The Impact of Motivation on MOOC Retention Rates: A Systematic Review

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Abstract
This systematic review investigates the effectiveness of motivational strategies on learner engagement and retention rates in Massive Open Online Courses (MOOCs). Adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, we analyzed 140 studies published between 2014 and 2023 from key academic databases. The objective was to identify and evaluate motivational strategies that significantly reduce MOOC dropout rates. Our findings reveal that personalized learning, interactive content, and peer collaboration are strongly correlated with increased learner engagement and persistence. These strategies align well with learners' intrinsic goals, enhancing their educational experience and adherence to courses. The review also identifies gaps, such as the need for longitudinal studies and culturally tailored motivational strategies, offering a refined agenda for future research in MOOC education. This study contributes to the field by systematically synthesizing existing research, providing new insights into effective educational strategies, and highlighting areas for improvement in MOOC design and implementation.

Keywords: MOOC; Dropout; Motivation; Engagement; Review; Design.

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1- Introduction
The digital revolution has significantly reshaped the landscape of online education, notably through the advent of Massive Open Online Courses (MOOCs). These platforms, which offer expansive educational content, support ongoing development, and facilitate lifelong learning, have been widely adopted across the globe [1]. However, despite their potential, MOOCs are challenged by persistently high dropout rates, with completion rates fluctuating between 3% and 15% [2, 3]. This alarming trend highlights an urgent need for comprehensive research to understand and mitigate the factors contributing to such high attrition.

Since 2016, the academic focus on MOOC dropout rates has intensified, with numerous studies dissecting the causes and proposing effective countermeasures. Research has identified two primary categories of factors influencing dropout rates: learner-focused and MOOC-related. Learner-focused factors include insufficient motivation, time constraints, inadequate prior knowledge, and a disconnect with the course material, while MOOC-related factors often involve course structure, feelings of isolation, limited interaction, and unforeseen costs [4, 5]. Despite identifying these critical factors, many studies have not delved deeply into specific motivational drivers or proposed detailed strategies for addressing these dropout determinants. Furthermore, comprehensive studies by Goopio & Cheung (2020) [6] identified unclear course design, restricted interaction, and language proficiency as significant barriers to learner persistence. However, these analyses often lack a nuanced exploration of how motivational theories can be systematically applied to enhance course design and learner engagement.

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Despite the growing body of research, there remains a significant gap in understanding the specific motivational factors that encourage continued engagement in MOOCs. Prior studies have predominantly focused on identifying broad thematic issues but often fall short of operationalizing how motivational elements can be systematically leveraged to enhance learner retention [7–10]. Moreover, while motivation is frequently cited as a key determinant of learner retention, most studies have employed qualitative methods that may not fully capture the complex interplay of motivational factors within the MOOC context [10, 11]. These studies provide a foundation but do not sufficiently explore the application of motivational theories to practical MOOC design, a gap our research aims to fill.

This systematic review aims to bridge these gaps by offering a focused examination of motivation in MOOCs. Unlike previous research, our approach is not only to identify the factors influencing motivation but also to explore how these factors can be strategically implemented within the design and delivery of MOOCs to optimize learner engagement and success. We address our research questions through the PICOC criteria (Population, Intervention, Comparison, Outcome, Context):

**Q1:** What are the fundamental factors that influence learner motivation in the context of MOOCs?

**Q2:** Which theoretical frameworks underpin the practical strategies for enhancing motivation and retention in MOOCs? How can these frameworks guide effective implementation?

**Q3:** What are the limitations or challenges associated with the implementation of these motivational strategies in MOOCs?

Our review aims to provide actionable insights for MOOC designers, instructors, and researchers, with the goal of enhancing the effectiveness of MOOCs and reducing dropout rates. By deeply understanding the motivational factors contributing to learner retention, we can develop targeted interventions and strategies that significantly improve both learner outcomes and overall satisfaction with online learning experiences.

In accordance with the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA) 2020 guidelines, our systematic review will detail the search strategy, selection criteria for studies, data extraction methods, and quality assessment processes in the Methods section. The Results section will present our findings, followed by a Discussion section where the implications of these results will be analyzed, limitations acknowledged, and future research directions suggested [12]. By uniquely applying motivational theories to the practical aspects of MOOC design and learner engagement, our study distinctively contributes to the literature and addresses critical gaps in understanding how to effectively reduce MOOC dropout rates.

2- Review Methodology

The objective of this systematic review is to explore and evaluate the existing literature for essential motivational factors and theories that influence participant retention in MOOCs. Through successful screening, extraction, and quality assessment of data from pertinent literature, crucial elements of motivational factors, engagement components, and theories were identified. Although not a meta-analysis, this systematic review adhered to the PRISMA 2020 guidelines for the selection process.

2-1- Inclusion and Exclusion Criteria

In this systematic review, we have established specific inclusion and exclusion criteria to ensure that the selected studies are relevant and contribute to a comprehensive understanding of the research questions. The inclusion criteria are designed to identify suitable studies that meet certain requirements, while the exclusion criteria are in place to filter out studies that do not contribute meaningfully to the analysis. The following are the detailed inclusion and exclusion criteria for this review:

**Inclusion Criteria**

1. Studies written in English or French.
2. The period was restricted to publications from 1 January 2013 to 31 March 2023 to include the most recent publications.
3. This review imposed no limitations on research settings or populations and embraced all research methodologies, including quantitative, qualitative, and mixed-methods approaches.
4. Peer-reviewed publications.
5. Gray literature, although it might not be peer-reviewed, it can still offer valuable and trustworthy information.
6. Studies specifically focused on motivation in MOOCs.
7. At least eight pages in length.
(8) Directly addressing learner motivation in MOOCs

(9) Should not duplicate the same concept by the same authors.

Exclusion Criteria

(1) Studies with similar contributions by the same authors.

(2) Studies not written in English or French.

(3) Blog entries, magazine articles, dissertations, newsletters.

(4) Published articles that were not peer-reviewed except grey literature.

(5) Studies that exhibited unclear or inadequate findings, as they failed to offer reliable information pertinent to the research questions.

2-2- Review Design

This systematic review examines the role of motivation in MOOC retention by identifying influential motivational factors, theories, and elements influencing participant retention. The focus is specifically on understanding motivation within the context of MOOCs, rather than comprehensively analyzing all possible factors and theories in other educational contexts. In this regard, this systematic review employs a mixed-methods design for evaluating quantitative and qualitative articles, enabling a comprehensive exploration of the chosen approach. A mixed-methods review facilitates examining interdisciplinary data on motivation components linked with MOOC retention. The design further uncovers various outcomes, including quantitative changes in ratings and self-reported insights into satisfaction, motivation, and dropout reduction.

A wide range of literature, including gray literature, was reviewed according to the predetermined inclusion/exclusion criteria. The selection principles were established before the search and applied to verify the relevance and validity of the data by setting normative standards for the content and purpose of the studies. The online databases used in this systematic review included Google Scholar, Scopus, Web of Science, ERIC, PsycINFO, and ProQuest. The search strategy incorporated keywords related to motivation, MOOC, dropout, participation, and review. A snowball approach was also employed to identify and review gray literature from sources such as the International Society for Technology in Education (ISTE) and Edutopia.org.

2-3- Search strategy

The search results were filtered by the publication date, including articles within the timeframe of January 1st, 2013 to March 31, 2023. The search strategy was based on the PICOC criteria, utilizing keywords with Boolean values and abbreviations. Specifically, keywords such as "motivat*", "MOOC", "dropout", "participat*", "retention", "intrinsic motivation", "extrinsic motivation", and "theories" were used to identify relevant literature, while keywords like "econom*" were employed to exclude any unrelated topics. Figure 1 provides an overview of the process and the results.

The first phase involved a search using the keywords "Motivation" and "MOOC". This search identified 750 potential articles. After reviewing 300 abstracts, 120 articles were selected for further examination. The second phase of the search was more detailed, aiming to refine the results from the first phase. The keywords used in this phase included "motivation", "online learning", "engagement", "dropout", "retention", "participation", "attrition", and " intrinsic/extrinsic motivation". This search identified 453 articles. After analyzing 120 abstracts, 70 articles were shortlisted for the review. The third phase was the most comprehensive and specifically targeted the research questions. The search resulted in a pool of 11041 articles. After analyzing abstracts, 372 articles were marked for further analysis.

