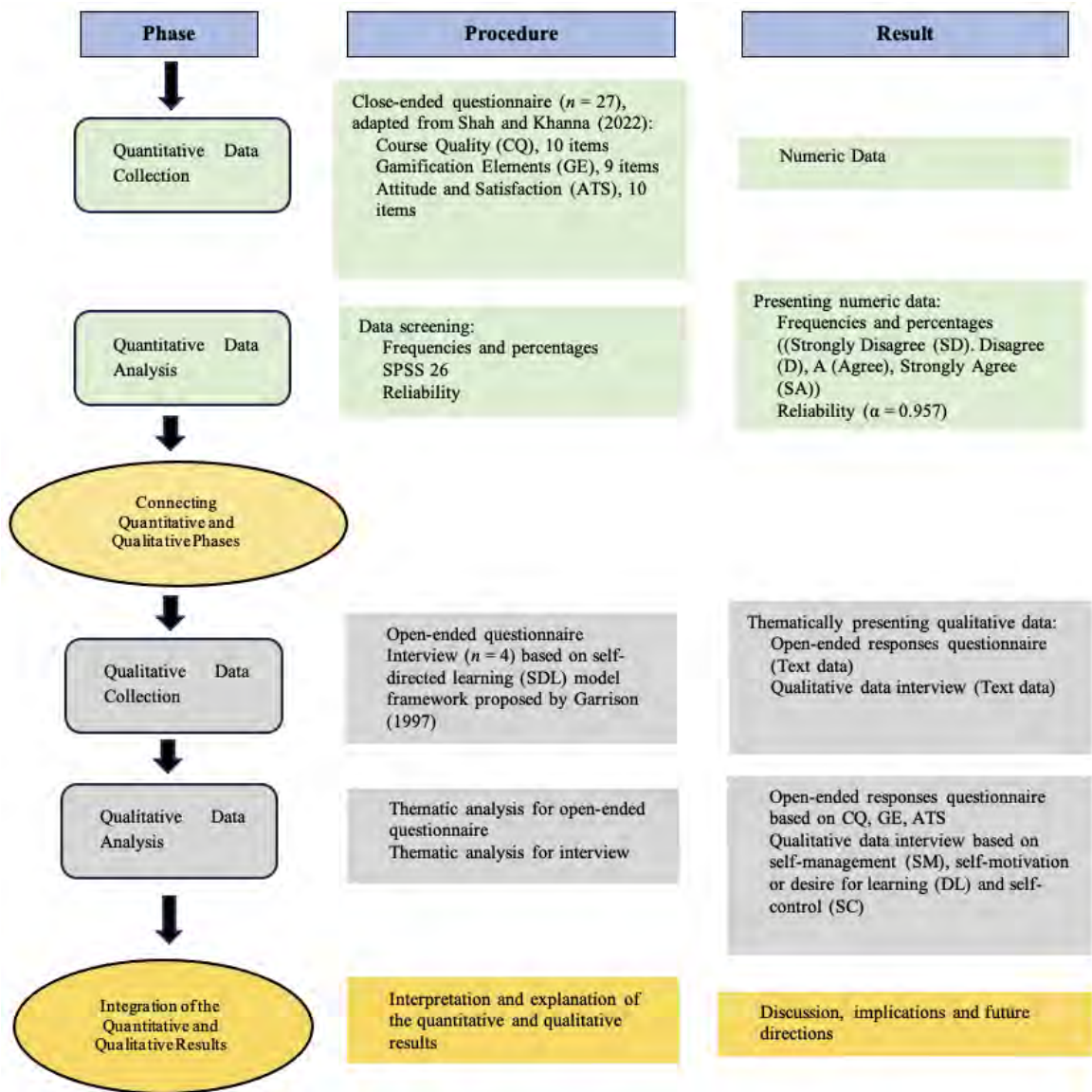
### **Research design and participants**

This study adopts a mixed-methods sequential explanatory design to delve comprehensively into participant experiences with gamification-based MOOC course on the LearnovaUM platform. This methodological approach is underpinned by the imperative to acquire an in-depth understanding of the formulated questions by amalgamating both quantitative and qualitative data sources (Ivankova, Creswell, and Stick 2006). Quantitative data was initially gathered through open-ended questionnaire responses focusing on dimensions including course quality (CQ), gamification elements (GE), attitude, and satisfaction (ATS). Subsequently, qualitative data was collected through open-ended questionnaire responses, focusing on the dimensions of CQ, GE, and ATS. This qualitative phase enriched the analysis by offering deeper insights into the participants’ perspectives, motivations, and challenges within the gamified MOOC context.

