OPEN ACCESS

FAR EAST JOURNAL OF ELECTRONICS AND COMMUNICATIONS

https://sci.pphmjopenaccess.com/index.php/fjec
Volume 29, 2025, Pages 11-53
https://doi.org/10.17654/0973700625002

P-ISSN
0973-7006

GAMIFICATION AND ADAPTIVE GAMIFICATION IN MOOCS: A SYSTEMATIC LITERATURE REVIEW

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Abstract

The purpose of this study is to present current research on gamification in MOOCs. These approaches aim to enhance the effectiveness of MOOCs by addressing challenges such as low completion rates, high dropout rates, low participant engagement, feelings of isolation, motivational issues, inadequate collaboration among participants, etc. To address the problem, rigorous papers were collected on gamification and adaptive gamification in MOOCs. The findings were categorized based on each paper's specific challenges, providing valuable insights for researchers and MOOC designers in creating new courses for further study. The analysis indicated that both gamified and adaptive gamified MOOCs can have a positive impact on distance education. The incorporation of gamification elements into these courses significantly enhances their effectiveness by overcoming the limitations associated with traditional MOOCs. Distance education can offer an improved learning experience by implementing gamification and adaptive gamification. This review aims to assist researchers and practitioners involved in gamified and adaptive gamified MOOCs in avoiding or minimizing these challenges and managing them systematically. Additionally, it emphasizes the significance of gamification in enhancing the effectiveness of MOOCs.

Keywords and phrases: gamification, adaptive gamification, MOOCs, distance education.
Received: July 7, 2025; **Accepted:** July 23, 2025
Published: August 5, 2025

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1. Introduction

This paper has in view to emphasize the significance and contribution of gamification and adaptive gamification in Massive Open Online Courses (MOOCs) in distance education and to inform us of the improvements it brings to conventional MOOCs in addressing key challenges such as dropout rate, low completion rate, retention rate, engagement, loneliness, motivation, cooperation between trainees, etc.

Distance education enables students to access and engage with high-quality educational resources online, regardless of their location or the time of day. To create a persuasive argument on gamification, the focus is on synthesizing results from diverse literary works and using them to inform and understand primary literature on gamification.

MOOCs are online courses with no prerequisites that supply flexible learning environments and unrestricted access to anybody for free anywhere in the world, over the Web. The MOOC participants have high heterogeneity and may differ in age, gender, educational status, community, psychological status, and other characteristics. MOOCs are characterized by the uniquely powerful combination of classic digital teaching equipment such as videos, audio, graphics, etc., personalized tools for obtaining and confirming knowledge, and the proper use of exclusive social networks making them a powerful means of approaching teaching and learning [1].

Gamification refers to a technique that incorporates gaming elements and strategies into non-gaming contexts such as MOOCs. The primary objective of gamification is to captivate and inspire users to change their behavior, address real-world challenges, and improve the overall user experience. By integrating gamification elements and strategies into traditional non-gaming scenarios, the experience becomes more enjoyable and enhances user engagement in reaching specific objectives [2, 3].

According to [4], adaptive gamification in MOOCs is a new research area that improves gamification techniques by using adaptable approaches. These approaches aim to address users' specific needs based on their attributes [4]. When adapting various elements to learner needs, we use their particular aspects [5].

Research on gamification has yielded inconsistent findings, indicating that gamification could potentially benefit and harm students. This calls into doubt gamification's general efficacy in the educational process. The main causes of this uncertainty are the experimentation on small-scale clusters, the haphazard application of gamification features, and restricted subject implementation. One possible way to tackle this research difficulty is to assess the true efficacy of gamification by contrasting gamified and conventional learning methodologies [6].

Researchers have explored a variety of approaches and techniques to tackle the challenges and drawbacks that conventional MOOCs face. One promising avenue of development is gamification, which is gaining traction in the area of MOOCs. Reference [7] imputes MOOCs' success to gamification. They support the need to understand the factors contributing to their success to realize their potential fully. These factors are defined as user engagement, user satisfaction, and the impact on individual and organizational performance stemming from user involvement.

An investigation into the development and impact of MOOCs on distance learning has identified several significant issues with traditional methods that can undermine their effectiveness. These problems include high dropout rates, low completion, and participation levels, feelings of isolation among learners, low engagement, poor retention, minimal interaction among users, lack of learner motivation, a diverse user base, and limited reliability in the techniques used to assess learners' knowledge [8].

Recently, researchers have attempted to conduct systematic literature reviews on gamified MOOCs, but these studies have been limited in scope. The SLR by [9] examines a limited number of papers (22 papers) and a limited number of challenges. The SLR by [10] examines only gamification in science education. The SLR by [11] focuses solely on the effect of motivation on the retention rates of MOOCs. A recent SLR by [12] focuses on balancing gamification design using game elements. It discusses the difficulties encountered by MOOC platforms and seeks to create customized frameworks for MOOCs to improve learner engagement and retention rates. The SLR conducted by [13] investigates the impact of gamified learning strategies on student motivation in both high school and higher education. The SLR by [14] focuses solely on the impacts of student motivation, engagement, and dropout rates. The SLR by [15] extensively discusses theories, strategies, and elements of gamified MOOCs. The SLR by [16] examines gamification in MOOCs only for Vocational Education and Training.

This article addresses the research gap by compiling findings from studies conducted between 2011 and 2024, with some inclusion into 2025. The period from 2011 to 2025 was chosen for the following reasons: The acronym MOOC was first introduced in 2008, and Peter Norvig launched the first MOOC in 2011. Therefore, this review examines the evolution of MOOCs from 2011 to 2025.

The focus is on enhancing the effectiveness of traditional MOOCs through both gamification and adaptive gamification, while also addressing the inherent challenges and shortcomings. The review aims to identify the challenges and weaknesses of traditional MOOCs that are addressed by gamified MOOCs, providing a concise overview of these issues. The findings are organized by specific challenges or shortcomings, detailing the various approaches and techniques used to address them.

Gamification is applied to MOOCs to enhance their effectiveness, and the results are positive. This efficiency is measured by how well these programs achieve their intended results. The success of gamification in MOOCs relies on its ability to address common issues associated with traditional MOOCs, such as low motivation, low engagement, low participation, high dropout rates, etc. By enhancing effectiveness, we can improve the quality of MOOCs, making it crucial to widely share existing research on this topic.

We hope that the research findings will assist future researchers and MOOC developers in systematically addressing drawbacks and overcoming challenges. Additionally, it highlights their importance in improving MOOC efficiency.

The research method used in this review is a standalone systematic literature review. A systematic literature review (SLR) is a structured and rigorous approach. The review offers MOOC's new researchers a clearer and broader perspective on key issues of gamification in MOOCs, stimulating motivation and interest in the search for relevant articles. To address these issues, a study was planned, and the following research questions were produced and explained: (a) What is the impact of gamification in MOOCs on distance education? (b) What proposals and solutions have been proposed to gamified and adaptive gamified MOOCs to improve their effectiveness compared to conventional MOOCs? (c) What benefits do gamified and adaptive gamified MOOCs offer in addressing the low effectiveness of conventional MOOCs?

The article is structured into multiple sections. The subsequent section elaborates on the methods and materials employed in the research. The third section delivers a literature review concerning gamification in MOOCs. The fourth section showcases the findings of the analysis, succeeded by a discussion in the fifth section. Ultimately, the sixth section presents the conclusions derived from the research.

2. Methodology

2.1. Research method

The central aim of this review is to outline the methods and implementations used by gamified and adaptive gamified MOOCs to enhance their effectiveness compared to traditional MOOCs. To achieve this, research was conducted to identify the strategies employed by gamified and adaptive gamified MOOCs to tackle the challenges and limitations faced by traditional MOOCs, such as issues related to motivation, engagement, participation, feelings of isolation, dropout rates, etc. Consequently, an SLR was performed to assess the effects of gamification on MOOCs, drawing upon pertinent existing studies. Reference [17] characterizes a systematic literature review (SLR) as a methodical, transparent, thorough, and replicate process for recognizing, evaluating, and consolidating the complete and documented

contributions made by researchers, scholars, and practitioners. The pursuit of rigor is a desired objective accomplished by fulfilling standards such as internal and external validity, reliability, and objectivity [18]. Reference [19] argues that a rigorous SLR should adhere to a systematic methodological approach. This approach must involve a trustworthy and strict appraisal of the literature with a clear objective, ensuring an unbiased recognition of all research meeting the inclusion and exclusion criteria.

To review the literature, [20] suggested method was adopted that supports a review is scientifically rigorous if all of the following steps are kept: (1) formulating the problem, (2) searching the literature, (3) screening for inclusion, (4) assessing quality, (5) extracting data, and (6) analyzing and synthesizing data. Moreover, the guidance provided by [21] was followed to enhance the trustworthiness of the review, minimize errors and biases, and ensure reliability for achieving transparency and systematicity.

This systematic review seeks to incorporate as many relevant studies as possible to enhance the effectiveness of traditional MOOCs to ensure that the validity of the review is not compromised and rigorous methods are employed to guarantee methodological soundness [22]. Conducting an SLR not only helps cover the breadth of relevant works but also provides a deeper insight into a body of literature, enabling the production of competent, original, and critical reviews. To minimize bias and errors, inclusion and exclusion criteria were used, and an enhanced Cochrane method was also implemented to mitigate this problem.

(a) Formulating the problem

This review will produce a critical synthesis of existing papers on gamification and adaptive gamification in MOOCs. This synthesis might serve as a compass for new researchers, scholars, and practitioners for their research. Thus, this article reviewed the literature on gamified and adaptive gamified MOOCs from 2011 to 2025 and found relevant high-quality research papers, conferences, or books that support their effectiveness versus traditional MOOCs by synthesizing the existing literature on this research field and also, identifying research domains needed further research. The results may be adopted by MOOC designers, scholars, or practitioners who intend to incorporate gamification into their MOOCs and achieve higher quality results than conventional MOOCs in identifying challenges, addressing shortcomings, and formulating relevant research questions for further study. The report also offers general information on innovative gamified MOOCs that can be used for educational purposes such as doctoral students' dissertations for entering this field.