After the three search phases, a total of 562 articles (120 from the first search, 70 from the second, and 372 from the third) were selected for further screening. During this process, 67 articles were removed due to issues identified during codification.

Of the remaining 495 articles, they were thoroughly analyzed and 355 were removed, as they did not meet the established selection criteria. The remaining 140 articles were selected for the review.

This search strategy was iterative, starting with a wide scope and gradually becoming more focused with each subsequent phase. The strategy aimed to be comprehensive, ensuring that all potential literature was considered. The screening and analysis processes were rigorous, ensuring that only the most relevant and high-quality articles were included in the final review. The search process diagram is presented in Figure 1 below.
2-4. Quality Appraisal

In the initial stage, two researchers with backgrounds in educational technology (Coder 1: a Ph.D. student researcher in Education and Learning Sciences; Coder 2: a Dr. in educational technology) screened the selected articles to eliminate duplications and exclude those not relevant or outside the scope of the review. They used three criteria for the critical appraisal: (1) relevance based on the title and abstract, (2) explicit results, consequences, and proof tied to the research inquiries, and (3) omission of articles concerning software, coding, and technical aspects, with emphasis solely on those with educational ramifications.

To reduce bias and address concerns about the reliability and validity of The Mixed Methods Appraisal Tool (MMAT), the review researcher clarified some of the criteria utilized in the MMAT for obtaining additional objective scores in selected articles. Other researchers analyzed and categorized the studies using the identical inclusion and exclusion guidelines. They evaluated each study’s relevance, delving into the complete text of the papers when required. The level of concurrence between the coders was determined using the kappa coefficient, which came out to be 76%, signifying a considerable degree of agreement.
The researcher autonomously extracted data from the final list of articles that fulfilled the predefined criteria. Data regarding study design, intervention duration, participant information, data collection, and intervention outcomes were recorded. The two authors resolved disagreements during the settlement, with a third author resolving disagreements if necessary. Despite the paucity of consensus in the literature regarding the MMAT’s reliability, this technique has been examined for reliability and content validity, and the team made efforts to ensure a thorough and unbiased review process.

2-5-Data Analysis

Upon identifying the relevant articles and completing data extraction, the research team carried out a meticulous analysis of the gathered data. This analysis comprised the following steps:

Categorization: The studies were sorted based on their emphasis on specific motivational factors, target population, MOOC environment, and engagement. This categorization enabled the team to discern patterns and trends in the role of motivation and engagement in MOOCs.

Thematic analysis: The research team performed a thematic analysis to pinpoint common themes and trends arising from the studies. This entailed coding each study’s findings and assembling them into broader themes. Each researcher independently undertook the coding process, followed by a discussion to agree on the final themes.

Comparative analysis: The team juxtaposed the outcomes of studies examining similar motivational factors, theories, or engagement aspects to comprehend the consistency of the findings across diverse studies. This allowed the researchers to determine the generalizability of the results and identify areas where the findings might be contradictory or inconclusive.

Synthesis and interpretation: Ultimately, the research team integrated the findings from the categorization, thematic analysis, and comparative analysis to draw conclusions about the role of motivation and engagement in MOOC retention, and how these factors and theories can be harnessed to encourage course completion. The team also recognized potential limitations and areas for future research based on the reviewed studies. By adhering to this thorough data analysis process, the research team aimed to offer an extensive understanding of the current state of research on motivation and engagement in MOOCs, and their influence on student retention and dropout rates.

Table 1. Articles selected for the review

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<td>Alario-Hoyos et al. [14]</td>
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<td>Alraimi et al. [15]</td>
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<td>Brooker et al. [19]</td>
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<td>Buhr et al. [20]</td>
<td>2019</td>
<td>Computers in Human Behavior</td>
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<td>Reparaz et al. [22]</td>
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<td>Chang et al. [23]</td>
<td>2015</td>
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<td>Deshpande &amp; Chukhlomin [24]</td>
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<td>Doo et al. [25]</td>
<td>2020</td>
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<td>Journal of Computing in Higher Education</td>
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<td>James [34]</td>
<td>2022</td>
<td>Journal of College Student Retention: Research, Theory and Practice</td>
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Joo et al. [35] 2018 Computers and Education
Jung & Lee [36] 2018 Computers and Education
Khan et al. [37] 2018 Telematics and Informatics
Kim et al. [38] 2017 Computers in Human Behavior
Kyewski & Kramer [39] 2018 Computers and Education
Li et al. [40] 2018 Computers in Human Behavior
Lu et al. [41] 2017 British Journal of Educational Technology
Maya-Jariiego et al. [42] 2020 Educational Technology Research and Development
Ortega-Arranz et al. [43] 2019 Computers and Education
Petronzi & Hadi [44] 2016 European Journal of Open, Distance and E-learning
Salmon et al. [45] 2017 British Journal of Educational Technology
Shao [46] 2018 Internet Research
Shaprio et al. [47] 2017 Computers and Education
Sun et al. [49] 2019 British Journal of Educational Technology
Tsai et al. [51] 2018 Computers and Education
Uchiduno et al. [52] 2018 International Journal of Artificial Intelligence in Education
Wang & Baker [53] 2015 Journal of Online Learning and Teaching
Wang & Baker [54] 2018 The International Review of Research in Open and Distributed Learning
Wang et al. [55] 2016 Behavior and Information Technology
Watted & Barak [56] 2018 The Internet and Higher Education
Wu & Chen [57] 2017 Computers in Human Behavior
Xing et al. [58] 2016 The Internet and Higher Education
Xiong et al. [59] 2015 Global Education Review
Zhou [60] 2016 Computers and Education
Zhao et al. [61] 2020 Computers and Education
Alharbi et al. [62] 2020 Lecture Notes in Computer Science
Antonacci et al. [63] 2019 Lecture Notes in Computer Science
Anutariya & Thongsuntia [64] 2019 Proceedings of the International Conference on Sustainable Information Engineering and Technology (SIET)
Appiah-Kubi & Rowland [65] 2016 Proceedings of the 3rd ACM Conference on Learning @ Scale
Baek & Shore [66] 2016 Proceedings of the 3rd ACM Conference on Learning@Scale
Balasooriya et al. [67] 2018 Communications in Computer and Information Science
Bonafini et al. [68] 2017 Online Learning
Borras-Gené et al. [69] 2019 Informatics
Bote-Lorenzo & Gomez-Sánchez [70] 2017 Proceedings of the 7th International Learning Analytics & Knowledge Conference
Brady et al. [71] 2016 Proceedings of the 3rd ACM Conference on Learning @ Scale
Brunskill et al. [72] 2016 Proceedings of the 5th Annual ACM Conference on Learning at Scale
Cassidy et al. [73] 2014 All Ireland Journal of Teaching and Learning in Higher Education
Chang & Wei [74] 2016 Educational Technology & Society
Chen et al. [75] 2016 Proceedings of the 8th ACM Conference on Web Science
Coffrin et al. [77] 2014 Proceedings of the 4th International Conference on Learning Analytics and Knowledge - LAK '14
Cook et al. [78] 2015 Proceedings of the THETA: The Higher Education Technology Agenda Conference
Crosslin et al. [79] 2018 Online Learning
Craes et al. [80] 2018 Proceedings of the 5th Annual ACM Conference on Learning at Scale
Davis et al. [81] 2017 Proceedings of the 7th International Learning Analytics & Knowledge Conference
de Freitas et al. [82] 2015 British Journal of Educational Technology
Deng et al. [83] 2020 British Journal of Educational Technology
Deng et al. [84] 2020 Journal of Computer Assisted Learning
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<td>Gallego-Romero et al.</td>
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<td>2015</td>
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Table 1 presents a comprehensive list of the 140 collection of academic researches selected for the review. Notably, there is a larger representation of conference proceedings, with 89 entries, as compared to the 51 journal articles. This disparity might indicate that the issue of dropout rates in MOOCs and the impact of motivation is of great importance, prompting researchers to frequently present their findings at conferences for quicker dissemination and discussion of their work. The substantial number of conference proceedings suggests that the academic community is highly engaged in addressing this critical concern, actively exploring new ideas, fostering collaboration, and staying informed of the latest advancements in understanding and addressing the challenges of dropout rates, motivation, and engagement in MOOCs.