Furthermore, to delve into the participants’ SDL behaviors, structured interviews were conducted. These interviews are framed around an SDL framework derived from Garrison’s model (1997), encompassing facets of self-management (SM), self-motivation or desire for learning (DL), and

self-control (SC). By exploring these dimensions qualitatively, the study aims to offer a more comprehensive understanding of the participants' engagement within a gamified MOOC environment, contributing to the broader discourse on online learning efficacy and pedagogical strategies. Below, Figure 1 (adapted from Ivankova, Creswell, and Stick 2006) presents the visual model for the study design procedures.

**Figure 1:** Visual model for the research design procedures



The study involved the 27 students currently enrolled in the “English for IT Professionals” course on the LearnovaUM platform at Universitas Negeri Malang (UM), Indonesia. Participants were specifically chosen based on their active course enrollment status. Detailed demographic profiles of the participants are outlined in Table 1.

**Table 1:** Demographic information of the participants

Category	Subcategory	Frequency (f)	Percentage (%)
Gender	Male	22	81.50
	Female	5	18.5
Age	18-24	27	100.00
Academic Background	IT	17	62.96
	Engineering	10	37.04

### Data collection instruments

Two main instruments were used to collect data: questionnaires and interviews. Initially, participants completed a structured questionnaire, adapted from Shah and Khanna (2022). This questionnaire employed a Likert scale ranging from 1 to 4, covering multiple sections. Participants rated CQ dimension, evaluating aspects such as content relevance, organization, and delivery. They then provided feedback on GE dimension, including badges, leaderboards, and rewards. Finally, participants expressed their ATS towards the MOOC through quantitative statements. Following the questionnaire, participants were invited to provide open-ended feedback. This qualitative phase allowed them to elaborate on quantitative responses, offering nuanced perspectives and additional insights. After, researchers conducted structured interviews focusing on the participants' SDL behaviors. These interviews followed an SDL framework derived from Garrison's model (1997), covering SM, DL, and SC dimensions. The qualitative data provided deeper insights into the participants' engagement and agency within the gamified MOOC environment, complementing the quantitative findings.

### Data analysis

Our data analysis involved scrutinizing quantitative and qualitative data from questionnaire responses and structured interviews. The participants engaged with a structured questionnaire featuring Likert-scale questions based on CQ, GE, and ATS dimensions. The responses from all 27 participants were collected and quantitatively analyzed using SPSS 26, with frequencies and percentages computed for each Likert-scale option. To ensure data reliability and validity, a comprehensive reliability assessment of the questionnaire was conducted, yielding a high Cronbach's alpha coefficient of 0.957, affirming high internal consistency. Transitioning to qualitative analysis, the questionnaire's open-ended responses provided rich narrative insights into the participants' experiences, challenges, motivations, and suggestions within the gamified MOOC context. Thematic analysis techniques were applied to extract recurring themes and patterns. Furthermore, qualitative analysis extended to structured interviews with four selected participants (P1-P4, anonymous). These participants were chosen based on their engagement levels within the MOOC and potential to offer unique perspectives on SDL behaviors. The qualitative analysis of these interviews aimed to deepen our understanding of participant engagement with the gamified MOOC.

### Ethical considerations

Ethical considerations were ensured through detailed informed consent, clarifying the study's purpose, voluntary participation, and data anonymization. Participants were informed of their rights, including the ability to withdraw without consequences. Data collected were anonymized and securely stored on a password-protected server, adhering to ethical and legal standards.

## FINDINGS

**RQ1: What are users' experiences responses to the integration of gamification elements in a MOOC?**

Shifting our focus to RQ2, which explores users' experiences and responses to the integration of gamification elements, we present key insights primarily in the form of tables. Table 2 provides a comprehensive overview of participants' feedback across four dimensions: CQ, GE, ATS, and open-ended feedback. This data reveals how participants perceive gamification's impact on their learning experience.