To formulate relevant research questions addressing the posed problem, the critical keys adopted for all research questions include gamification, adaptive gamification, and MOOCs as well as their effectiveness, challenges, and shortcomings. The following PICOS framework was used to formulate the research questions.

Table 1. PICOS framework

PICOS Element	Description
Population	Focused on relevant high-quality research papers, conferences, and books from 2011 to 2025.
Intervention	Identification of key challenges and techniques that improved the gamified and adaptive gamified MOOCs.
Comparison	Analysis of proposals and solutions that improve the effectiveness and impact of gamified and adaptive gamified MOOCs compared to conventional MOOCs.
Outcome	Identification of proposals and solutions that improve MOOCs' effectiveness and their impact on distance education.
Study Design	Systematic literature review.

Following the critical keys and the PICOS framework, the following research questions (RQ) were derived:

RQ1: *What is the impact of gamification in MOOCs on distance education?*

RQ2: *What proposals and solutions have been proposed to gamified and adaptive gamified MOOCs to improve their effectiveness compared to traditional MOOCs?*

RQ3: *What benefits do gamified and adaptive gamified MOOCs offer in addressing the low effectiveness of traditional MOOCs?*

(b) Searching the literature

In selecting appropriate articles, more importance was given to determining inclusion and exclusion criteria, assessing research quality, and using databases. A thorough review of the relevant literature was conducted to examine the challenges and limitations of traditional MOOCs and to identify potential solutions through research on gamification and adaptive gamification in MOOCs. The research methodology sought to determine the elements that improve the efficacy of traditional MOOCs through the use of gamification.The articles were sourced from the Google Scholar database, which is a highly effective research tool. The search string that has been configured is:

Gamification OR Gamified OR "adaptive Gamification" OR "adaptive Gamified" AND MOOCs AND Effectiveness AND Challenges AND Shortcomings

Additionally, efforts were made to minimize errors, increase effectiveness and reliability, and restrict biases and shortcomings by selecting relevant studies and literature that meet specific inclusion and exclusion criteria, as described below.

(c) Screening for inclusion

During the eligibility screening, the proposal by [23] was considered, acknowledging that bibliographic searches can generate many references that need to be screened for inclusion. Consequently, it is essential to organize the results of search effectively to facilitate efficient screening and evaluate their suitability and quality for evidence synthesis. Also, they argue that using clear and pre-defined eligibility criteria guarantees a transparent and objective approach to including or excluding articles or studies in a systematic review. This practice minimizes the risk of errors or biases that might arise from selective, subjective, or inconsistent decision-making. A set of rules and selection criteria for evaluating the quality of scientific journals has been established. These criteria serve as a foundation for including or excluding specific studies, aiming to minimize the risk of selection bias and enhance the overall quality of the review. The search found 14,600 papers, 13,606 of which were duplicates. Google Scholar itself grouped duplicates in 994 papers.

Restrictions were applied during the screening process to enhance rigor, quality, reliability, and inner and outer validity and to minimize bias errors. Initial screening involved reviewing abstracts and the quality of journals, while the second phase excluded papers based on specific criteria, as described below.

The inclusion and exclusion criteria were as follows:

Inclusion criteria: Particular high-quality journals, conference papers, and books with a notable number of citations and high impact or new important research from 2011 to 2025; results that manage drawbacks and low effectiveness of traditional MOOCs; a selection of primarily original studies was made to address the limitations of population coverage often found in SLRs. However, high-impact books and other no high-impact or quality conference papers were also selected because of the significant research they presented.

Exclusion criteria: Articles written in languages other than English from 2011 to 2025, duplicates, articles focusing on gamification in non-MOOC applications, studies with insufficient data for association calculations, articles lacking significant information, those related to games, articles with low citation counts, studies unrelated to gamification in MOOCs, articles that did not demonstrate significant influence, and articles reporting the same data as previously included studies. After reviewing the articles, those that met the inclusion criteria but provided insufficient information were excluded. During the eligibility stage, articles were assessed based on criteria such as: lack of data for associations, insufficient significant information, relevance to games, articles with minimal citation counts and lacking interest, articles that do not exhibit substantial influence. Additionally, articles that reported data already presented in another study were excluded. Bias evaluations were performed using the Cochrane RoB 2 tool (Excel version), and any articles identified as biased were excluded from selection.

The process for identifying the most appropriate articles is detailed in the Prisma 2020 flowchart presented below (Figure 1).

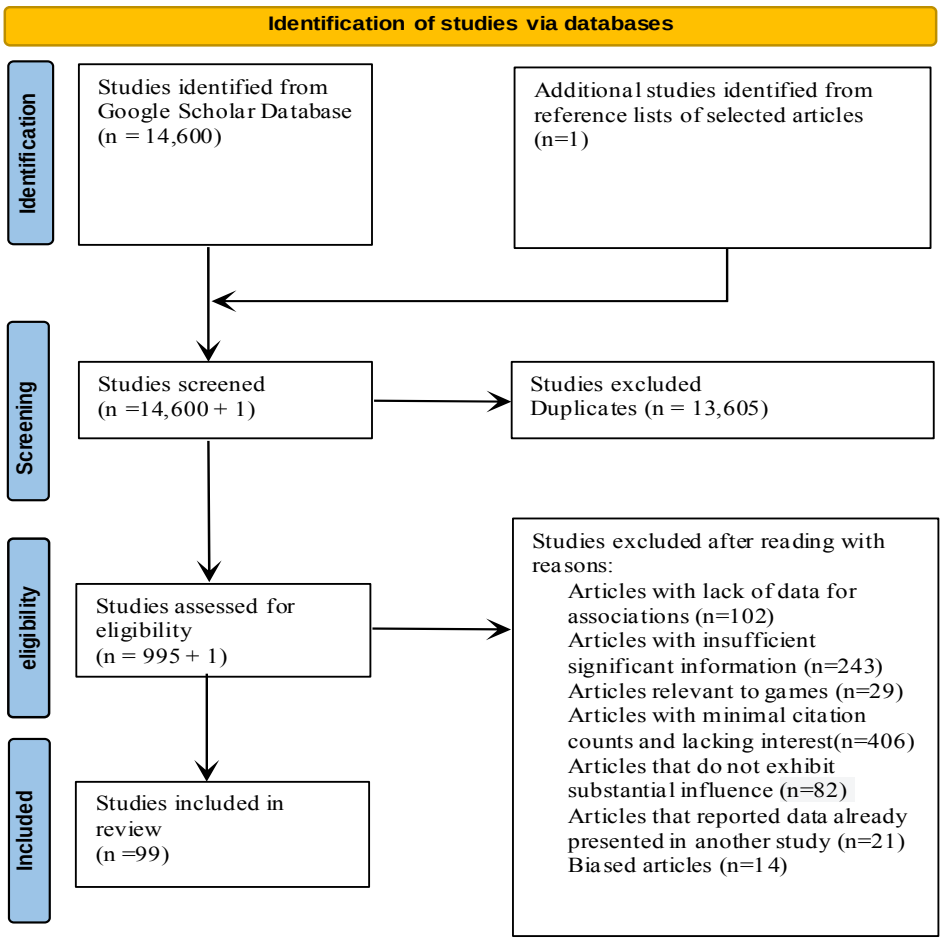

Figure 1. Prisma 2020 flow diagram.

In the screening stage, duplicates were removed from the articles using Google Scholar, which helps by grouping them. After reviewing the articles, those that met the inclusion criteria but lacked significant information were eliminated. During the eligibility stage, the articles satisfying exclusion criteria were checked and removed. Two scholars examined the articles to identify those that fulfilled the criteria. Then, they made comparisons and reviewed differences. After careful examination, 99 articles that fulfilled the inclusion and exclusion criteria were chosen and investigated. These articles contained empirical data on gamified and adaptive gamified MOOCs that showed their impact on student advancement and gamified MOOCs effectiveness in comparison to conventional MOOCs. The main articles total 99, with only 1 article outside of the years 2011 to 2025. Moreover, 8 articles were used to improve the review rigor, qualification and reliability.

The statistics of the collected articles related to gamified and adaptive gamified MOOCs

are as follows: Almost half of the selected articles were chosen from 2020 to 2024, as shown in Figure 2. Years with 10 or more articles are from 2018 to 2024 except 2023, with the most in 2021. These total 75 out of 99 (75.75%).

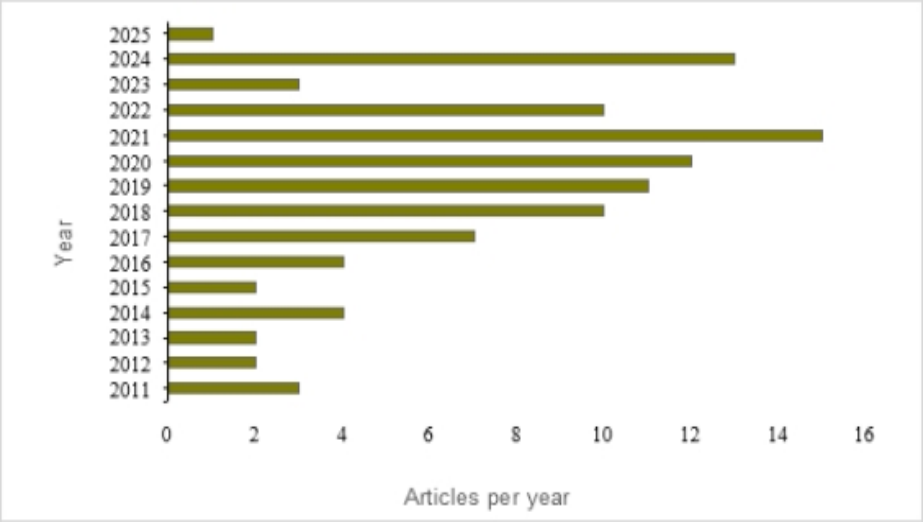

Figure 2. Articles per year.

Figure 3 takes into account the time of the citations per article per year. For the citations per article per year about gamification in MOOCs from 2011 to 2025, the highest size of citations per article per year occurred in 2011, followed by 2012, 2021, 2017, 2018, and 2013.