Figure 2. Statistic of reviewed Papers
As noticed in the first paragraph of the introduction, the number of articles published on the topic of MOOC dropout increased significantly in 2016, indicating a growing interest of researchers in this subject. However, it is important to note that the decrease in the number of articles published in the following years does not necessarily mean that the topic has become less important. It is possible that some articles were not selected for the systematic review because the ideas they presented had already been studied before. Additionally, the decrease in the number of articles published may reflect a saturation of research on this topic rather than a decrease in researchers’ interest.

Upon analyzing the data, it is evident that the majority of the articles employ quantitative methods, with the survey approach being the most frequently used. This highlights a preference for gathering structured, numerical data across various research contexts. Meanwhile, qualitative methods offer in-depth investigations through case studies and interviews. Mixed methods (30 articles) combine the strengths of both approaches to provide comprehensive insights. This variety of methodologies suggests a diverse range of research designs and objectives within the reviewed articles.

Following the methodology section, the next section in the research review is the results section. In this section, we present and summarize the key findings from the analyzed articles. By synthesizing the outcomes of the various methodologies, including quantitative, qualitative, and mixed methods approaches, we aim to provide a comprehensive understanding of the research topic. The results are organized and discussed according to the specific research questions or objectives that guided the review, allowing for a clear and coherent presentation of the significant findings and their implications. This section serves as the foundation for the subsequent discussion and conclusion sections, where the findings are further interpreted, and recommendations for future research are provided.

3- Results

Q1: *What are the fundamental factors and theoretical frameworks that influence learner motivation in the context of MOOCs?*

3-1- Motivation Factors

In order to comprehensively analyze the factors that influence MOOC completion rates, it is crucial to examine the diverse motivational sources that drive learners to complete courses. Based on the literature reviewed, these sources can be broadly categorized into two types: need-based and interest-based motivations [44]. Need-based motivations encompass academic, course-specific, and professional drivers, while interest-based motivations include personal, social, and technology-related factors, as illustrated in Table 2. In the following section, we will delve into these distinct categories of motivations and their impact on MOOC completion, drawing upon the selected articles for this review.

<table>
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<th>Table 2. Overview of motivation categories and types influencing MOOC completion</th>
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Need-based motivation refers to the concept that learners willingly engage in learning activities to meet their specific educational needs. This form of motivation, according to need-based theories, is shaped not only by external influences but also more importantly by internal drivers. These internal motivations can take the form of academic, course, and professional incentives. Collectively, these motivate learners to acknowledge and fulfill their educational needs, thus driving their learning journeys further.

Academic motivation: Academic motivation, which characterizes students’ zeal towards their academic pursuits, plays a pivotal role in determining their academic success. Students with higher academic motivation often achieve more in their academic fields, while those with lesser motivation struggle with academic challenges. This motivation is influenced by a variety of factors. For instance, academic self-efficacy, as studied by Jung & Lee (2018) [36], Shao (2018) [46], and Wang & Baker (2018) [54], is a key determinant. The use of innovative pedagogical instruments, such as flipped classrooms, gamification, and query-based learning, also contributes to academic motivation as observed in studies by Chang et al. (2015) [23], Carrera & Ramírez-Hernández (2018) [21], and Ortega-Arranz et al. (2019) [43]. Moreover, the quest for further knowledge and learning skills, the aspiration to earn certificates or credits, and the influence of the teaching presence factor into this motivation. There are also intrinsic motivators such as goal orientation, grit, perceived reputation, self-improvement, and the freedom to learn. Other elements like previous bad experiences in a subject, English proficiency, value learning, and the learning environment design also come into play. It is worth noting that academic motivation has been linked to MOOC retention, and it plays a crucial role in overall learning engagement and perseverance, making it a prime area of interest for educators and researchers alike.

Course motivation: Course motivation is a key factor in learner engagement and retention in MOOCs, is largely contingent upon the structure, design, and content of the course. The complexity and difficulty of the course material, as suggested by James (2020) [34], can significantly sway a student’s decision to continue or disengage from MOOCs. Moreover, factors such as course timing, highlighted by Kizilcec & Halawa (2015) [147], can impact completion rates; longer courses tend to have higher dropout rates. The perceived efficacy of the course content also plays a crucial role in student retention, as noted by Reparaz et al. (2020) [22] and supported by Alario-Hoyos et al. (2017) [14], with task value being a significant variable in this context. Other elements such as course relatedness to the program, learner’s social situation, task value, and interest also contribute to course motivation. Furthermore, the design of the course, emphasized by Eriksson et al. (2017) [27], Aldowah et al. (2019) [5], and El Said (2017) [26], significantly impacts dropout rates, reinforcing the need for high-quality course materials and design. Factors like autonomy, sense of scarcity, and learner’s perception of the course design and content are also of consequence. Thus, course motivation emerges as a multi-faceted concept, influenced by an array of factors tied to the course structure, content, and learner perception.

Professional motivation: Professional motivation is a key aspect driving individuals to engage with and complete MOOCs, often stemming from a desire to enhance their career prospects and job-related competencies. As highlighted in studies by Milligan & Littlejohn (2017) [148], MOOCs offer an avenue for learners to acquire novel knowledge and skills, thereby fueling their occupational development. The literature, including works by Doo et al. (2020) [25], Bayeck et al. (2016) [17], and Xiong et al. (2015) [8], underscores the importance of professional development needs as significant motivators for MOOC users. Furthermore, many individuals choose MOOCs due to their relevance to their current job or profession, a finding echoed in the research by Lu et al. (2017) [102], which pointed to a strong correlation between course relevancy and learner satisfaction. Additional professional motives influencing MOOCs retention include work circumstances [5, 47], workplace knowledge and experience [30, 44], and economic mobility [27, 52]. In sum, professional motivation in the context of MOOCs is a complex construct shaped by various career-related factors and aspirations.

One significant motivation for individuals to enroll and learn from MOOCs is interest-based motivation. Research has shown that interest can be a strong motivator for learning, which arises as individuals interact with their learning environment. Studies have identified two types of interest that affect motivation: personal and situational interests. Personal interests relate to the individual’s intrinsic interests and social motives, while situational interests are associated with technological motives.

Personal motivation: Personal motives refer to an individual’s unique reasons for enrolling in a MOOC, play a crucial role in influencing the decision to complete or abandon these courses. This form of motivation encapsulates a myriad of factors including internal motivations, curiosity, personal growth, self-enjoyment, perceived value, and prior experiences, as outlined in research by Bonk & Lee (2017) [18]. Aldowah et al. (2019) [5], and Watted & Barak (2018) [55] among others. The role of personal interest, boredom, and other personal reasons also significantly sway learners’ decisions, as indicated by Petronzi & Hadi (2016) [44], Buhr et al. (2019) [20], and Shao (2018) [46]. Despite the limited influence of certifications on MOOCs retention identified by Wang & Baker (2015) [53], personal motives consistently emerge as a pivotal factor in course completion as emphasized by Kizilcec & Halawa (2015) [147]. Additionally, social motivations, involving aspects such as social support, interactions, and the social presence observed by Gregori et al. (2019) [31] and Khan et al. (2018) [37], complement these personal motives and further impact MOOC participation and completion.
Social motivation: Social motivations, essentially our innate desire to connect and interact with others, are a substantial determinant in the decision to engage with and complete MOOCs. This spectrum of motivation encapsulates elements such as social support, the presence of friends in a course, opportunities for networking, and the chance to meet new people, as highlighted by Aldowah et al. (2019) [5], Gregori et al. (2019) [31], and Uchidiuno et al. (2018) [52]. Additionally, the influence of social norms, the potential for social mobility, and the value of communication and information use cannot be understated, as they shape the social dynamics within MOOCs. According to research by Khan et al. (2018) [37] and Chaw & Tang [50], these social motivations not only make MOOCs more attractive to learners, but also enhance participation, engagement, and overall performance. Furthermore, the quality of social interactions and the perceived reputation of a course, as examined by Gregori et al. (2018) [31] and Khan et al. (2018) [37], also contribute significantly to MOOC completion rates.