**Table 2:** Questionnaire responses on users' experiences in LearnovaUM

Course quality (CQ)					
Code	Statements	SD (n, %)	D (n, %)	A (n, %)	SA (n, %)
CQ.1	The course objectives are clear and understandable.	3.7% (1)	0% (0)	59.3% (16)	37% (10)
CQ.2	Learning materials keep me engaged.	0% (0)	3.7% (1)	55.6% (15)	40.7% (11)
CQ.3	Assessments effectively gauge my understanding.	0% (0)	3.7% (1)	66.7% (18)	29.6% (8)
CQ.4	Activities relate directly to IT topics.	0% (0)	0% (0)	63% (17)	37% (10)
CQ.5	Supplementary resources add value to the course.	0% (0)	3.7% (1)	70.4% (19)	25.9% (7)
CQ.6	Practical examples are incorporated effectively.	0% (0)	0% (0)	77.8% (21)	22.2% (6)
CQ.7	I can apply what I have learned in real-world situations.	0% (0)	3.7% (1)	81.5% (22)	14.8% (4)
CQ.8	The course structure is easy to follow.	0% (0)	0% (0)	66.7% (18)	33.3% (9)
CQ.9	Feedback on assignments helps me improve.	0% (0)	0% (0)	63% (17)	37% (10)
CQ.10	Overall, the course quality positively impacts my professional growth.	0% (0)	3.7% (1)	66.7% (18)	29.6% (8)
Gamification elements (GE)					
Code	Statements	SD (n, %)	D (n, %)	A (n, %)	SA (n, %)
GE.1	Gamification elements enhance my motivation.	3.7% (1)	3.7% (1)	59.3% (16)	33.3% (9)
GE.2	Gamification elements make learning more enjoyable for me.	3.7% (1)	7.4% (2)	66.7% (18)	22.2% (6)
GE.3	Gamified activities reinforce my understanding.	3.7% (1)	3.7% (1)	66.7% (18)	25.9% (7)
GE.4	Interactive games are engaging.	0% (0)	3.7% (1)	59.3% (16)	37% (10)



GE.5	Gamification elements are seamlessly integrated into the course.	0% (0)	0% (0)	74.1% (20)	25.9% (7)
GE.6	Feedback for achievements is meaningful.	0% (0)	11.1% (3)	51.9% (14)	37% (10)
GE.7	Gamification aligns with course objectives.	0% (0)	0% (0)	70.4% (19)	29.6% (8)
GE.8	Stories or narratives within gamification elements enhance engagement.	0% (0)	0% (0)	81.5% (22)	18.5% (5)
GE.9	Overall, gamification elements contribute positively to my learning experience.	0% (0)	7.4% (2)	59.3% (16)	33.3% (9)
<b>Attitude and satisfaction (ATS)</b>					
<b>Code</b>	<b>Statements</b>	<b>SD</b>	<b>D</b>	<b>A</b>	<b>SA</b>
ATS.1	I feel confident in using the MOOC for my IT course.	0% (0)	7.4% (2)	63% (17)	29.6% (8)
ATS.2	I enjoy using the MOOC for my IT studies.	0% (0)	3.7% (1)	70.4% (19)	25.9% (7)
ATS.3	I believe that the MOOC provides me with opportunities to acquire new knowledge.	0% (0)	0% (0)	74.1% (20)	25.9% (7)
ATS.4	I believe that the MOOC enhances my overall learning experience.	0% (0)	0% (0)	66.7% (18)	33.3% (9)
ATS.5	I believe that the MOOC's integration of various media enhances the quality of my learning.	0% (0)	0% (0)	66.7% (18)	33.3% (9)
ATS.6	I am satisfied with the MOOC-based course.	0% (0)	0% (0)	66.7% (18)	33.3% (9)
ATS.7	I feel that this MOOC course served my learning needs well.	0% (0)	0% (0)	70.4% (19)	29.6% (8)
ATS.8	I feel that the MOOC enhances my ability to learn 'English for IT Professionals' course.	0% (0)	0% (0)	74.1% (20)	25.9% (7)
ATS.9	The MOOC's interactive features contributed to my satisfaction with the course.	0% (0)	3.7% (1)	74.1% (20)	22.2% (6)
ATS.10	Overall, I am pleased with the results of taking this course via the MOOC.	0% (0)	0% (0)	63% (17)	37% (10)