When an academic article is frequently cited by other researchers in its field, it indicates that the research presented is influential and significant to the ongoing discussions within the academic community. This is why a higher number of citations per article per year is viewed as a sign of quality research. Such articles are often recognized for their originality, methodological rigor, and relevance to the field, attracting other scholars' attention over time.

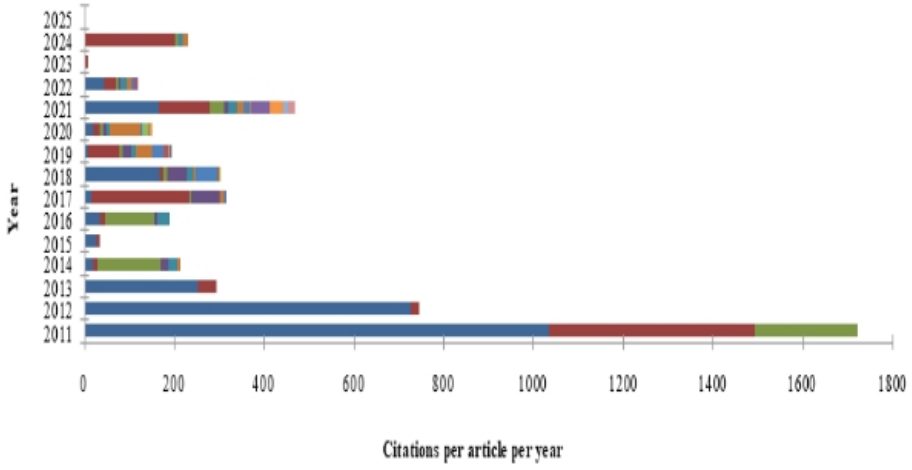

Figure 3. Citations per article per year.

(d) Assessing quality

During the assessment of quality, the following factors were considered: (a) The relevance of the research method was evaluated to determine if it was suitable for answering the research questions, along with an examination of whether appropriate inclusion and exclusion criteria were applied; (b) The reliability of the outcome estimates was assessed for accuracy; (c) The validity of the selection process was enhanced by the involvement of two researchers, which helped minimize bias in the article selection; (d) Applicability was confirmed, as the results are transparent and deemed relevant for other researchers. Most articles were selected from reputable sources based on their quality, specifically focusing on the research methodologies used and the quality of the scientific journals in which they were published. Moreover, this evaluation can be facilitated by referring to established journal ranking lists [24]. In addition, the tool Cochrane RoB 2 (Excel version) for evaluating quality and potential for bias was used to limit the bias and increase the quality of the review by assessing the objectivity of the research papers for bias in selecting the reported results. Papers found to be biased were not selected.

Table 2 presents a ranking list of high-impact and prestigious journals and quality conferences that were selected for this research, as well as high-impact conferences indicating the quality of the study.

Additionally, reputable texts, including those by [40] and [49], were utilized to improve the quality and dependability of the article.

Table 2. The key journals and conferences referenced in this review

Journal	h-index	Impact factor (SJR)	Quantity
Lecture Notes in Computer Science	499	0.352	1
PLoS ONE	467	0.803	1
Journal of Business Research	292	3.450	1
IEEE Access	290	0.849	3
Computers in Human Behavior	275	2.923	1
Journal of Clinical Epidemiology	262	3.149	1
Computers and Education	253	3.343	4
Frontiers in Psychology	212	0.872	2
Sustainability	207	0,688	1
Information and Management	204	2.920	1
Information Systems Research	192	4.850	1
Applied Sciences	162	0.521	1
International Journal of Human-Computer Studies	152	1.394	1
Procedia Computer Science	152	0.471	1
European Journal of Information Systems	139	3.459	1

Journal of Systems and Software	135	0.975	1
British Journal of Educational Technology	127	2.690	1
Educational Technology and Society	117	1.924	1
Educational Research Review	117	3.839	1
Heliyon	115	0.644	1
Computers and Electrical Engineering	106	1.053	1
Education and Information Technologies	97	1.654	1
Journal of information technology	96	2.192	1
Mathematical Problems in Engineering	95	0.400	2
International Journal of Qualitative Methods	94	1.622	1
Interactive Learning Environments	80	1.976	2
International Journal of Educational Technology in Higher Education	77	3.912	1
Australasian Journal of Educational Technology	75	1.249	1
International Journal of Artificial Intelligence in Education	68	1.960	2
Education Sciences	68	0.730	2
Communications of the Association for Information Systems	64	0.738	2
Humanities and social sciences communications	64	0.810	1
International Journal of Emerging Technologies in Learning	55	0.536	1
ACM Transactions on Computing Education	51	0.784	1
MDPI - Computers	50	0.805	1
Computer Applications in Engineering Education	48	0.831	1
Environmental Evidence	47	1.382	1
International Journal of Information and Learning Technology	45	0.699	1
Entertainment Computing	43	0.681	1
Cogent Education	43	0.602	2
Smart Learning Environments	41	2.476	1
IEEE Global Engineering Education Conference, EDUCON	39	0.321	4
Journal of Information Technology Education: Research	38	0.712	1
MDPI Informatics	37	0.651	1
E-Learning and Digital Media	35	0.757	1
Telkomnika (Telecommunication Computing Electronics and Control)	35	0.228	1
Research and Practice in Technology Enhanced Learning	33	0.865	1
International Journal of Engineering and Technology	32	0.103	1
Informing Science: The International Journal of an Emerging Trandiscipline	29	0.318	1
Journal of Educators Online	29	0.205	1
International Journal of Evaluation and Research in Education	28	0.324	1
Information Discovery and Delivery	27	0.540	1
Proceedings of the 25th European Conference on Information Systems	22	-	1

International Journal of Modern Education and Computer Science	20	0.415	1
World Journal on Educational Technology: Current Issues	19	0.249	1
International Journal of Serious Games	14	0.480	1
Asia Pacific Journal of Information Systems	11	0.184	1
Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments	11	-	1
Proceedings of the 7th International Conference on Computer Supported Education (CSEDU 2015)	9	-	1
Proceedings of the 2014 IEEE International Conference on MOOCs, Innovation and Technology in Education	3	-	1

(e) Extracting data

In order to gather pertinent information from the reviewed sources, a template for data extraction was created. This process took into account the quality and type of each source, the inclusion of qualitative method studies, and the established inclusion/exclusion criteria. It also considered the sampling procedures, types of quality assessments, extraction techniques, and data analysis methods. Additionally, the transparency and systematic guidelines established by [21] were adhered to.

During the data extraction stage, the essential characteristics of studies that propose solutions to improve the key challenges and shortcomings of traditional MOOCs were captured. This was done for each research question and in a structured, standardized format, using information from selected rigorous journal articles and conference papers. To develop a preliminary synthesis of findings, a synthesis of proposals or solutions concerning key challenges from the included studies was carried out. To strengthen the evidence and the quality of the review, an effort was made to include as many sentences as possible for each key challenge and the extracted data checked by two researchers. It is considered that all previous procedures contributed to reliable results with a limited risk of bias.

(f) Analyzing and synthesizing data

During the data analysis and synthesis stage, the guidelines for transparency and systematicity provided by [21] were used.

Thematic analysis and focused coding were used for the data analysis. Thus the data (evidence) were organized into three categories based on the research question. The first category focused on key challenges addressed such as motivation, engagement, participation, dropout rate, and loneliness (RQ1), the second on proposals or solutions that have been made to the gamified and adaptive gamified MOOCs (RQ2) and the third on the benefits that offer in addressing the low effectiveness of traditional MOOCs (RQ3).

The analysis was conducted by collecting and contrasting evidence based on predefined questions and selection criteria. This was succeeded by the aggregation, summarization, and organization of the data acquired from the primary studies through the use of focused coding.

The synthesis was done by grouping the findings according to each research question related to proposals concerning key challenges such as dropout rate, completion rate, retention rate, engagement, motivation, cooperation between trainees, etc for confronting them. Summary tables were used to present the results more clearly. The cumulative evidence was interpreted, and the findings were organized clearly to enhance understanding of existing knowledge.

The results of analysis and synthesis will be presented after the section of the literature review on gamification in MOOCs.

3. Literature Review on Gamification in MOOCs

The introduction of this article discusses the efforts made by researchers to conduct systematic literature reviews on gamified and adapted gamified MOOCs, highlighting the various challenges and shortcomings that have been addressed, although the range of these issues is somewhat limited. Additionally, the article outlines the gaps in research within this area.

The primary objective of this review is to acknowledge the findings within the literature concerning the diverse challenges and limitations associated with traditional MOOCs, with the ultimate aim of improving their effectiveness. To provide a more detailed overview of these issues, an extensive bibliography is included in this section, organized according to the research questions posed. This format is intended to enhance the article's readability and accessibility for users.

This section aims to highlight the review findings on gamification in MOOCs in line with the research questions, ensuring a clear and organized structure for better understanding.

To address the research questions, all selected articles were reviewed, and relevant data was extracted accordingly. The reviewers carefully examined the research questions in their sequence to ensure the proper data was selected, analyzed, and synthesized effectively. This structured approach will make it easier for readers to refer back to specific sections of the article for more information.

3.1. The impact of gamification on MOOCs in distance education

(a) Gamification in general

Gamification is widely acknowledged as a successful technique for improving learning outcomes in different educational settings [25]. The attainment of learning outcomes provides a measurable way to determine if there are academic benefits due to increased student engagement [26].

The impact of gamification in promoting learner achievement significantly depends on the

educational discipline in which it is applied [27]. The hit of gamification in MOOCs relies on its ability to tackle the challenges of traditional MOOCs, such as low engagement and high dropout rates.

The evolution of MOOCs has guided a significant admission of distance learning by a significantly broad audience. MOOCs have great accessibility due to their considerable number of open online courses. Which aspects impact the success of MOOCs in developing new methods and implementations to reduce dropout rates and address other issues of traditional MOOCs is a crucial research challenge.