Technology-related motivation: Technological motivation significantly influences a learner's engagement with MOOCs, shaping the learning experience through factors such as platform usability, innovative features, and accessibility. Studies by Joo et al. (2018) [35] and Jung & Lee (2018) [36] demonstrate how an intuitive interface can boost the perceived ease of use, making learning more enjoyable. Aspects like media richness and interactivity, highlighted by Zhao et al. (2020) [59] and Deshpande & Chukhlomin (2017) [24], add a dynamic appeal to MOOCs. However, challenges like infrastructural limitations [47] and navigation difficulties can sometimes hinder progress. Despite such obstacles, the benefits of MOOCs, including wide accessibility [27, 37], and the convenience of flexible learning [47], often prevail. The incorporation of interactive and integrative design elements further strengthens the technological appeal of MOOCs, ultimately contributing to a learner's decision to continue or abandon a course.

Understanding the complex interplay between different motivational categories and their influence on MOOC completion is crucial for creating more effective learning experiences. While each motivation category play a role in MOOC completion, their combined effect may provide a more comprehensive understanding of factors that drive learners to complete these courses. Researchers have discovered that motivation categories are not isolated factors, and they often interact and influence each other [149]. For instance, academic motivation can be intertwined with personal motivation, as students may be driven both by their passion for a subject matter and by their desire to develop personally. Similarly, social motivation can enhance course motivation if learners find that engaging with peers enriches their experience and understanding of the course content. Identifying the ways in which these motivation categories intersect can help course designers and instructors tailor their MOOCs to better address the diverse needs and interests of learners. By considering the multifaceted nature of motivation, it becomes possible to create MOOCs that can more effectively engage learners, fostering a supportive environment that encourages completion. Future research should continue to explore the interplay between different motivation categories, as well as the impact of these interactions on MOOC completion rates, in order to provide a more nuanced understanding of the factors that drive learners to succeed in these courses.

Building upon the understanding of motivation categories and their influence on MOOC completion, it is vital to propose strategies that can be implemented by course designers and instructors to enhance motivation and retention in MOOCs. By addressing the diverse needs and interests of learners, these strategies aim to create more engaging and effective learning experiences.

Q2: Which theoretical frameworks underpin the practical strategies for enhancing motivation and retention in MOOCs? How can these theoretical frameworks guide to an effective implementation of these strategies?

3.2-Motivational Strategies and Frameworks

In this section, we delve into a comprehensive exploration of the key strategies that contribute to enhancing motivation and retention in MOOCs, offering insights into their underlying principles and the potential impact on online learning experiences. According to the comprehensive body of literature on MOOCs, the factors motivating participants to complete these courses are underpinned by a diverse array of theoretical frameworks [16, 37, 42, 49, 56, 126]. These theories offer valuable insights into understanding and enhancing student motivation, thereby reducing dropout rates in MOOCs. An analysis of these theories suggests that they broadly fall into five key dimensions: Learner's Control, Pedagogical, Technological, Social, and Engagement/Behavioral [150]. Learner's Control theories highlight the learner's role as an independent and active participant in the learning process. Pedagogical theories focus on the teaching and learning aspects of MOOCs, while Technological theories emphasize the role of new technologies and their potential for enhancing learning.

Table 3 adapted from the works of the aforementioned authors, presents these dimensions, the corresponding theories, and a brief description of each:
considered because they directly influence active learning and constructive learning environments and managing — I, HTFT, and RIDT, addressing diverse facets, ranging from motivation to behavior strategies were c behaviors within human activity text of MOOCs, SDT plays a pivotal role. MOOCs cater to the need for autonomy by engaging learners in a more personalized and effective learning experience. These systems track a student's performance over time, and adjust and learning activities that cater to a learner's unique needs, adaptively.

Knowledge of the world through experiences and reflection. By using computer algorithms to deliver custom resources and Comprehension of the world and related knowledge of the world through experiences and reflection. By using computer algorithms to deliver custom resources and learning activities that cater to a learner's unique needs, adaptively.

According to PCT, individuals interpret and learn about the world through personal constructs. Educational interventions, thus justifying their selection for a focused examination in this review.

Engagement, Support, and Communication. Each of these categories can be associated with the theoretical dimensions of SDT.

Determination Theory. Engagement strategies were included due to their significant role in adapting learning experiences to individual needs, thereby enhancing intrinsic motivation as suggested by Self-Determination Theory. Engagement strategies were considered because they directly influence active learning and participation, factors known to improve retention rates. Support mechanisms, such as feedback and scaffolding, were examined due to their capacity to aid learners in overcoming challenges within the course, fostering a sense of accomplishment and reducing dropout rates. Lastly, communication strategies were included because effective dialogue between learners and instructors is essential for maintaining motivation and community within online learning environments. Each of these parameters has been shown in previous empirical studies to critically affect the outcomes of educational interventions, thus justifying their selection for a focused examination in this review.

Adaptive Learning: Adaptive learning is a strategy grounded in the principles of Personal Construct Theory (PCT) and Constructivist Learning Theory (CLT). According to PCT, individuals interpret and learn about the world through their unique mental constructs. CLT, on the other hand, proposes that learners construct their understanding and knowledge of the world through experiences and reflection. By using computer algorithms to deliver custom resources and learning activities that cater to a learner's unique needs, adaptive learning systems embody these theories, fostering a more personalized and effective learning experience. These systems track a student's performance over time, and adjust

Table 3. Theoretical Frameworks Categorization in MOOCs Research

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Theories</th>
<th>Description</th>
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<tbody>
<tr>
<td>Learner’s Control</td>
<td>SDT, PRT, SRLT, CVTAE</td>
<td>Theories emphasizing the learner's ability to learn MOOC courses in a self-directed way, considering the learner as an active agent [150].</td>
</tr>
<tr>
<td>Pedagogical</td>
<td>EVT, AGT, ECT, CLT, ALT, ELT, UDL</td>
<td>Theories focusing on the pedagogical, teaching, and learning aspects of MOOCs, including the creation of constructive learning environments and the expectations and achievements in MOOCs [151].</td>
</tr>
<tr>
<td>Technological</td>
<td>TAM, FT, TTAT, MRT, TNE, CHAT</td>
<td>Theories concerning the incorporation and utilization of innovative technologies and media in MOOCs, and their potential advantages for large-scale learning [37, 56].</td>
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</table>

In the literature reviewed, Self-Determination Theory (SDT) emerged as particularly relevant. It is a psychological framework that outlines three fundamental intrinsic needs that drive human behavior: autonomy, competence, and relatedness [152]. In the context of MOOCs, SDT plays a pivotal role. MOOCs cater to the need for autonomy by enabling learners to select their preferred courses, to control their learning pace, and to maintain choice over their learning journey, thereby impacting their decisions to continue with the course [37, 153]. The element of competence in SDT is evident when learners, by engaging in MOOCs, enhance their abilities and increase their sense of effectiveness, which encourages further engagement [37, 154]. Furthermore, the need for relatedness is met as MOOCs foster a sense of belonging and facilitate social interactions, which further strengthens engagement [37]. The interplay of autonomy, competence, and relatedness in SDT thus contributes significantly to a learner's motivation, engagement, and persistence in MOOCs [35, 49].

In addition to these theoretical insights, we have also identified practical strategies that can be used to enhance motivation and retention in MOOCs. These strategies can be categorized under four main categories: Personalization, Engagement, Support, and Communication. Each of these categories can be associated with the theoretical dimensions identified earlier. For instance, personalization strategies such as adaptive learning, relevant and authentic content, and learner-centered design are closely related to the learner's control theories, including SDT. By tailoring the learning experience to the individual learner, these strategies can enhance the sense of autonomy and competence, two key components of SDT.

The choice of parameters in this systematic review—focusing on personalization, engagement, support, and communication—was guided by an extensive preliminary literature review that identified these factors as critical in influencing learner motivation and retention in MOOCs. Personalization strategies were included due to their significant role in adapting learning experiences to individual needs, thereby enhancing intrinsic motivation as suggested by Self-Determination Theory. Engagement strategies were considered because they directly influence active learning and participation, factors known to improve retention rates. Support mechanisms, such as feedback and scaffolding, were examined due to their capacity to aid learners in overcoming challenges within the course, fostering a sense of accomplishment and reducing dropout rates. Lastly, communication strategies were included because effective dialogue between learners and instructors is essential for maintaining motivation and community within online learning environments. Each of these parameters has been shown in previous empirical studies to critically affect the outcomes of educational interventions, thus justifying their selection for a focused examination in this review.