*Noted: SD=strongly disagree, D=disagree, A=agree, SA=strongly agree, n=number of respondents*

The data in Table 2 from LearnovaUM's gamification-based MOOC reveals key insights into participant experiences and satisfaction levels. A significant majority of participants, 96.3%, perceived the course objectives (CQ.1) as clear and understandable, suggesting effective communication. Learning materials (CQ.2) engaged an equivalent percentage of participants, while assessments (CQ.3) were also perceived as effective, indicating their suitability for measuring comprehension. The learning materials and course' activities (CQ.4) encompassed interactive modules, video lectures, and supplementary readings, while assessments included quizzes, assignments, and practical tasks designed to reinforce understanding and skills acquisition. Supplementary resources (CQ.5) were highly valued by 96.3% of participants, showcasing their importance. Practical examples (CQ.6) were endorsed by 77.8%, and a notable 81.5% believed they could apply their learning in real-world

situations (CQ.7). Overall, 96.3% agreed that the course positively impacted their professional growth (CQ.10).

Gamification elements significantly enhanced motivation (GE.1) and enjoyment (GE.2) for 92.6% and 89.3% of participants, respectively. Reinforcing understanding (GE.3) was achieved for 92.6% of participants, further emphasizing the role of gamification in aiding comprehension. Integration of gamification elements (GE.5) received full agreement, indicating a seamless inclusion. Almost all participants also affirmed these elements enhanced engagement (GE.8), with 92.6% believing that gamification elements positively contributed to their learning experience (GE.9).

In terms of attitudes and satisfaction, participants reported high confidence levels in using the MOOC for their IT courses (ATS.1), with 92.6% either agreeing or strongly agreeing. They enjoyed using the MOOC for their IT studies (ATS.2), with 96.3% agreeing or strongly agreeing. Furthermore, participants strongly believed that the MOOC offered opportunities to acquire new knowledge (ATS.3), and the MOOC was perceived to enhance the overall learning experience (ATS.4) by 92.6% of participants. Satisfaction levels with the MOOC-based course (ATS.6) were notably high, with 92.6% either agreeing or strongly agreeing. Overall, participants expressed a high level of satisfaction with the course via the MOOC (ATS.10), with 96.3% either agreeing or strongly agreeing, indicating a fulfilling learning experience.

The integration of gamification elements in MOOCs represents a significant innovation in online learning, prompting our exploration of the “English for IT Professionals” course on the LearnovaUM platform with the 27 participants. Through detailed analysis of open-ended questionnaire responses, we delve into participant perspectives on course quality, the influence of gamification elements, and participants’ attitudes and satisfaction. This thorough examination aims to uncover strengths and areas for improvement.

Figure 2 illustrates how leaderboards impact students’ self-directed learning in the gamified MOOC environment, promoting autonomy. Metrics for leaderboard rankings include active participation, task completion, and quiz performance. Students earn experience points (XP) by engaging in discussions and completing tasks. By offering a dynamic platform for tracking progress and comparing achievements, leaderboards not only enhance the students’ management, motivation, and control but also empower them to take ownership of their learning journey. This visual representation fosters a sense of autonomy and self-regulation, encouraging students to set personal goals, explore diverse learning resources, and persist in their educational pursuits.

**Figure 2:** Leaderboards in course completion

Rank	Level	Participant	Total	Progress
1	6	GN	1,164 <sup>XP</sup>	 next level in 368 <sup>XP</sup>
2	5	JM	843 <sup>XP</sup>	 next level in 243 <sup>XP</sup>
3	5	AK	771 <sup>XP</sup>	 next level in 315 <sup>XP</sup>
4	4	IC	687 <sup>XP</sup>	 next level in 56 <sup>XP</sup>
5	4	AI	588 <sup>XP</sup>	 next level in 155 <sup>XP</sup>

Participants, numbering 27, generously shared their thoughts, providing a qualitative dimension to the study. Through thematic exploration and analysis, we aim to capture the essence of their perspectives, shedding light on the nuances that quantitative data alone might not offer.