Numerous factors influence the success or failure of learners in MOOCs. Most learners are genuinely motivated to complete the course, considering its quality and ease. Reference [28] argues that successful MOOCs cannot be defined according to specific reported outcomes but rather by the result of learner engagement in course activities. Research on the elements that act on the retention rate in a MOOC was done. The high dropout rate of about 90% for users who initially enroll in a MOOC is a major apprehension for MOOCs' long-range success, influence, and viability, as per [29]. Reference [30] researched to be aware of the causes behind the high dropout rate. They stated that the reasons for the high dropout rate include lack of time, gender-specific issues, insufficient online skills, lack of prior experience, challenges in course design, poor quality of lectures, and unsuitable pedagogical models.

Reference [31] also highlighted the significance of collaboration, the sensation of community, and the requirement for confirmation and use of standards as the principal factors influencing the dropout rate in MOOCs. In a study conducted by [32] aimed at identifying the challenges encountered by both learners and educators in traditional MOOCs, it was discovered that a significant number of learners experience a deficiency in guidance and motivation. Additionally, there is a pronounced need for communication and interaction with peers and/or instructors, which ultimately contributes to course attrition.

Another significant predictor of MOOC retention is the interaction with the teacher. According to a study by [33], perceived usability, usefulness, social impact, and self-efficacy are among the elements influencing MOOC participants' retention levels. According to [34] study on students' views, the action of course matter on perceived course efficiency acted as a moderator in the connection between course matter and retention in MOOCs. An empirical survey conducted by [35] on both students' learning outcomes and pleasure showed that gamification is a productive tool for tutoring exacting courses at the advanced education level.

According to [36], there are several challenges in selecting a suitable gamification strategy. These challenges include the difficulty of choosing the right gamification features, the adequacy of the information available for decision-making, and the importance of

managing the impact of gamification effectively. Reference [37] raised concerns about why gamification elements often do not directly address the main needs of contributors. They suggested that a more theory-based approach to utilizing these elements could be beneficial.

Gamification is often proposed for provoking activities because it positively impacts students' motivation, engagement, and satisfaction [38], has an effective impact on the final grade [39], and can increase the motivation, performance, engagement and persistence of learners [40].

Reference [13] suggests that a gamified design can promote autonomy support by incorporating features such as avatars, missions, social interaction (like chats or teamwork), and instant feedback. They also argue that achievements within the gamified experience should help foster a sense of competence, promoting students' basic psychological needs and increasing their positive motivation. Gamification merely raises the motivation and engagement of learners through intrinsic and extrinsic motivation, but other factors must also be taken into account [41].

Reference [42] argues that improving online learners' motivation and engagement is crucial for their success. Gamification, in general, increases user engagement by meeting the competency, autonomy, and relatedness needs [43]. As a result of increased engagement, user failure rates in MOOC courses are decreasing [44]. Research by [45] showed that gamification increases motivation and participation but not achievement, while research by [46] showed a good connection between academic performance and gamification. According to [47], gamification is an effective method for motivating and enhancing learning. It helps students develop long-term life skills by increasing their engagement in the educational experience through creativity and imagination.

Gamification in education involves integrating gaming mechanics and game-like experiences into instructional materials [3]. As a result, it can improve students' skills and increase involvement in learning [48]. Reference [49] argues that gamification in education effectively enhances students' attention and motivation, helping them commit to tasks and influencing their behavior. Grasping the part played by gamification within education entails comprehending in which scenarios game-like elements can bolster educational performance and can be derived from diverse gamification assignments [50].

A study conducted by [51] revealed notable mitigating effects associated with user type, academic discipline, design principles of educational gamification, length of gamification experience, and the learning context.

According to [52], students' learning experiences in MOOCs - encompassing both their cognitive and emotional states - are connected to their course completion rates and learning outcomes. The research showed that students who actively participated but had little influence

in their interactions often experienced feelings of flow and boredom. In contrast, students who participated less frequently but had a significant impact on interactions were more likely to feel anxiety and apathy. In their study, [53] indicated that an individual's enjoyment and challenges they encounter significantly impact the effectiveness of their learning. To achieve this result, mediating processes such as satisfaction, commitment and intrinsic motivation are required.

(b) Gamification in MOOCs

Gamified MOOCs have rapidly evolved and gained popularity due to their adoption of gamification strategies and elements used to improve MOOCs' effectiveness. These strategies and elements can supplement existing learning methods, resulting in more effective learning. In higher education, gamification strategies are primarily used in distance learning to enlarge students' motivation and commitment to academic work [55]. Recent research conducted by [15] has identified the most well-known gamification strategies as achievement-based, goal-based, attention-based, immersive-based, and social-based.

According to [56], one main purpose of gamification in a MOOC application is to enhance the motivation of MOOC attendees. Research by [57] showed an improvement in student motivation, learning level, completion rate, active participation, and high engagement in terms of content, especially a notable interaction within the collaborative gamified MOOC. Similarly, [58] established a positive correlation between gamification and learner motivation and engagement in MOOC settings.

Individuals are driven to address challenges and sustain their engagement through a range of elements and strategies [15]. Among the most prevalent and captivating features in MOOCs are points, badges, leaderboards [3], and virtual goods [59]. As noted by [60], the most rewarding elements of gamification in MOOCs encompass leaderboards, badges, and competitive elements.

Reference [61] proposes that the use of goal indicators, levels, and communication channels plays a crucial role in improving learning outcomes, storytelling, and avatar interaction for users of MOOCs. Additionally, these communication channels contribute to enhancing users' learning performance, goal attainment, and scores, while also fostering greater overall engagement.

We should follow some design principles and methods when using gamification to improve the effectiveness of educational activities in MOOCs. According to [3], gamification design mainly includes goals, challenges, freedom of choice and failure, rapid and visible feedback, individualization, and social involvement.

Reference [62] considers the interaction between learners as a crucial criterion for providing a sense of satisfaction to each other when studying through a gamified MOOC.

Many students who feel excluded by traditional teaching methods are thought to benefit from it as an alternate method [41].

Reference [7] considers gamification in MOOCs to be a decisive factor for their success and that its use can increase, in addition to engagement, participation, and improve user satisfaction, as well as the success of gamification being measured through engagement. However, we should decide how best to achieve continuing engagement [63]. As noted by [64], the motivation of students and their personal satisfaction are essential elements to consider when designing MOOCs. Additionally, the goal of gamification should not be solely to foster competition; it should also create opportunities for collaboration.

Reference [14] performed a study that illustrates how gamification components - like badges, levels, leaderboards, challenges, and rewards - have a considerable impact on student motivation and engagement, while also contributing to a decrease in dropout rates in MOOCs. Nevertheless, the effectiveness of these elements may differ depending on their specific design, implementation, and alignment with students' intrinsic motivations and objectives. Reference [65] argues that expectations of performance and effort, social effects, simple conditions and hedonistic motivation influence satisfaction. Additionally, performance expectations, hedonistic motivation, satisfaction, and personal inventiveness influence the intention to continue engaging with MOOCs.

A research study by [66] regarding MOOCs indicated that both autonomy and relatedness exert a statistically significant positive effect on learners' attitudes. Conversely, the impact of competence was found to be statistically insignificant. Additionally, the results demonstrated that autonomy and relatedness have a considerable influence on perceived use facilitation. Furthermore, research conducted by [16] established that gamification has the potential to enhance motivation, engagement, and academic performance among learners in vocational education.

To enhance learner engagement in MOOC environments, [67] proposed seven personalization criteria: personal expectations and motivations, preferences and necessities, learning outcomes, level of capability and experience, learning style, and study pace. Reference [11] showed that motivational factors affect participant retention in a MOOC without a moderator, as well as the effect is mediated by participant satisfaction, willingness to use MOOCs, self-regulation, commitment, performance, and quality of participation. By developing a continuing education course on segmentation design, participants were able to experience prolonged engagement, confirm cognitive load and find a clear path to completion [68].

(c) Adaptive gamification in MOOCs

Adaptive gamification, as previously mentioned, enhances the educational experience by adjusting learning materials and integrating game elements to cater to the diverse needs of

learners across different contexts. Learners are engaged in various ways, necessitating a comprehension of gamification mechanisms that elicit enjoyment, so they can be tailored to individual characteristics such as personality, needs, honor, and motivation of each learner [69].

Gamification has been found to enhance the effectiveness of conventional MOOCs, but it has also created new challenges that need to be addressed. Adaptive gamification, however, has shown promise in further improving MOOCs. Reference [70] have identified several difficulties associated with gamified MOOCs, such as time constraints, limited knowledge, financial constraints, a mismatch between gamification and course content, concerns over student perception, and worries about potential negative impacts. Reference [71] has pointed out three key drawbacks in current MOOC research, including insufficient attention given to improving MOOCs, a lack of empirical analysis, and a lack of critical reflection.

Reference [72] highlighted that the integration of gamification into MOOCs presents significant challenges, which are affected by various factors including the user's electronic experience, the user interface, design, and psychological aspects.

Adaptive gamification is a rapidly developing research area that advances gamification applications with learner-centered, personalized, and adaptive standards adapted to specific attributes of different learners and contexts [4]. Course content and other elements are adapted to each learner's attributes and requirements [5]. Reference [73] demonstrated through their research that gamification elements tailored to learners significantly enhance the amount of time they spend in a learning environment compared to those lacking such adaptive gamification elements. MOOC researchers, to address such problems and improve MOOCs further, examine new theories, methods, and techniques to improve the functionality and effectiveness of gamified MOOCs. Adaptive gamification in MOOCs represents a new and more encouraging research area.

Reference [54] states that adaptive gamification improves the learning experience by modifying educational materials and incorporating gaming elements to support the varying needs of learners in different contexts. Therefore, it is essential to reflect on how gamification elements can be customized for students in educational settings.

Rather than applying the same studying approach for the courses, it is suggested to apply individualized learning which is inspired by adaptive learning. By creating a model of the learner that contains characteristics such as goals, knowledge, prerequisites, preferences, interests, learning style, etc., and using this model during the interaction of the learner with the adaptive system then we achieve better learning results [74].