Adaptive Learning: Adaptive learning is a strategy grounded in the principles of Personal Construct Theory (PCT) and Constructivist Learning Theory (CLT). According to PCT, individuals interpret and learn about the world through their unique mental constructs. CLT, on the other hand, proposes that learners construct their understanding and knowledge of the world through experiences and reflection. By using computer algorithms to deliver custom resources and learning activities that cater to a learner's unique needs, adaptive learning systems embody these theories, fostering a more personalized and effective learning experience. These systems track a student's performance over time, and adjust

Table 3 categorizes the dominant theories applied in the study of MOOCs into six groups: Learner's Control, Pedagogical, Technological, Social, Engagement/Behavioral, and Others. Learner's Control theories, such as SDT, PRT, SRLT, and CVTAE, emphasize the learner's ability to engage with MOOCs in a self-directed manner, considering them as active agents [150]. Pedagogical theories, including EVT, AGT, ECT, CLT, ALT, ELT and UDL, concentrate on the teaching and learning aspects of MOOCs, including creating constructive learning environments and managing expectations and achievements. Technological theories, like TAM, FT, TTAT, MRT, and TNE, address the adoption and application of new technologies and media in MOOCs, and how these can facilitate learning at scale [37, 56]. Social theories, such as CT, SCT, ST, and TRQ, examine social exchanges, collaborative learning processes, and activities in MOOCs, highlighting the importance of social context and interactions in learning [16, 49]. Behavioral theories, such as TPB and TRA, are employed to anticipate actions determined by existing attitudes and behavioral intentions, delineating the link between attitudes and behaviors within human activity [42]. Finally, the 'Others' category encompasses theories like MT, ITI, HTFT, and RIDT, addressing diverse facets, ranging from motivation to behavior and more, that don't comfortably align with the prior five classifications.
the pacing and difficulty of material based on the student's progress. Consequently, the application of these theoretical frameworks through adaptive learning can enhance student engagement, comprehension, and retention. It is important to note that the success of this approach is particularly effective in online and digital learning environments where large volumes of learning data can be analyzed and utilized [155].

Table 4. Categories of Strategies for Enhancing Motivation and Retention in MOOCs

<table>
<thead>
<tr>
<th>Strategy Category</th>
<th>Strategy</th>
<th>Theoretical Support</th>
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<tbody>
<tr>
<td>Personalization</td>
<td>Adaptive Learning</td>
<td>SDT, TAM, SRLT</td>
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<td></td>
<td>Relevant and Authentic Content</td>
<td>SDT, EVT</td>
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<td></td>
<td>Learner-Centered Design</td>
<td>SDT, CLT, SRLT</td>
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<td></td>
<td>Learning Analytics</td>
<td>SDT, TAM</td>
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<td></td>
<td>Personal Learning Networks</td>
<td>SDT, EVT</td>
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<td></td>
<td>Personal Learning Pathways</td>
<td>SDT, SRLT</td>
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<tr>
<td>Engagement</td>
<td>Gamification</td>
<td>SDT, SCT, TRA</td>
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<tr>
<td></td>
<td>Peer Collaboration and Support</td>
<td>SCT, CT, SDT</td>
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<td></td>
<td>Instructor Presence and Interaction</td>
<td>SDT, EVT</td>
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<tr>
<td></td>
<td>Real-world Applications</td>
<td>SDT, EVT</td>
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<tr>
<td></td>
<td>Immersive Experiences (e.g., VR)</td>
<td>SDT, CLT</td>
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<tr>
<td></td>
<td>Interactive Learning Activities and Higher Order Thinking Skills (HOTS)</td>
<td>SDT, CLT, ALT</td>
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<tr>
<td>Support</td>
<td>Regular Feedback and Assessment</td>
<td>SDT, FT, EVT</td>
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<tr>
<td></td>
<td>Scaffolded Learning</td>
<td>SCT, CLT, ALT</td>
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<tr>
<td></td>
<td>Accessible Course Design</td>
<td>TAM, UDL</td>
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<tr>
<td></td>
<td>Continuous Improvement</td>
<td>SDT, TAM</td>
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<td></td>
<td>Multilingual Support</td>
<td>CHAT</td>
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<tr>
<td></td>
<td>Peer Mentoring and Mentorship</td>
<td>SCT, SDT</td>
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<tr>
<td>Communication</td>
<td>Clear Communication of Expectations</td>
<td>SDT, EVT, TRA</td>
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<tr>
<td></td>
<td>Feedback and Reflection</td>
<td>SDT, FT, EVT</td>
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<tr>
<td></td>
<td>Multi-Modal Communication (e.g., video, audio, text)</td>
<td>SDT, MRT, TRA</td>
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<tr>
<td></td>
<td>Social Media Integration</td>
<td>SCT, MRT, TAM</td>
</tr>
<tr>
<td></td>
<td>Synchronous Discussions</td>
<td>SCT, CT, SDT</td>
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Relevant and Authentic Content: The implementation of relevant and authentic content in a learning environment is heavily informed by Experiential Learning Theory (ELT) and Situated Learning Theory (SLT). ELT emphasizes the importance of direct experience and reflection in the learning process, while SLT suggests that learning is most effective when it is directly relevant to the context in which it will be applied. By aligning educational material with real-world situations, learners are able to directly apply their acquired knowledge and skills to practical contexts, thereby fostering a deeper understanding of the subject matter. This alignment, thus, serves to boost the learner's motivation and engagement, contributing to a more meaningful and enriching learning experience. Moreover, the incorporation of such content encourages critical thinking, problem-solving, and collaboration, essential skills required in the modern workplace. These theoretical frameworks guide the effective implementation of this strategy, with research supporting its potential in fostering learners' readiness for real-world challenges [156].

Learner-Centered Design: This educational strategy prioritizes the individual needs, preferences, and objectives of the learner. It emphasizes active learning, cooperation in problem-solving, and authentic tasks that stimulate the learner. Its objective is to cultivate learner autonomy and accountability while encouraging a deeper comprehension of the subject. A key aspect of this approach is the shift from the teacher being the primary source of knowledge to learners actively creating their own understanding. This approach often necessitates adaptable learning environments and individualized learning paths. It also emphasizes the importance of continuous feedback and reflection as means for advancement. Learner-centered design is underpinned by several learning theories, including Self-Determination Theory (SDT) and Cognitive Load Theory (CLT), which underscore the importance of active participation and independence in learning. Research has demonstrated that learner-centered methods can result in improved learning outcomes and increased student motivation [157].

Learning Analytics: This strategy involves collecting, evaluating, and reporting data about learners and their environments to understand and optimize learning and the contexts in which it takes place. Educational institutions increasingly use learning analytics to enhance learner outcomes, individualize learning, and transform teaching methods.
This approach employs a range of statistical, machine learning, and data mining techniques to analyze learner data, including interactions with learning management systems, performance data, and even social and demographic data. The insights gained from learning analytics can help predict learner performance, identify students at risk, offer personalized feedback and support, and inform the design of learning environments and interventions. However, the use of learning analytics also raises important ethical and data privacy concerns [158]. The Technology Acceptance Model (TAM) supports this strategy by explaining how users come to accept and use technology.

Personal Learning Networks (PLNs): PLNs refer to the network of people and resources from which an individual learns in their informal learning context. This can include peers, mentors, teachers, online communities, social media groups, blogs, and other resources. PLNs are self-directed and evolve based on the learner's interests and goals. They provide diverse perspectives, real-time information, and support, enhancing the learner's knowledge and skills. PLNs are particularly crucial in lifelong learning and professional development, helping individuals stay current in rapidly evolving fields. Digital technologies and social media have significantly facilitated the creation and maintenance of PLNs, allowing individuals to connect and learn from others globally. Various research supports the effectiveness of PLNs in promoting learning and development [159-161]. This strategy is supported by the Expectancy-Value Theory (EVT), which explains the motivational factors that influence the individual's decision to engage in an activity.