#### *CQ dimension*

The participants' responses concerning course quality offer a spectrum of opinions, reflecting the diverse nature of the learning experience. Among the chorus of positive feedback, GN (anonymous) commendably notes, "The course content stands out for its exceptional engagement and relevance. The structured modules facilitated a smooth and enjoyable learning journey, making it one of the best courses I've encountered." This resounding acclaim emphasizes the success of the course in delivering content that resonates with participants. However, amid the positivity, a nuanced perspective emerges, with EQ (anonymous) suggesting, "While the content was commendable, incorporating more interactive elements could elevate the learning experience. Practical activities or discussions could add a new dimension to the course." This constructive feedback signals a desire for a dynamic and interactive learning environment, underscoring the importance of continuous improvement. The positive feedback on course quality points to a well-received educational experience. Simultaneously, the call for more interactive elements underscores a need to adapt and respond to diverse learning preferences.

#### *GE dimension*

As the participants navigate the gamified elements embedded in the MOOC, their responses reveal a rich tapestry of experiences. JM (anonymous) shares, "The gamification elements were transformative! Challenges and rewards kept me motivated, and I felt like I was on a learning adventure. It made the course not just educational but also fun." This positive perspective illuminates the success of gamification in elevating participant motivation and enjoyment. However, amidst the positivity, a critical voice emerges; ABP (anonymous) argues, "Some gamification features felt distracting to me. I appreciate the attempt to make learning enjoyable, but a more balanced integration with the core content could be beneficial." This critical viewpoint raises a crucial consideration, emphasizing the delicate balance required in integrating gamification elements, such as earning badges and points without compromising the core educational objectives. The positive response highlights the effectiveness of gamification in enhancing motivation. Meanwhile, the critical feedback emphasizes the need for a judicious integration that aligns with the primary learning goals.

#### *ATS dimension*

Exploring the participants' attitudes and overall satisfaction uncovers a mosaic of perspectives. FJ (anonymous) expresses high satisfaction, stating, "I'm extremely satisfied with the course. It not only met but exceeded my expectations. The positive impact it had on my attitude towards learning is immeasurable." This positive sentiment reflects the course's success in meeting or surpassing participant expectations. In contrast, ENF (anonymous) provides constructive feedback, suggesting, "While the course content was valuable, clearer communication channels for participants could enhance overall satisfaction. A more interactive platform would be beneficial." This constructive critique underscores the importance of effective communication and an interactive platform in order to enhance participant satisfaction. Positive participant feedback indicates the course's success in meeting or exceeding participant expectations. Simultaneously, the call for improved communication channels emphasizes the critical role of fostering a more interactive and connected learning community.

This thematic analysis reveals participants' perspectives on engaging with content and gamification elements. While participants appreciate the content design quality, they also seek increased interactivity for a richer learning experience. The motivating impact of gamification elements is evident, yet the participants suggest a more balanced integration to avoid distractions. Exceptional satisfaction with the course indicates its success in meeting or exceeding expectations and fostering a positive attitude towards learning. Constructive feedback on communication channels and interactive platforms suggests areas for improvement. Overall, these insights provide a comprehensive understanding of participant perceptions, highlighting the MOOC's strengths in course quality, effective gamification, and positive impact on attitudes and satisfaction.

### **RQ2: To what extent does gamification influence autonomous learning and SDL behaviors among participants in a MOOC?**

Furthermore, our investigation aimed to dive into the extent to which gamification influences autonomous learning and SDL behaviors among participants in the MOOC. The findings demonstrate the dynamics within the gamified MOOC environment, emphasizing participant engagement within the platform. The structured interviews with four selected participants (P1–P4, anonymously) reveal insights into their experiences, motivations, and challenges within the gamified MOOC on the LearnovaUM platform. These interviews, guided by an SDL framework derived from Garrison's model (1997), delve into SM, DL, and SC, offering valuable perspectives on the effectiveness of gamification in promoting autonomous learning.