When developing adaptive education systems, such as adaptive MOOCs, developers should consider [75] design rules:

- Modeling of learner characteristics related to reported outcomes is required.
- A preemptive rule for developing an adaptive learning system is to avoid using wash-out methods for modeling the learner.
- The learners' professional competencies, understanding, and capability to maintain knowledge details in a MOOC context should be considered when modeling.
- The non-transparent algorithm-based adaptation of a specialized framework cannot function by itself.
- Utilizing data sets, the learner and teacher must negotiate.
- The adaptation process should be dictated, plain, and under the learner's management.
- The learner should be given the capability to review his learning model.

3.2. Proposals and solutions for gamification in MOOCs

Several researchers in recent years have been designing gamified MOOCs to investigate whether the gamification strategies they use improve on the weaknesses of conventional MOOCs. MOOCs that incorporate gamification elements are significantly advantageous for higher education institutions [28] and may play a crucial role in the effectiveness of these courses [7]. This advantage arises from the potential to enhance user engagement and retention rates [9, 76].

According to [77], the completion of a MOOC gamification activity has a favorable effect on final test scores on course content for all participant profiles, and as a result, gamification may improve student's performance in MOOCs. According to a study by [78], learner-centered methods were offered to adapt gamification elements to specific learner traits such as learning styles, motivation, individuality, or kinds of interaction with differing learning activities. According to [39], incorporating gamification elements into educational settings requires an examination of various factors, including the capability to adjust to learning challenges and the ongoing profiling of participants, as well as the integration of sensory information, contextual awareness, and preliminary user profiling.

Reference [79] argues that gamification processes in MOOCs receive a remarkable response from teachers and students, especially from students, who appear to have increased motivation, engagement, and participation. [80] demonstrated that gamification, which included challenge, fun, and social interaction, was very strong in increasing students' preposition to continue using MOOCs and successful course proficiency.

Reference [81] proposed the Learning Style Gamification Model (LSGM), which is an idealization model for gamified systems, such as MOOCs, that utilize the Felder-Silverman Learning Style Model to recognize student's learning styles and their activities and behavior.

Reference [54] introduced LudiMoodle system that utilizes an initial static adaptation grounded in learner profiles, succeeded by a dynamic adaptation that leverages learning analytics to enhance the adaptation process, assess learner engagement relative to peers, and notify the learner if a modification is necessary. Reference [82] proposed a gamification analytics (GA)-based framework for tracking task completion, analyzing user behavior, and adapting gamification elements to boost student engagement, motivation, and learning.

Reference [83] emphasized the possibility of automatically adjusting gamified elements according to interaction assessments, thus identifying appropriate gamification attributes for learners. Reference [10] found that gamified science instruction increases student motivation, engagement, and leads to improved learning outcomes. Nevertheless, they indicate that more investigations must be taken out regarding gamification in science education and students' learning results to define the actual dimensions of gamification's influence. According to [72] propose that gamification strategies in MOOCs can build a sense of community and social interaction among students. Thus, they showed that gamification designs improve users' social presence, community feeling, and learning performance.

Recent studies indicate that the incorporation of gamification in MOOCs significantly enhances enrolment rates, while also fostering user motivation, interaction, and overall performance. This, in turn, boosts user engagement throughout the course and promotes collaboration among students [59], making learning a unique and fun experience [7, 44, 63, 84], guiding to a more impressive numeral of active participants [9, 57], as well as the extensive increase in the retention of MOOCs [9].

Reference [57] analyzed aspects of gamified MOOCs, such as enjoyment and motivation, and the results showed active participation, high engagement in the MOOC community, and a high level of interaction.

Recent research by [85] showed that gamification can be used in MOOCs to promote self-directed learning and improve learning outcomes.

A study conducted by [86] demonstrated that incorporating additional collaborative components within a gamified MOOC can enhance learners' motivation, with enjoyment being a crucial factor. According to [87], gamification in MOOCs promotes social engagement by giving participants enjoyable, engaging, and meaningful experiences. This leads to more visitors and extended median activity times.

Research by [77] concerning age, academic degree, and gender in gamified xMOOC uncovered that participants aged 20 to 50 had the utmost completion rates in provoking gamified xMOOC. Participants were more likely to complete the gamified xMOOCs challenge the more advanced their educational background was. They also found that finishing a gamification challenge improves test results on the course material for all

participant characteristics (e.g., gender, age, and educational level). Other research shows that elements of gamification improve some weaknesses of conventional MOOCs, such as that of [57], which showed that incorporating gamification elements into MOOCs, such as rewards, increases enjoyment and affects how learners perceive their progress.

Reference [84] suggested that the implementation of gamification within MOOC environments can be achieved by incentivizing learning advancement, incorporating gamification features like levels and leaderboards to promote progress and competition, and providing badges for participation in meetings. Based on the HEXAD framework, reference [88] demonstrated that female students have the highest preferences for game elements such as challenge, leaderboard, level, collection, competition, customization, etc. To increase female participation in gamified MOOC courses, designers must focus on their favorite gamification elements.

Reference [89] proposed a gamification analytics tool that has a notable influence on students' motivation, involvement, and learning. Teachers can monitor and modify gamification designs based on how individuals or groups of individuals interact with the adaptive system. In a study conducted by [90], it was proposed that the Goal-Access-Feedback-Challenge-Collaboration (GAFCC) gamification technique was effective. The research findings showed that the GAFCC class had significantly higher pre-class and post-class training participation compared to the non-GAFCC class. Furthermore, the GAFCC class displayed greater levels of engagement and satisfaction. Reference [91] contend that substantial gamification is considered an essential strategy for developing engaging MOOCs, especially when integrated into a modular and flexible mini-MOOC structure that emphasizes small learning tasks, straightforward instructional content, and diverse multimedia formats to improve the learning experience.

The MARC framework for MOOCs was presented by [92] as a method for developing a gamified MOOC platform that complies with the rules and applicability of the tools and gamification elements and is suited for raising students' intrinsic motivation. The mobile application Noneliness [93] seeks to alleviate feelings of loneliness by fostering social interactions through a gamified methodology that employs quest-based learning within a secure and cooperative user network. Reference [94] proposed a model called AGE-Learn, which incorporates adaptive gamification into ontology, guiding the implementation of gamification mechanics and dynamics to design effective interventions.

There is no doubt that the high dropout rate of MOOCs poses a major challenge Employing machine learning techniques to forecast dropout rates is essential for recognizing students who are at risk and enhancing their educational experiences [95]. Furthermore, the implementation of gamification positively influences the quality of information and systems, as well as user enjoyment, thereby augmenting perceived usefulness and overall satisfaction.

The perceived usefulness of the learning experience further enhances satisfaction, and both of these factors contribute to increased reliability [96].

In the same direction, to address the high dropout rate in web-base learning, [97] developed a dropout prediction model that takes into account the complex interactions and collaborations among learners. Experimental results indicate that this model enhances the quality and effectiveness of dropout predictions. Additionally, learners' backgrounds and demographics can significantly influence their learning behaviors.

Reference [98] developed a MOOC system called PhyGame to support learners who struggle with motivation and may cancel their online courses. This system was especially designed for secondary physics education and includes gamification and interactive elements. Evaluations have shown that PhyGame is an effective learning platform that makes studying physics fun and keeps students sufficiently motivated and engaged.

Reference [99] proposed the Octalysis framework as a tool for evaluating gamification. The findings suggest that while the framework successfully identifies effective gamification elements, challenges such as a limited time frame and low participant numbers may have impacted engagement and retention rates.

3.3. Proposals and solutions for adaptive gamification in MOOCs

Considerable research has been done on gamification in MOOCs to improve their effectiveness. The following proposals and solutions emerged from the investigations. Reference [100] developed a course integrated into Nanomoocs and provided an evaluation of adaptive gamification. They used a simulator with simulated bots to compare three distinct methods of rating types of players: constant, dynamic, and random dynamic. The results showed that their approach achieves a low error compared to baseline methods to estimate the consequences of completion rates in gamification. In a research conducted by [101], a novel evaluation approach was introduced that employs dynamic adaptive gamification to assess motivation for engagement and involvement in online education, aiming to enhance the overall user experience and mitigate feelings of boredom.

In a study, [89] found that gamification analytic tools powered by the GamAnalytics tool positively influence learners' motivation, engagement, and knowledge by adapting gamification according to the student behaviors or groups of learners. Reference [73] conducted a study demonstrating that gamification in MOOCs positively affects learners who exhibit low motivation. Furthermore, the research indicated that the effectiveness of gamification varies based on the specific type of gamification element employed, the initial motivation level of the learner, and their individual profile. As a result, the researchers developed the LoodiMoodle system, which allocates the most appropriate gamification element to each student to enhance their motivation. According to [102], trainees' interactions

with the MOOC can be used to identify their learning styles and provide them with adaptive gamification experiences to increase trainees' motivation and decrease dropout rates. Moreover, they showed that their e-learning system using adaptive feedback to each trainee taking into account their cooperative modes and preferred gamification features significantly improves their performance.

In order to address the elevated dropout rates observed in MOOCs, Reference [60] introduced the DT-ELM. This innovative hybrid algorithm integrates a decision tree with an extreme learning machine (ELM) grounded in entropy theory. Notably, this method eliminates the need for iterative training. The decision tree is utilized to pinpoint features that exhibit significant classification power, subsequently enhancing the weighting of these chosen features to bolster their classification efficacy. Furthermore, they refine the ELM architecture to attain precise prediction outcomes by aligning the decision tree with the ELM. Reference [103] confirms that students' preferences and learning styles give rise to different motivations. Therefore, they use k-Means and Nearest Neighbour Machine Learning algorithms, gradually adapting to students' learning behaviour to classify them according to their engagement and suggesting appropriate gamification elements based on the level of interactivity.

Reference [104] developed the PAGE (Personalised Adaptive Gamified E-learning) model for a MOOC by introducing advanced learning analytics and visualizations, such as a ranking of student performance, to adapt the course to achieve better outcomes like engagement, participation and improved social collaboration.

In the same direction, [89] developed the Gamification Analytics Model for Teachers to enhance the potential of achieving more positive outcomes in adaptive gamified learning systems (such as MOOCs) with regard to student engagement, learning results, and motivation.