Personal Learning Pathways: Personal Learning Pathways offer customized learning routes tailored to the individual learner's needs, interests, and goals. This approach provides learners with choices and flexibility, enabling them to set their own learning pace and select their own learning activities. Personal learning pathways are adaptable and can change in response to the learner's progress and feedback. This approach often uses digital technologies, such as learning management systems or other personalized learning platforms, to facilitate learning and track progress. Personal learning pathways promote self-directed learning and provide learners with agency, allowing them to take ownership of their learning and achieve their goals. This approach is particularly effective in promoting student engagement and motivation, as learners can pursue topics and activities that are meaningful to them. Research has shown that personal learning pathways can improve learning outcomes and promote lifelong learning [162, 163]. This strategy is underpinned by the Self-Regulated Learning Theory (SRLT), which emphasizes the role of self-regulation in the learning.

Gamification: Gamification employs game-design elements in non-gaming scenarios, which can boost user engagement, motivation, and productivity. In learning, gamification can use game-like attributes such as points, levels, challenges, and rewards to stimulate learners and render the learning process more enjoyable. It capitalizes on our innate inclination towards competition and achievement to improve learning outcomes. Gamification strategies can range from straightforward features like leaderboards to complex systems incorporating narratives and character development. However, careful design is crucial to ensure that gamification supports learning rather than distracting from it. It is most effective when it complements learning objectives and bolsters other motivation forms. Various studies have corroborated the effectiveness of gamification in promoting engagement and learning [146, 164, 165]. This strategy is underpinned by Self-Determination Theory (SDT), Social Cognitive Theory (SCT), and the Theory of Reasoned Action (TRA).

Peer Collaboration and Support: This strategy involves learners working collectively to reach shared learning goals. It can take many forms, such as group projects, study groups, peer tutoring, and online discussion forums. By collaborating, students can glean insights from each other's perspectives, build on each other's ideas, and bolster each other's learning. Additionally, this approach can promote the development of key skills like communication, teamwork, and problem-solving. Peer collaboration and support is rooted in Social Cognitive Theory (SCT) and Constructivism Theory (CT), which posit that learning is a social process that transpires when individuals engage in dialogue and cooperation. It also aligns with Self-Determination Theory (SDT), implying that feelings of relatedness and community can enhance motivation and engagement. Research indicates that peer collaboration and support can positively impact student engagement, comprehension, and retention, fostering a sense of community, particularly beneficial in online learning environments where learners might otherwise feel isolated [166].

Instructor Presence and Interaction: This strategy pertains to the instructor's active involvement in the learning process, encompassing activities such as providing feedback, facilitating discussions, addressing questions, and offering clarification or additional explanations. The instructor's presence can also involve expressing interest and concern for students, acknowledging their contributions, and cultivating a supportive, inclusive learning environment. Instructor presence and interaction is a vital factor in promoting student engagement, motivation, and learning [167]. It aids in creating a sense of community and connection, especially crucial in online learning environments where students may feel isolated. It also supports learning scaffolding and guides students towards achieving learning outcomes. This strategy is supported by social constructivism theory, emphasizing social interaction and dialogue in learning, and expectancy-value theory, suggesting that students' expectations of success and the value they assign to learning can be influenced by the instructor's support and feedback.
Real-world Applications: This approach entails incorporating practical, real-world examples and tasks into educational content, allowing learners to perceive the relevance of the knowledge or skills they are acquiring, and how they can be applied in practical, everyday scenarios. This may include case studies, project-based learning, internships, fieldwork, and other forms of experiential learning. Real-world applications can enhance student engagement and motivation by making learning more meaningful and pertinent. It can also aid students in gaining a deeper understanding of the subject matter and acquiring practical skills transferable to the workplace or other real-world contexts. Real-world applications are supported by experiential learning theory, which emphasizes the importance of experience in the learning process, and self-determination theory, suggesting that learners are more motivated when they perceive their learning as relevant and valuable. Numerous studies have shown that real-world applications can improve learning outcomes, enhance student engagement, and better prepare students for future careers or other real-world challenges [168, 169].

Immersive Experiences: Immersive experiences in learning involve engaging learners in a comprehensive, realistic, and interactive learning environment. The advent of digital technologies, such as virtual reality (VR), augmented reality (AR), or mixed reality (MR), allows for the creation of simulated environments, interactions with virtual objects, or overlays of digital information onto the physical world. Immersive experiences provide learners with opportunities to practice skills, explore scenarios, or engage with content in ways that might not be feasible or safe in the real world. By appealing to learners' senses and emotions, they make learning more engaging and memorable. Immersive experiences are supported by experiential learning theory, which emphasizes the importance of direct experience in the learning process, and cognitive load theory, suggesting that realistic, interactive environments can help manage the cognitive load involved in learning complex skills or concepts. Research has demonstrated that immersive experiences can improve learning outcomes, enhance learner engagement, and promote the development of practical skills. However, the use of immersive technologies also raises issues related to accessibility, cost, and potential for motion sickness or other adverse effects. Therefore, careful planning is needed to ensure that these technologies are used effectively and ethically [170]. As with other strategies, the specific implementation of immersive experiences can vary greatly depending on the context and the learners' needs and preferences.

Interactive Learning Activities and Higher Order Thinking Skills (HOTS): Interactive learning activities are crucial components of an engaging online learning environment. These can take various forms such as problem-solving tasks, group projects, interactive multimedia, quizzes, and more. The essence of such activities is to promote active participation from learners, leading to a more immersive and memorable learning experience. Not only do these activities make learning more enjoyable, but they also serve as a platform for developing higher-order thinking skills (HOTS). Higher-order thinking skills include critical thinking, analysis, problem-solving, and creativity. These skills are often nurtured when learners are encouraged to actively process and apply the information they learn, rather than passively receiving it. Therefore, well-designed interactive learning activities can promote the development of HOTS by presenting learners with complex problems and tasks that require more than mere memorization. For instance, an interactive case study activity may require learners to analyze a situation, evaluate different strategies, and propose a solution, thereby practicing critical thinking and problem-solving skills. Similarly, a group project may require learners to collaborate, share ideas, and create something new, thereby fostering creativity and communication skills. By promoting HOTS, interactive learning activities can increase learners' sense of competence and autonomy, which are key drivers of intrinsic motivation according to Self-Determination Theory. Consequently, the integration of interactive learning activities that promote HOTS can be an effective strategy for enhancing motivation in MOOCs [171, 172]. This approach aligns with various learning theories such as Constructivist Learning Theory and Active Learning Theory, which emphasize the importance of active involvement and cognitive engagement in the learning process.

Regular Feedback and Assessment: This strategy involves providing learners with timely, constructive feedback on their performance and regular assessment opportunities. Feedback helps learners understand their strengths and weaknesses, monitor their progress, and adjust their learning strategies. Assessment helps both learners and instructors gauge the effectiveness of the instruction and identify areas for improvement. Regular feedback and assessment can enhance learning outcomes, motivation, and self-regulation [173].

Scaffolded Learning: Scaffolded learning provides learners with structured support to master complex tasks or concepts. This involves breaking down tasks into manageable parts, providing clear instructions and examples, offering hints and prompts, or providing opportunities for guided practice. As learners develop their skills and confidence, the level of support is gradually reduced. Scaffolded learning, supported by Vygotsky's theory of the Zone of Proximal Development, can enhance learners' understanding, self-efficacy, and autonomy [174].

Accessible Course Design: Accessible course design involves creating courses that are accessible and inclusive for all learners, including those with disabilities. It can involve using accessible technologies, providing alternative formats for materials, using clear and simple language, offering flexible learning paths, and creating supportive learning environments. Accessible course design, supported by Universal Design for Learning (UDL) principles, can enhance learner engagement, satisfaction, and outcomes [175].
Continuous Improvement: Continuous improvement involves an ongoing process of evaluating, refining, and enhancing teaching and learning practices. It requires collecting and analyzing data on student performance, feedback from learners, and insights from instructors to identify areas for improvement and implement changes. Continuous improvement is rooted in reflective practice and is supported by various quality improvement frameworks, such as the Plan-Do-Study-Act (PDSA) cycle. It aims to optimize the learning experience and outcomes for learners [176].

Multilingual Support: Multilingual support in MOOCs involves providing resources, materials, and instructional design that cater to learners with different language backgrounds. This includes offering course content in multiple languages, providing translations or subtitles, and incorporating culturally relevant examples and perspectives. Multilingual support can improve learner engagement, accessibility, and overall learning outcomes, especially for learners whose native language differs from the language of instruction [177].