#### *The interview results from SM dimension*

Participants also spoke about the SM dimension of SDL behavior within the context of a gamified MOOC on LearnovaUM. Interview questions aimed to uncover specific examples of how participants effectively managed their time for the gamified MOOC. The responses provided valuable insights into the time management strategies and approaches used by the participants within the gamified learning environment.

I managed my time effectively for gamified MOOC by setting daily priorities and dedicating focused blocks of time to each task. This approach helped me maintain a steady pace and meet deadlines consistently. (P1)

One specific example of effective time management in LearnovaUM was during a project that required both research and practical application. I structured my time by allocating afternoons for practical exercises, and evenings for reflection and review. This approach helped me stay focused and ensured I made progress in both understanding the theory and applying it practically. (P2)

To manage my time effectively for the tasks in LearnovaUM, I created a weekly study plan with specific time slots dedicated to each activity. For instance, I allocated evenings for completing quizzes and assignments. This structured approach helped me stay organized and focused.” (P3)

Effectively managing my time in LearnovaUM involved creating a daily study routine with designated blocks for interactive videos and quizzes. This structured approach improved productivity and task completion rates. (P4)

The insights gleaned from the interviews provide a nuanced understanding of effective time management strategies within the gamified MOOC environment on LearnovaUM. Participant 1's emphasis on setting daily priorities and dedicating focused blocks of time underscores the importance of consistent effort and task prioritization in order to maintain progress and meet deadlines. Participant 2's time allocation for both practical exercises and reflection highlights the value of a balanced approach that fosters both understanding and practical application. Participant 3's creation of a weekly study plan reflects a structured strategy that promotes organization and focus, enhancing overall efficiency. Participant 4's adoption of a daily study routine with designated blocks for interactive elements demonstrates a systematic approach that improves productivity and task completion rates. These insights collectively underscore the importance of structured time management approaches in fostering organization, focus, and productivity within the gamified MOOC context, providing essential guidance for learners aiming to maximize their learning experiences. This structure was embedded within the MOOC design through features such as personalized learning pathways, weekly goal-setting exercises, and time-bound challenges. These design elements encouraged participants to adopt effective time management strategies, ensuring optimal engagement and progress during the course.

*The interview results from DL dimension*

When examining the aspect of DL, the participants shared insights into their motivation to gain new knowledge and skills. The interview questions were designed to reveal instances where the participants' eagerness to learn drove their involvement in the gamified MOOC learning tasks.

Actively seeking new information in LearnovaUM involved exploring diverse perspectives through readings and online forums. This approach not only expanded my knowledge but also sparked insightful discussions with fellow learners. (P1)

My strong desire for new knowledge and skills in gamified MOOC on LearnovaUM learning motivates me to actively engage in discussions, seek out additional resources, and participate in challenging tasks. This curiosity drives continuous learning and growth. (P2)

My desire for new knowledge and skills in LearnovaUM learning motivated me to explore additional resources beyond the course materials. For instance, I participated and engaged in interactive quizzes to deepen my understanding. (P3)

Actively seeking new information within the gamified MOOC expanded my knowledge base and encouraged critical thinking. Yet, navigating through vast resources and gamified activities required strategic prioritization to focus on learning objectives. (P4)

Participants' insights shed light on intrinsic motivation to acquire new knowledge and skills within the gamified MOOC environment on LearnovaUM. Participant 1's engagement in exploring diverse perspectives through readings and online forums not only broadened their knowledge but also fostered meaningful discussions with peers, highlighting the value of collaborative learning. Participant 2's strong desire for continuous learning and growth drove active participation in discussions, pursuit of additional resources, and success in tackling challenging tasks, underscoring the role of curiosity in driving motivation. Participant 3's motivation to seek additional resources beyond course materials, such as engaging in interactive quizzes, exemplifies proactive learning

behaviors to deepen understanding. Participant 4's experience underscores the need for strategic prioritization amid abundant resources and activities, emphasizing the importance of focus on learning objectives amidst the gamified environment. Overall, these insights illuminate the intrinsic motivation driving participant engagement and continuous learning endeavors within the gamified MOOC, offering valuable insights for fostering a conducive learning environment that nurtures curiosity, collaboration, and strategic learning approaches.