Reference [47] presented the ANFIS Gamified Framework Model. This model helps to make informed decisions about the distribution of rewards that are directly linked to the coins won by the students. Consequently, the group of students who used this smart gamified system reported higher participation compared to the control group, confirming the validity of the model. [105] introduced a framework designed to offer researchers a smart model for the incorporation of gamification elements into MOOCs, aimed at enhancing students' higher-order thinking abilities. Reference [106] found that an attention-based adaptation strategy increase participation in meetings.

Research conducted by [107] has demonstrated that gamification is an effective learning approach. It enhances motivation, engagement, learning outcomes, academic performance, and retention rates in both web-based and traditional learning environments, applicable to both theoretical and practical courses.

4. Findings

The collected data, by analyzing the bibliography, was coded and categorized based on aspects, such as motivation, engagement, participation, dropout rate, loneliness, etc. (RQ1) as well as according to the proposals and solutions that have been made to the gamified and adaptive gamified MOOCs (RQ2) and the benefits that offer in addressing the low effectiveness of traditional MOOCs (RQ3).

RQ1: What is the impact of gamification in MOOCs on distance education?

The findings for the first research question (RQ1) regarding the impact of gamification in MOOCs on distance education are presented in Table 3.

Table 3. The impact of gamification on aspects of MOOCs

Aspects	Impact of Gamification in MOOCs	Researcher(s)
Motivation	Increases or improves motivation.	[14, 40, 45, 59, 107]
	Collaborative elements in gamified MOOC can increase motivation.	[86]
	Gamification brings a favorable influence on student's motivation.	[38]
	Raises motivation through intrinsic and extrinsic motivation.	[41]
	Provides an easy way to motivate and encourage learning.	[47]
	Is a very effective tool for motivation enhancement.	[49]
	Gamification strategies are used to enlarge students' motivation in academic work.	[55]
	Improves motivation within the cooperative gamified MOOC.	[57]
	A positive correlation was found between gamification and learner motivation in MOOC environments.	[58]
	Gamification in MOOCs has an overall positive impact on motivation and this impact differs depending on the nature of the game element, and the learner's profile.	[73]
	Adapting gamification experiences in MOOCs increases motivation.	[102]
	The gamification Analytics Model for Teachers enhances the potential of achieving more positive outcomes in adaptive gamified learning systems (such as MOOCs) with regard to student engagement, learning results, and motivation.	[89]
	Enhances the instruction of science education and increases learner motivation, involvement, and learning results.	[10]
	Learner-centered methods were offered to adapt gamification elements to specific learner traits such as motivation.	[78]
	Gamification processes in MOOCs receive a remarkable response from teachers and students, especially from students, who appear to have increased motivation, engagement, and participation.	[79]
Engagement, Involvement	Increases engagement to achieve certain goals.	[2, 3]
	Can increase engagement.	[40, 107]

	Can increase user engagement throughout the study	[59]
	Brings a favorable influence on student's engagement	[38]
	Raises engagement through intrinsic and extrinsic motivation.	[41]
	Increases user engagement by meeting the competency, autonomy, and relatedness needs.	[43]
	Assist students in increasing their engagement in the learning procedure through creativity and imagination.	[47]
	Shows a high engagement in terms of content, especially a notable interaction within the collaborative gamified MOOC.	[57]
	A positive correlation was found between gamification and learner engagement in MOOC settings.	[58]
	The use of gamification in MOOCs can increase engagement.	[7]
	Gamification enhances the instruction of science education and increases learner motivation, involvement, and learning results.	[10]
	Gamification could be used in MOOCs to enhance self-regulated learning of engagement.	[85]
	Communication channels improve MOOC users' learning performance, goal indicators, and scores, and enhance MOOC users' engagement.	[61]
	Enhances engagement in MOOC platforms if we apply seven personalization criteria: personal expectations and motivations, preferences and necessities, learning outcomes, level of capability, experience, learning style, and study pace.	[67]
	The GAFCC model demonstrates higher levels of engagement and satisfaction.	[90]
	It can increase involvement in learning.	[48]
	Gamification processes in MOOCs receive a remarkable response from teachers and students, especially from students, who appear to have increased motivation, engagement, and participation.	[79]
	Gamification elements have a significant impact on student engagement in MOOCs.	[14]
	The gamification strategies they use improve on the weaknesses of conventional MOOCs. This is due to the potential for higher user engagement and retention rates.	[9, 76]
Social engagement	Gamification in MOOCs promotes social engagement by giving participants enjoyable, engaging, and meaningful experiences.	[87]
Completion rate	Shows a notable enhancement in the completion rate regarding content, particularly impressive engagement within the cooperative gamified MOOC.	[57]
	By developing a continuing education course on segmentation design, participants were able to experience prolonged engagement, confirm cognitive load and find a clear path to completion.	[68]
	Participants aged 20 to 50 had the utmost completion rates in provoking gamified xMOOC.	[77]
Satisfaction,	It has a favorable impact on satisfaction.	[38]

Enjoyment, Fun	The interaction between learners is a crucial criterion for providing a sense of satisfaction to each other when studying through a gamified MOOC.	[62]
	The use of gamification in MOOCs improves user satisfaction.	[7]
	The motivational factors affect participant retention in a MOOC without a moderator, as well as the effect is mediated by participant satisfaction, etc.	[11]
	The GAFCC model demonstrates higher levels of engagement and satisfaction.	[90]
	The level of enjoyment and challenges they encounter significantly impact the effectiveness of their learning.	[53]
	Makes learning a unique and fun experience.	[7, 44, 63, 84]
Participation	Increases participation.	[45]
	Shows a notable enhancement in active engagement through content, particularly impressive interaction within the cooperative gamified MOOC.	[9, 57]
	Gamification in MOOCs can increase user participation.	[7]
	The motivational factors impact the level of participation.	[11]
	Attention-based adaptation strategy increases participation in meetings.	[106]
	Gamification processes in MOOCs receive a remarkable response from teachers and students, especially from students, who appear to have increased motivation, engagement, and participation.	[79]
Academic or Educational or Overall Performance	Has a good connection with academic performance.	[43, 46]
	Scenarios game-like elements can bolster educational performance and can be derived from diverse gamification assignments.	[50]
	Can improve user overall performance.	[59]
	Can increase performance.	[40]
	Enhances academic performance in both online and traditional learning environments	[107]
	Motivational factors impact performance.	[11]
Final grade	Has an effective impact on the final grade.	[39]
Attention	Gamification is a very effective tool for attention enhancement.	[49]
	This is one of the three key drawbacks of current MOOC research.	[71]
Behavior	Commit to a mission and influence behavior.	[49]
MOOCs retention	Leads to a significant increase in the retention of gamified MOOCs	[9]
	Enhances retention rates in both online and traditional learning environments	[107]
	Motivational factors impact MOOCs retention.	[11]
	According to their study, perceived usability, usefulness, social impact, and self-efficacy are among the elements influencing MOOC participants' retention levels.	[33]

	According to their study on students' views, the action of course matter on perceived course efficiency acted as a moderator in the connection between course matter and retention in MOOCs.	[34]
	The gamification strategies they use improve on the weaknesses of conventional MOOCs. This is due to the potential for higher user engagement and retention rates.	[9, 76]
Long-term life skills	It facilitates their development.	[47]
Learning style	They are considered to tailor various elements to each learner's requirements.	[5]
	Students' motivations differ depending on their learning styles.	[103]
	Learner-centered techniques were offered to adapt gamification elements to interaction types with different activities.	[78]
Learning outcomes or Results	Enhances learning outcomes in both online and traditional learning environments.	[107]
	Both students' learning outcomes and pleasure showed that gamification is a productive tool for tutoring exacting courses at the advanced education level.	[35]
	The gamification Analytics Model for Teachers enhances the potential of achieving more positive outcomes in adaptive gamified learning systems (such as MOOCs) with regard to student engagement, learning results, and motivation.	[89]
	Gamification enhances the instruction of science education and increases learner motivation, involvement, and learning results.	[10]
	Gamification could be used in MOOCs to enhance learning outcomes.	[85]
Self-regulation	The motivational factors impact self-regulation.	[11]
Dropout rate	Trainees' interactions with the MOOC can be used to identify their learning styles and provide them with adaptive gamification experiences to increase trainees' motivation and decrease dropout rates.	[102]
	To tackle the high dropout rates in MOOCs, they proposed the DT-ELM.	[60]
	Gamification elements reduce the dropout rate in MOOCs.	[14]
	They stated that the reasons for the high dropout rate include lack of time, gender-specific issues, insufficient online skills, lack of prior experience, challenges in course design, poor quality of lectures, and unsuitable pedagogical models.	[30]
Social presence and sense of community	Positively influence the development of social presence and sense of community.	[72]
Cognitive load	By developing a continuing education course on segmentation design, participants were able to experience prolonged engagement, confirm cognitive load and find a clear path to completion.	[68]
Autonomy	A gamified design promotes autonomy support through an avatar or a mission.	[13]

	Autonomy and relatedness significantly affect perceived ease of use.	[66]
Persistence	Gamification can increase persistence.	[40]
User enrollment	Gamification in MOOCs dramatically increases user enrollment.	[59]
Interaction	Gamification in MOOCs can improve interaction.	[59]
	Aspects of gamified MOOC, such as enjoyment and motivation show a high level of interaction.	[57]
	Learner-centered techniques were offered to adapt gamification elements to interaction types with different activities.	[78]
Collaboration between students	Gamification in MOOCs increases collaboration between students.	[59]
	Students who actively participated but had little influence in their interactions often experienced feelings of flow and boredom. In contrast, students who participated less frequently but had a significant impact on interactions were more likely to feel anxiety and apathy.	[52]
Enjoyment, Pleasure	Integrating gamification features into MOOCs, including rewards, enhances enjoyment and influences learners' perceptions of their progress.	[57]
	Both students' learning outcomes and pleasure showed that gamification is a productive tool for tutoring exacting courses at the advanced education level.	[35]
	Students are motivated through various means, necessitating a comprehension of gamification strategies that elicit enjoyment, so as to tailor them to individual traits such as personality, needs, values, and motivations of each student.	[69]
Preferences	Students' motivations differ depending on preferences.	[103]
Boredom	The authors proposed dynamic adaptive gamification to measure motivation for acceptance and participation in online education in order to improve the overall user experience and reduce boredom.	[101]
Loneliness	The mobile app Noneliness seeks to alleviate feelings of loneliness by fostering social interactions through a gamified methodology that employs quest-based learning within a secure and cooperative user network.	[93]
Students' skills	Improve students' skills.	[48]
Goal achievement	Enhances goal achievement.	[72]
Intention	Performance expectations, hedonistic motivation, satisfaction, and personal inventiveness influence the intention to continue engaging with MOOCs.	[65]

The study covers 37 aspects, nine of which (such as autonomy, cognitive load and learning styles) are mentioned for the first time in systematic literature reviews and contribute to the state of knowledge about gamification and MOOCs.