Peer mentoring and mentorship: Peer mentoring and mentorship are complementary strategies that provide learners with guidance, support, and knowledge sharing. Peer mentoring pairs learners with experienced peers who offer insights, assist in course navigation, and foster community and collaboration. Mentorship involves the guidance and support provided by experienced instructors or experts through virtual sessions, individualized feedback, or mentor-led discussions. Both peer mentoring and mentorship have been shown to enhance learner engagement, satisfaction, and learning outcomes in MOOCs, making them valuable mechanisms for supporting learner success and engagement [178].

Clear Communication of Expectations: Grounded in the principles of effective instructional communication and Self-Regulated Learning Theory, clear communication of expectations in MOOCs ensures learners understand what is expected of them. This strategy involves providing explicit guidelines, objectives, and assessment criteria upfront. By setting clear expectations, learners can effectively manage their learning process, a key aspect of Self-Regulated Learning Theory. This enables them to set realistic goals, manage their time efficiently, and engage more effectively in course activities. Consequently, clear communication assists learners in planning their study schedule, allocating resources appropriately, and actively participating in the learning process. This transparent approach fosters a conducive learning environment and enhances learner satisfaction and success in MOOCs [179].

Feedback and reflection: Feedback and reflection play crucial roles in promoting optimal learning experiences in MOOCs, aligning with important theoretical frameworks such as Self-Determination Theory, Flow Theory, and Expectancy-Value Theory. Feedback, whether provided by instructors or peers, supports learners' basic psychological needs for autonomy, competence, and relatedness, as outlined in SDT. It offers information on performance, progress, and areas for improvement, fostering a sense of competence and intrinsic motivation. Reflection, on the other hand, encourages learners to engage in metacognitive processes, aligning with FT, where learners experience a state of deep engagement and immersion in their learning activities. By reflecting on their learning experiences, learners can identify their strengths, areas of growth, and the value of the knowledge and skills they are acquiring, as emphasized in EVT. This reflective process enhances learners' expectancy beliefs and values, promoting their motivation and persistence in the MOOC. Thus, integrating feedback and reflection in MOOCs, informed by theories such as SDT, FT, and EVT, can foster a supportive and engaging learning environment [180], leading to enhanced motivation, satisfaction, and ultimately, improved learning outcomes.

Multi-modal Communication: Underpinned by the Cognitive Theory of Multimedia Learning [181], multi-modal communication in MOOCs, which includes the integration of video, audio, and text formats, enhances communication effectiveness. Catering to diverse learning preferences and styles, this approach ensures a more inclusive and engaging learning experience. Videos provide visual demonstrations and presentations, aiding the understanding of complex concepts. Audio-based communications, such as podcasts or recorded lectures, cater to auditory learners, emphasizing verbal cues and tone. Text-based communications, including written instructions and discussion forums, support reading and textual comprehension, fostering critical thinking. The Cognitive Theory of Multimedia Learning posits that learners process information more efficiently when it's presented in both verbal and visual formats, thus multi-modal communication optimizes information processing. Consequently, incorporating such communication strategies in MOOCs promotes inclusivity, maximizes learner engagement, and enhances overall learning outcomes [182].

Social media integration: Social media integration in MOOCs aligns with several theoretical frameworks, including Social Cognitive Theory, Media Richness Theory, and Technology Acceptance Model. SCT emphasizes the importance of social interaction, observational learning, and self-efficacy in the learning process. By incorporating social media tools, MOOCs provide learners with opportunities to observe and model behaviors, engage in collaborative learning, and enhance their self-efficacy. MRT examines the effectiveness of communication channels, suggesting that social media platforms, with their multimedia capabilities, provide rich channels for exchanging complex ideas, fostering engagement, and supporting knowledge creation. TAM explores individuals' acceptance and adoption of technology and integrating familiar and user-friendly social media platforms in MOOCs aligns with TAM by enhancing learners' acceptance and usage patterns. Overall, social media integration in MOOCs, informed by SCT, MRT, and TAM, promotes engagement, collaboration, and knowledge sharing, enhancing the learning experience for participants [124].
Synchronous discussions: synchronous discussions play a valuable role in facilitating real-time interaction and teamwork among learners in MOOCs. By incorporating synchronous communication tools such as live webinars, virtual classrooms, or real-time chat platforms, MOOCs enable learners to engage in immediate and dynamic discussions with instructors and peers. SCT emphasizes the importance of social interaction and observational learning, and synchronous discussions provide a platform for learners to observe and model behaviors, receive immediate feedback, and develop a sense of community. Furthermore, synchronous discussions promote the formation of Communities of Practice, where learners actively participate, share ideas, and collectively construct knowledge. This collaborative learning environment fosters social presence, engagement, and the development of critical thinking skills. By incorporating synchronous discussions in MOOCs, learners can benefit from real-time interaction, peer-to-peer learning, and the guidance of instructors, resulting in enhanced engagement, deeper understanding, and an enriched learning experience [21].

The strategies discussed have a substantial potential to enhance MOOC learning experiences and reduce dropout rates. By fostering an engaging, personalized, and effective learning environment, these strategies can boost learning outcomes and be tailored to meet the diverse needs, preferences, and objectives of learners. However, it is crucial to recognize that the successful application of these strategies is not a universal solution but rather context-dependent. Their effective implementation relies on the careful customization and adaptation to the unique context, the subject matter at hand, the learner profile, and the resources available. Hence, while these strategies come with potential advantages, they necessitate meticulous planning, execution, and constant refinement to fully realize their potential. Even with the evident potential of these strategies, they are not devoid of challenges and limitations.

As we progress into the next subsection, we will delve into a comprehensive examination of the potential hurdles and constraints associated with these strategies’ implementation in MOOCs. This exploration will cover factors such as accessibility, cost, technical prerequisites, learner support, and ethical considerations. Recognizing these challenges is a fundamental step towards devising effective solutions and ensuring that our endeavors to enhance online learning are inclusive, fair, and advantageous for all learners.

Q3: What are the limitations or challenges associated with the implementation of strategies to enhance motivation and retention in MOOCs?

3-3-Limitations for Enhancing Motivation and Retention in MOOCs

When implementing strategies to enhance motivation and retention in MOOCs, there are several challenges to consider. One significant challenge is the cost associated with certain strategies, like integrating immersive experiences and AI, which can limit scalability. Moreover, advanced technologies may require a certain level of digital literacy, posing a learning curve for instructors and learners and affecting user experience. The effectiveness of strategies can vary depending on the context and learner profile. Some strategies may require substantial time and resources. Additionally, concerns about misuse of technology, including privacy, data security, and ethical considerations, need to be addressed. Evaluating the effectiveness of these strategies is challenging due to the complex nature of learning outcomes and the difficulty in isolating the impact of a specific strategy. Lastly, the absence of personal interaction and a sense of community in MOOCs compared to traditional classrooms can impact learner engagement and satisfaction. These challenges align with the four strategy groups mentioned earlier: Personalization, Engagement, Support, and Communication.

Personalization strategies, such as adaptive learning, relevant and authentic content, learner-centered design, learning analytics, personal learning networks, and personal learning pathways, can greatly enhance motivation and retention in MOOCs. However, implementing these strategies also comes with certain limitations and challenges. Adaptive learning involves collecting and analyzing vast amounts of learner data to provide personalized recommendations and content delivery, which can pose challenges in terms of data privacy, security, and the need for robust technological infrastructure [183]. Similarly, creating relevant and authentic content for MOOCs across diverse domains and disciplines can be a complex and time-consuming task, requiring subject matter expertise and instructional design skills [184]. Implementing learner-centered design in MOOCs necessitates the development of flexible and adaptable learning environments, as well as individualized learning paths, which can be resource-intensive and require a high level of instructional expertise [185]. Leveraging learning analytics to personalize the learning experience requires effective data collection, analysis, and interpretation, as well as the availability of appropriate technologies and tools [186]. Establishing and maintaining personal learning networks and pathways in MOOCs may require robust networking platforms, reliable support systems, and active community management to ensure effective collaboration and knowledge sharing [160, 163].