#### *The interview results from SC dimension*

Lastly, in exploring the SC aspect, participants shared their perspectives on setting personal goals and taking responsibility for their decisions and actions within gamified learning contexts. Goal setting was indeed integral to the MOOC design, with the participants expected to regularly establish and track their learning objectives in order to enhance their engagement and progress throughout the course.

Setting personal goals in the course on LearnovaUM involves aligning them with long-term objectives while remaining adaptable to changes. This flexibility supports continuous improvement, although setting overly ambitious goals can lead to stress and burnout. (P1)

In setting my own goals in the gamified MOOC course on LearnovaUM, I prioritize specific objectives such as completing modules with a minimum score, participating in weekly challenges, and earning badges for achievements. For example, I set a goal to complete all quizzes with a score of 90% or above, which motivated me to review materials thoroughly and seek clarification on challenging topics. (P2)

My preferences in setting goals in the LearnovaUM involved creating SMART goals that were specific, measurable, achievable, relevant, and time bound. For example, I set a goal to complete a certain number of modules with a minimum score within a specified timeframe, which kept me motivated and focused. (P3)

Taking responsibility for decisions and actions in gamified learning was evident when I faced a challenging assignment with conflicting approaches. Instead of procrastinating or seeking external validation, I evaluated the options based on learning outcomes and personal growth. This proactive decision-making not only enhanced my learning experience but also reinforced my sense of accountability and ownership. (P4)

The insights provided by the participants offer valuable perspectives on goalsetting and accountability within the gamified MOOC environment on LearnovaUM. Participant 1 emphasizes the importance of aligning personal goals with long-term objectives while maintaining flexibility in order to adapt to changes, highlighting the balance between continuous improvement and avoiding stress and burnout. Participant 2 illustrates the efficacy of setting specific objectives to enhance motivation and engagement, such as completing modules with a minimum score and participating in challenges. Participant 3's focus on creating SMART goals underscores the value of specificity, measurability, achievability, relevance, and time-bound nature in maintaining motivation and focus. Participant 4's proactive approach to decision-making in the face of challenges demonstrates a sense of responsibility and ownership, contributing to enhanced learning experiences and personal growth. Overall, these insights illuminate the importance of thoughtful goal-setting and proactive decision-

making in fostering a conducive learning environment within a gamified MOOC, and they have implications for promoting motivation, focus, and accountability among learners.

## DISCUSSION

The current study aims to delve into the intricate relationship between gamification, autonomous learning, and SDL behaviors within the context of a MOOC. Firstly, the integration of gamification elements in the MOOC demonstrates a substantial positive influence on autonomous learning behaviors among participants. Participants who engaged with gamified activities, such as quizzes, challenges, and rewards, showcased a heightened sense of autonomy in their learning process. This finding aligns with previous research emphasizing the motivational impact of gamification in educational settings (Jarnac de Freitas and Mira da Silva 2023; Saputro et al. 2019). Gamified activities effectively stimulate learners' intrinsic motivation (Afrilyasanti and Cahyono 2022; Buckley and Doyle 2016), resulting in greater proactivity and engagement during the learning journey. The findings suggest that incorporating gamification elements can significantly boost the participants' autonomy by fostering an environment where they feel in control of their learning.

Moreover, our study highlights the empowerment of learners to take control of their education and explore course content autonomously through gamification. The sense of agency and choice offered by gamified elements plays a pivotal role in enhancing autonomous learning behaviors, consistent with previous research (Cheng 2021; Ivone and Jacobs 2022; Khotimah et al. 2022). Learners perceive their actions as autonomous choices, aligned with their interests and personal goals, further reinforcing their motivation and engagement. Gamification, therefore, not only motivates learners but also provides them with the tools to become self-directed learners.