RQ2: What proposals and solutions have been proposed to gamified and adaptive gamified MOOCs to improve their effectiveness compared to traditional MOOCs?

The second research question (RQ2) aimed to investigate suggestions and solutions proposed to improve the effectiveness of gamification in MOOCs compared to traditional MOOCs. The results of this question are presented in Table 4, which lists the different suggestions and solutions to improve the effectiveness of MOOCs.

Table 4. Proposals and solutions for gamified MOOCs

Proposal or Solution	Researcher(s)
Gamification in MOOCs	
A course integrated into Nanomoocs achieves a low error compared to baseline methods to evaluate the effects of completion rates in gamification.	[100]
Individuals are driven to address challenges and sustain their engagement through a range of elements and strategies.	[15]
Points, badges, leaderboards, and virtual goods are among the more popular and engaging elements in MOOCs.	[3, 59]
The most rewarding elements of gamification in MOOCs encompass leaderboards, badges, and competitive elements.	[60]
Gamification in MOOCs is a challenging task that is influenced by many factors, such as the user's e-experience, the user interface, design, and psychology.	[72]
In higher education, gamification strategies are primarily used in distance learning to enlarge students' motivation and commitment to academic work.	[55]
Gamification which included challenge, fun, and social interaction, was very strong in increasing students' preposition to continue using MOOCs and successful course proficiency.	[80]
They proposed the Octalysis framework as a tool for evaluating gamification. The findings suggest that while the framework successfully identifies effective gamification elements, challenges such as a limited time frame and low participant numbers may have impacted engagement and retention rates.	[99]
A group of students using the ANFIS gamified system succeeded in higher participation.	[47]
The Gamification Analytics Model for Teachers (GAMT) improves the possibilities for student engagement, learning outcomes, and motivation.	[89]
The gamification within MOOC environments can be achieved by incentive's learning advancement, incorporating gamification features like levels and leaderboards to promote progress and competition, and providing badges for participation in meetings.	[84]
The hybrid algorithm DT-ELM addresses the high dropout rates in MOOCs by combining a decision tree with an extreme learning machine (ELM) that does not require iterative training.	[60]
The MARC gamification framework for MOOCs is a method for developing a gamified MOOC platform that complies with the rules and applicability of the tools and gamification elements and is suited for raising students' intrinsic motivation.	[92]
Using the HEXAD framework, the female students choose the following game elements: challenge, leaderboard, level of competition, choice, customization, guild, lottery, and prize, according to their favorite gamification elements.	[88]

Significant gamification is regarded as a crucial approach for creating engaging MOOCs, particularly when incorporated into a modular and adaptable mini-MOOC framework.	[91]
The GAFCC gamification design model improves participation, engagement, and satisfaction.	[90]
Theoretical background of Adaptive Gamification in MOOCs	
Adaptive gamification in MOOCs is a rapidly developing research area that advances gamification applications with learner-centered, personalized, and adaptive standards adapted to specific attributes of different learners and contexts.	[4]
Learner-centered techniques adapt gaming elements to specific learner traits such as learning styles, motives, individuality, or kinds of interaction with differing learning activities.	[78]
When developing adaptive learning plans in adaptive MOOCs, they should include Gynther's design criteria.	[75]
Adaptive gamified MOOCs emphasized the possibility of automatically adjusting gamified elements according to interaction assessments, thus identifying appropriate gamification attributes for learners.	[83]
To increase female participation in adaptive gamified MOOC courses, designers must focus on their favorite gamification elements.	[88]
Adapting gamification elements into educational settings requires an examination of various factors, including the capability to adjust to learning challenges and the ongoing profiling of participants, as well as the integration of sensory information, contextual awareness, and preliminary user profiling.	[39]
Employing machine learning techniques to forecast dropout rates is essential for recognizing students who are at risk and enhancing their educational experiences.	[95]
They developed a prediction model to address dropout that takes into account the complex interactions and collaborations among learners, which enhances the quality and effectiveness of dropout predictions.	[97]
They introduced a framework designed to offer researchers a smart model for the incorporation of gamification elements into MOOCs, aimed at enhancing students' higher-order thinking abilities.	[105]
They developed a MOOC system called PhyGame developed a MOOC system called PhyGame to support learners who struggle with motivation and may cancel their online courses. Evaluations indicated that PhyGame is an effective learning platform.	[98]
Adaptive gamification in MOOCs	
LoodiMoodle adaptation engine uses adapted gamified MOOCs to allocate the most adapted gamification element to each student to support their motivation.	[73]
The Learning Style Gamification Model (LSGM) is an idealization model for (adaptive) gamified systems, such as MOOCs, that utilize the Felder-Silverman Learning Style Model to recognize student's learning styles and their activities and behavior.	[81]
Authors' e-learning system using adaptive feedback to each trainee taking into account their cooperative modes and preferred gamification features significantly improves their performance.	[102]
The mixture of K-means and Nearest Neighbor Machine Learning Algorithms can classify students based on engagement level and gradually adapt appropriate gamification elements.	[103]

PAGE model for a MOOC by introducing advanced learning analytics and visualizations, such as a ranking of student performance, to adapt the course to achieve better outcomes like engagement, participation and improved social collaboration.	[104]
A framework based on Gamification Analytics (GA) can monitor task success for understanding user behavior and adapting gamification elements to provide helpful understandings and to achieve increasing student motivation, engagement, and learning in a learning context.	[82]
Gamification analytic tools powered by the GamAnalytics tool positively influence learners' motivation, engagement, and knowledge by adapting gamification according to the student behaviors or groups of learners.	[89]
The LudiMoodle system utilizes an initial static adaptation grounded in learner profiles, succeeded by a dynamic adaptation that leverages learning analytics to enhance the adaptation process, assess learner engagement relative to peers, and notify the learner if a modification is necessary.	[54]
The AGE-Learn model incorporates adaptive gamification into ontology, guiding the implementation of gamification mechanics and dynamics to design effective interventions.	[94]
Gamification Analytics Model for Teachers was introduced by the Authors to enhance the potential of achieving more positive outcomes in adaptive gamified learning systems (such as MOOCs) with regard to learner engagement, learning results, and motivation.	[89]

RQ3: What benefits do gamified and adaptive gamified MOOCs offer in addressing the low effectiveness of traditional MOOCs?

The response to the third research question (RQ3) examined the benefits of gamified and adaptive gamified MOOCs in addressing the restricted efficacy of traditional MOOCs. Taking into account all the aforementioned factors, the findings are as follows:

Gamification in MOOCs: (a) increases engagement, social engagement, motivation, enrollment, interaction, student performance, collaboration among students, participation, students' intention, enjoyment, course completion rates, and retention; (b) positively influences the development of social presence and sense of community among users; (c) offers active participation and high engagement in the MOOC community, and especially high interaction; (d) enhances self-regulated learning engagement and learning outcomes; (e) enhances social engagement by offering participants with enjoyable, interactive, and meaningful experiences; (f) plays a crucial role in increasing students' retention rate and their course performance if includes entertainment, challenge, and social interaction; (g) can increase learning motivation by cooperation elements; (h) has a favorable effect on final test scores on course content for all profiles by completing of a MOOC gamification activity.

Adaptive gamification in MOOCs: (a) uses students' interactions with the MOOC to identify students' learning styles and provide them with adaptive gamification experiences to increase learners' motivation and decrease dropout rates; (b) increases learner engagement and provides information for implementing adaptation mechanisms that adapt gamification

elements: (c) positively influence students' motivation, engagement, and knowledge by using gamification analytic tools powered by the GamAnalytics tool; (d) improves student engagement, learning outcomes, and motivation by using Gamification Analytics Model for Teachers; (e) increases learners' motivation and decreases dropout rates; (f) adapts gamification elements to each student to support their motivation; adapting feedback significantly improves students' performance; (g) reports higher participation by using ANFIS gamified framework model; (h) adapts the course to enhance the likelihood of favorable results, including engagement, participation, social collaboration, and improved performance, by employing the PAGE model for MOOCs.

Furthermore, gamification can be regarded as an effective approach for creating engaging MOOCs, especially when incorporated into a modular and flexible mini-MOOC design framework, serving as an alternative for numerous students who experience a sense of isolation from traditional teaching methods.

5. Discussion

As mentioned in the Introduction of this paper, several SLRs have been conducted on gamification in MOOCs. The most recent ones include studies by [12-16]. However, none of these reviews address the most recent research on the aspects that enhance the effectiveness of MOOCs making use of gamification and adaptive gamification, mainly regarding overcoming challenges and improving coping strategies.

This article focuses on exploring the challenges and shortcomings of traditional MOOCs and how these can be improved through gamified and adaptive gamified MOOCs to address the research gap identified in other current SLRs. Moreover, this article analyses the concept of gamification and its implementation in MOOCs. It emphasizes the most significant issues that researchers are endeavoring to resolve and the strategies they employ to tackle these challenges. In contemporary MOOCs, the research areas of gamified and adaptive gamified MOOCs concentrate on addressing the obstacles and constraints associated with conventional MOOCs. Both innovations improve traditional MOOCs by addressing their challenges, as explored in detail in the study. The research questions guided the coding of the gathered data. A systematic literature review was chosen as the research methodology for this review.