The symbiotic relationship between gamification and SDL behaviors is another significant finding of our study. Participants in the MOOC enriched with gamification elements such as badges, points and leaderboards displayed enhanced SDL behaviors, such as goal setting, resource utilization, and persistence in their learning endeavors. These results resonate with the idea that gamification motivates learners to set and achieve personal learning goals (Conole 2016; Torres-Toukoumidis, González-Moreno, and Palma-Ruiz 2021). The interactive and engaging nature of gamified activities fosters a sense of ownership, driving participants to take charge of their learning experience (Azevedo and Marques 2017). Gamification, as evidenced in our study, is not only an effective tool for promoting autonomous learning but also a catalyst for nurturing and reinforcing SDL behaviors.

However, it is essential to acknowledge potential negative implications from integrating of gamification elements in a MOOC. While our study primarily focused on the positive aspects, some concerns should be addressed. One concern relates to the potential for gamification to overly emphasize extrinsic motivation, such as rewards and leaderboards, at the expense of intrinsic motivation. This can lead to participants engaging in activities solely for the sake of earning points or badges, rather than a genuine interest in course content (Pozo-Sánchez, Lampropoulos, and López-Belmonte 2022; Shi and Cristea 2016). Balancing extrinsic and intrinsic motivators within gamified elements is essential to sustain genuine learner engagement and motivation. To achieve this balance, course designers could incorporate elements connected directly to the course content, fostering intrinsic interest. For example, tying rewards to mastery of subject matter rather than mere completion of tasks can enhance intrinsic motivation. Offering personalized feedback and opportunities for autonomy within the gamified environment can further cultivate intrinsic motivation while still leveraging extrinsic rewards for reinforcement. Another potential drawback is the risk of learners becoming overly competitive in pursuit of high scores or rankings on leaderboards. This hyper-competitive environment might lead to stress and anxiety among some participants

(Palaniappan and Noor 2022; Pozo-Sánchez, Lampropoulos, and López-Belmonte 2022). Therefore, careful consideration must be given to the design of gamification elements in order to promote healthy competition while minimizing adverse psychological effects. One approach is to ensure that competition is collaborative rather than solely individualistic, encouraging learners to work together towards shared goals rather than against one another. Additionally, providing clear and transparent criteria for earning rewards can help prevent feelings of unfairness or inequity among participants. Moreover, incorporating mechanisms for self-reflection and self-regulation can empower learners to manage their competitive impulses effectively, promoting a positive and supportive learning environment. Furthermore, the effectiveness of gamification may vary depending on individual learner preferences and demographics. Some learners may not respond positively to gamified elements, and their learning experiences may be adversely affected if gamification is the primary mode of interaction in a MOOC (Fiş Erümit and Yılmaz 2022; Rojas-López et al. 2019). It is essential to recognize that a one-size-fits-all approach to gamification may not be suitable for all participants.

In essence, our study not only affirms existing findings but also uncovers unique facets of a gamification-based MOOC environment. By identifying specific nuances related to the impact of gamification, participant satisfaction, and the necessity for targeted improvements, our research contributes novel insights to the field. Emphasizing autonomy, our study serves as a catalyst for a more profound understanding of how gamification influences the intricate web of autonomous learning and SDL behaviors within online education.

## CONCLUSION

This study has explored the dynamic relationship between gamification, autonomous learning, and SDL behaviors within the specific context of a MOOC. The findings demonstrate that the strategic incorporation of gamification elements effectively catalyzes the participants' autonomous learning experiences. Gamified activities, such as quizzes, challenges, and rewards, not only stimulate intrinsic motivation but also grant learners the agency to navigate their educational journey independently. Moreover, this study uncovers the profound interplay between gamification and SDL behaviors, highlighting how participants immersed in the gamified MOOC exhibit heightened levels of intrinsic motivation, proactive learning strategies, and sustained engagement. While these results offer valuable insights, acknowledging the study's limitations is vital. These include the reliance on self-reported data and the study's confinement to a specific MOOC context. Future research endeavors should delve into the enduring impacts of gamification on autonomous and SDL across diverse educational settings, employing a blend of self-reported and objective measurements. In essence, this study underscores the potential of gamification as a potent educational instrument. It empowers educators to cultivate autonomy and SDL in online learning environments, thereby enriching the holistic learning experience for participants. It also presents a promising avenue for further exploration and implementation in pedagogical practice.

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