In the process, the most significant and reliable bibliographic sources were selected, ensuring the credibility of the results by considering the inclusion and exclusion criteria. For a more thorough systematic literature review, other less reliable sources that contained significant research were also utilized, which were considered to have little impact on the overall quality of the article.

The results will be utilized to conclude how gamified and adaptive gamified MOOCs improve traditional MOOCs effectiveness and how to assist distant learning generally.

Table 3, related to the first research question (RQ1), displays 37 key challenges addressed in the corresponding MOOCs that helped enhance overall effectiveness. This table illustrates that gamification in MOOCs improve the effectiveness of conventional MOOCs in the realm of distance education. They enhance various aspects such as motivation, engagement, involvement, completion rates, satisfaction, participation, enjoyment, preferences, academic performance, final grades, attention, behavior, MOOC retention, long-term life skills, learning outcomes, self-regulation, student skills, autonomy, persistence, user enrollment, interactions, collaboration among students, social engagement, social presence, sense of community, and they also help reduce drop-out rates, boredom, loneliness, and cognitive load.

Among the aspects listed in Table 3, self-regulation, autonomy, boredom, students' skills, learning style, cognitive load, loneliness, and intention are recent findings highlighted in this article that further enhance the effectiveness of MOOCs. Moreover, self-regulation and autonomy further enhance MOOCs in self-directed learning in distance education. Learning style is a learner characteristic that is applied to gamified and adaptive gamified MOOCs to improve their effectiveness for both traditional MOOCs and gamified MOOCs.

Course content, peers, and gamification elements can be adapted to students' learning styles to meet their requirements, as student motivations differ depending on their learning styles. Gamification improves MOOCs, but adaptive gamification also solves further some gamified MOOCs' issues.

In gamified MOOCs, various methods are used to meliorate the effectiveness of conventional MOOCs. By adapting gamification elements to each user's unique special features, learner involvement and motivation are enhanced, while also addressing various problems. Gamification applications in MOOCs have been developed to improve their effectiveness. Regarding applications, MOOC systems have been developed by various researchers or designers and these results were investigated with the second research question (RQ2) and are presented in Table 4.

Several adaptive gamification systems and methods have been designed or applied to improve the effectiveness of MOOCs, including LoodiMoodle, the ANFIS gamified system, the DT-ELM, and the mobile app Noneliness.

Several adaptive gamification methods or frameworks have been proposed and applied in adaptive gamification MOOCs such as the Learning Style Gamification Model (LSGM), the HEXAD framework, a mixture of K-means and Nearest Neighbor Machine Learning Algorithms, the PAGE gamified model for MOOCs, the GamAnalytics tool, the Gamification Analytics Model for Teachers (GAMT), the GAFCC gamification design model, and the MARC gamification framework for MOOCs. These tools aimed to enhance the effectiveness of conventional MOOCs.

Researchers who have designed and/or implemented adaptive gamified MOOCs have contributed to addressing the challenges and limitations of both traditional and gamified MOOCs. Some of the themes that adaptive gamified MOOCs incorporate include: choosing the most appropriate gamification elements for each student can significantly boost their motivation; offering tailored feedback for each trainee based on their collaboration styles and favorite gamification aspects, which greatly enhances their performance; and classifying students according to their engagement levels, gradually adapting the appropriate gamification elements to fit their needs; can monitor task success for understanding user behavior and adapting gamification elements to provide helpful understandings and to improve student motivation, engagement, and learning within a learning environment; positively influence learners' motivation, engagement, and knowledge by adapting gamification according to the student behaviors or groups of learners. With the capabilities that adaptive gamified MOOCs provide, they greatly boost the effectiveness of MOOCs, contributing in their way as added value to distance education through MOOCs.

From the third research question, many benefits emerge from both Gamified and Adaptive Gamified MOOCs. Several challenges of traditional MOOCs are addressed and significantly improved, such as engagement, social engagement, motivation, enrollment, interaction, student performance, collaboration among students, participation, students' intention, etc. Adaptive gamified MOOCs incorporate personalized elements-such as gamification features, course content, and feedback-tailored to individual students or groups. This customization aims to enhance motivation, performance, participation, and learning outcomes while reducing dropout rates. By doing so, they further improve the effectiveness of both traditional and gamified MOOCs. Each of these components adds unique value to distance education through MOOCs.

As the results show, extensive research has been done on gamified and adaptive gamified MOOCs. However, research requires extended deeds in this direction. Further investigation is required to tailor adaptive gamified MOOCs to adequately address the unique requirements of users, similar to the achievements realized in online adaptive educational hypermedia systems. Such needs are adapting the content to the language of each user, and giving access to non-English speakers. Designing adaptive gamified MOOCs must be equally accessible to all learners due to differences in prior knowledge, so it is necessary to design MOOCs in this direction. In addition to adapting gamification elements, it is essential to emphasize the quality of MOOCs. Many courses are developed by less experienced instructors, resulting in less reliable learning experiences. MOOCs should also be developed based on more theories and strategies of MOOCs and not just on elements.

Scaling adaptive gamified MOOCs should ensure that personalized learning remains effective at a larger scale. Furthermore, it is essential to remember that focusing solely on

gamified components may lead to a neglect of the educational objectives and the overall quality of the course. MOOCs should also be developed based on more theories and strategies of MOOCs and not just on elements.

6. Conclusion

In this article, a systematic literature review was used and, in terms of relevance, the adopted research method and study design were considered the most dependable and suitable techniques were employed to address the research inquiries presented, alongside particular inclusion and exclusion criteria applied. The dependability of the study results is caused by the quality of the articles and the application of researchers' guidelines. Validity was enhanced by two researchers involved in reducing random findings and minimizing bias through consistent results. The Cochrane RoB 2 tool was utilized to further minimize bias. The research questions were clear so there were no confounding factors. Concerning applicability, the results are clear and transparent and supported by multiple sources suitable for application by other researchers.

The integration of gamification into MOOCs significantly improves the quality of distance education by increasing course completion rates and enhancing student engagement, motivation, interaction, active participation, retention in MOOCs, enjoyment, preferences, learning outcomes, persistence, user enrollment, and overall performance, including academic performance, final grades, attention, behavior, long-term life skills, self-regulation, and more. It can also foster collaboration among students, enhance user satisfaction, promote autonomy, increase social presence, and build a sense of community. Additionally, it can influence how students perceive their progress and learning outcomes while reducing dropout rates, boredom, and feelings of loneliness.

The research analysis concludes that researchers suggest alternative approaches, such as gamified and adaptive gamified MOOCs, to enhance the effectiveness of traditional MOOCs. This could be succeeded by improving retention and completion rates while addressing dropout rates, which are the biggest challenges, along with students' interests, preferences, academic goals, etc. The present research offered several types of research in this direction in an organized manner so that any researcher or practitioner can study and apply in the design of similar systems or get a general update on the current research.

The study also concluded that various challenges and weaknesses of MOOCs have been addressed to a large extent. This review presents for the first time challenges, such as final grade, learning style, self-regulation, cognitive load, autonomy, boredom, loneliness, students' skills, and Intention. To systematically address the challenges, frameworks such as Octalysis, MARC, HEXAD, models such as PAGE, GAMT, GAFCC, LSGM, AGE-Learn,

GAFCC, and systems such as GamAnalytics, LudiMoodle, PhyGame, have been developed. It is essential to integrate the current research in a manner that yields enhanced promotional compositions, which will also consider the quality of the educational materials to achieve significantly improved outcomes.

This study can provide valuable findings for MOOC researchers and developers, helping them to address deficiencies and systematically tackle challenges. A broad conclusion indicates that both gamification in MOOCs positively influence distance education. The gamification applications developed for MOOCs improve their effectiveness by addressing drawbacks and challenges. The use of gamification adds value to distance education by enhancing the learning experience.

However, the study has some limitations and implications. To avoid incorrect research results, inclusion and exclusion criteria were utilized to identify appropriate and reliable sources. However, this process of selecting relevant studies and extracting data may have resulted in the negligence of some significant studies with relative information. Furthermore, the term "Gamified MOOCs" is often confused with games and not with gamification in MOOCs. As a result, some gamification applications in MOOCs may not have been understood properly by the researchers, leading to incomplete conclusions. MOOC designers should consider an educational approach for gamified and adaptive gamified MOOCs. They should also incorporate gamification elements that create a learning environment supporting better subject understanding, while simultaneously providing satisfaction and solving conventional MOOC shortcomings through gamification. This approach also must improve the effectiveness of MOOCs.

According to the findings of a recent study, MOOC designers must actively seek and evaluate feedback to effectively engage users with a gamified system. Moreover, it is essential to guarantee that the aims of the gamified system align with the users' objectives, while also noting that the immersive dynamics of the gamified system play a significant role in enhancing student engagement.

Consequently, MOOCs ought to adopt additional student-focused gamification techniques to tackle challenges including elevated dropout rates, diminished participation, low completion rates, significant attrition rates, experiences of isolation, reduced engagement, and low retention rates, among others. Researchers are already exploring ways to implement this approach to improve MOOC effectiveness for trainees.

Moreover, one promising region for boosting student motivation, engagement, retention, and interest is the accession of IoT technologies in cooperation with the gamification of MOOC applications. By enhancing the enjoyment and significance of their educational experiences, students can develop their skills, especially their creative abilities, all while engaging in enjoyable activities. This presents a challenge for upcoming researchers.

Web-based Adaptive Educational Hypermedia Systems have significantly impacted education through the incorporation of contemporary learning theories, and they can be further improved by integrating gamification elements. By tackling the challenges and limitations associated with conventional MOOCs, these systems have the potential to greatly enhance their efficacy. This also poses a challenge for future researchers.

In summary, this review identifies several gaps in the existing literature compared to other relevant studies. It offers additional insights into the explored topics through research, frameworks, and the design of more advanced MOOC systems. This review also provides crucial information to enhance the effectiveness of MOOCs by focusing on how researchers tackle the challenges and weaknesses of traditional MOOCs.

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