In addition to personalization strategies, engagement strategies such as gamification, peer collaboration and support, instructor presence and interaction, real-world applications, immersive experiences (e.g., VR), and interactive learning activities and higher-order thinking skills (HOTS) also play a crucial role in enhancing motivation and retention in MOOCs. However, implementing these strategies is not without its challenges. Incorporating gamification elements requires careful design and alignment with learning objectives to ensure that it enhances learning rather than distracting
from it [187]. Similarly, promoting peer collaboration and support in MOOCs can be challenging due to the asynchronous nature of online learning, which may limit opportunities for real-time interaction and collaboration [166]. Creating authentic instructor presence and interaction in online environments can be demanding, requiring effective communication strategies, timely feedback, and opportunities for meaningful engagement. Implementing real-world applications and immersive experiences may involve technical requirements, resource constraints, and the need for specialized expertise [188]. Furthermore, designing interactive learning activities and promoting HOTs may require careful curriculum design and the use of appropriate technology tools (Manciaracina, 2022).

Support strategies, such as regular feedback and assessment, scaffolded learning, accessible course design, continuous improvement, multilingual support, and peer mentoring and mentorship, are essential in enhancing motivation and retention in MOOCs. However, these strategies also come with their challenges. Providing regular feedback and assessment in MOOCs can be time-consuming and require a significant amount of resources, especially when dealing with large numbers of learners [189]. Scaffolded learning, which involves providing appropriate support and guidance to learners as they progress through a course, can be challenging to implement effectively in MOOCs, given the diverse backgrounds and learning needs of participants [92]. Accessible course design, based on principles such as UDL, requires careful planning and design, as well as familiarity with accessibility guidelines and standards [190]. Implementing continuous improvement in MOOCs necessitates ongoing evaluation, monitoring, and adjustment of courses, which can be resource-intensive and require a commitment to long-term development. Providing multilingual support in MOOCs, such as offering course materials and resources in multiple languages, can be complex and require translation, localization, and cultural adaptation efforts [191]. Lastly, establishing peer mentoring and mentorship programs in MOOCs may require dedicated resources, coordination, and support to ensure effective collaboration and guidance [192].

Communication strategies, including clear communication of expectations, feedback and reflection, multi-modal communication (e.g., video, audio, text), social media integration, and synchronous discussions, are vital for enhancing motivation and retention in MOOCs. However, implementing these strategies is not without challenges. Clearly communicating expectations in MOOCs requires effective instructional design and communication strategies, as well as an understanding of the diverse backgrounds and learning needs of participants [147]. Encouraging feedback and reflection in MOOCs can be challenging, especially when dealing with large numbers of learners and managing asynchronous communication [189]. Implementing multi-modal communication in MOOCs may require technical expertise, resources, and the availability of appropriate tools and platforms [193]. Integrating social media into MOOCs can raise concerns about privacy, data security, and the potential for misuse of technology [194]. Finally, facilitating synchronous discussions in MOOCs can be logistically challenging, given the need to accommodate learners from different time zones, varying levels of digital literacy, and potential technological barriers [195].

While there are numerous strategies available for enhancing motivation and retention in MOOCs, these strategies also come with a range of potential limitations and challenges. These encompass technical, logistical, pedagogical, and ethical considerations, and are related to the four key strategy areas of Personalization, Engagement, Support, and Communication. Therefore, it is crucial for educators, instructional designers, and MOOC providers to be mindful of these challenges when implementing these strategies, and to make informed decisions based on the specific context, learner profiles, available resources, and technological capabilities. Furthermore, continuous evaluation and improvement of these strategies are essential, as the landscape of MOOCs and online learning continues to evolve. By doing so, we can strive to ensure that MOOCs are not only widely accessible, but also effective in promoting learner motivation, engagement, and successful learning outcomes.

4- Discussion

This systematic review extensively explores the impact of various motivational strategies on learner engagement and retention in Massive Open Online Courses (MOOCs), illuminating the potential of these strategies to bolster motivation and enhance educational outcomes. It compares these findings with prior studies, offering a comprehensive analysis of how the results align with or diverge from existing research, and suggests directions for future investigation to bridge existing gaps and advance this field.

Previous research, such as that by Xiong et al. (2015) [8] and Kizilcec et al. (2017) [98], consistently highlights the importance of motivational factors in influencing MOOC completion rates, emphasizing individual learner characteristics such as self-regulation and goal setting. This review builds upon these findings by delving deeper into specific motivational strategies like personalized learning, interactive content, and peer collaboration, which have been shown to effectively address these individual characteristics. The strategies identified in this review—personalization, engagement, support, and communication—mirror elements highlighted in earlier research but extend the scope by explicitly linking them to theoretical frameworks like Self-Determination Theory (SDT), which posits that autonomy and competence are critical to enhancing intrinsic motivation.
Comparison with previous studies also reveals some discrepancies. While earlier research often focused on the quantitative analysis of dropout rates and generic motivational factors, this review contributes a qualitative depth by examining the interplay of specific strategies and their theoretical underpinnings. This approach not only confirms the multifaceted nature of motivation in MOOCs, as discussed by Zhu et al. (2020) and Wang et al. (2016) [10, 11], but also provides a structured framework for applying these insights in practical course design and implementation.

The review underscores the potency of personalization strategies in driving motivation and retention in MOOCs, noting that these strategies necessitate a careful approach towards privacy and data security issues, in addition to the need for strong technological frameworks. Future research should delve into the cultural and situational factors that affect the efficacy of personalization strategies in diverse educational environments, ensuring their adaptability and scalability. Specifically, understanding how cultural values, social norms, and educational expectations influence learner engagement and motivation could significantly enhance the global applicability of these strategies. Comparative studies across different geographical areas and educational systems can shed light on the cultural subtleties impacting these strategies' effectiveness, facilitating the design of culturally responsive and inclusive MOOCs.

Further research should focus on longitudinal studies to assess the long-term impacts of motivational strategies, as suggested by the limitations in current literature which mostly captures short-term effects. Additionally, comparative studies across different cultural contexts could elucidate how cultural differences impact the effectiveness of motivational strategies, addressing a gap highlighted by both this review and earlier research by Goopio & Cheung (2020) [6].

Moreover, there is a necessity for research into tackling the challenges and limitations associated with these strategies' deployment, such as the expenses and scalability of certain strategies like immersive experiences and adaptive learning. Finding cost-efficient solutions and innovative methods to surpass resource limitations will be key in making these strategies more accessible and sustainable in varied educational settings.

Research should also probe the possibility of synergistically integrating multiple strategies to boost motivation and retention in MOOCs. The interaction between different strategies and their combined effects on learner outcomes remain relatively untapped. By understanding how various strategies supplement and enhance each other, educators and instructional designers can devise more holistic and effective interventions to foster learner engagement and success.

Lastly, the ethical considerations related to the use of technology and data in MOOCs need to be addressed. As these strategies often depend on collecting and analyzing learner data, ensuring privacy, security, and the responsible usage of data is paramount. Future research should focus on formulating ethical guidelines and frameworks for these strategies' deployment, taking into account learner rights and consent, alongside the ethical duties of educators and institutions.

To conclude, this review has not only reinforced the contributions of the strategies discussed but also set a clear agenda for future research to continue refining the educational strategies that can foster more engaging and successful MOOC experiences. By addressing these challenges and advancing research in the recommended directions, we can further optimize the application of these strategies in MOOCs, contributing to the continued enhancement of online learning experiences.

5- Conclusion

In conclusion, this systematic review has meticulously analyzed the role of motivational strategies in boosting learner engagement and curtailting dropout rates in Massive Open Online Courses (MOOCs). It has illuminated the significant potential of approaches like personalized learning, interactive content, peer collaboration, and progress feedback to enhance learner motivation and retention. These strategies, when thoughtfully designed and implemented, can profoundly align with and stimulate learners' intrinsic motivations and specific educational aspirations. However, the review also brings to light several prevailing limitations that need addressing to maximize the effectiveness of these strategies. Key among these are technological constraints, concerns around privacy and data security, and the pressing need for a nuanced understanding of learner diversity. The formulation of comprehensive ethical guidelines for data use and safeguarding privacy in MOOC environments emerges as a crucial area for future inquiry.

Furthermore, the review underscores the vital importance of extending research into diverse cultural and educational contexts to verify the widespread applicability and efficacy of the discussed motivational strategies. There is also a marked need for longitudinal studies that can shed light on the long-term impacts of these strategies on learner motivation, ongoing engagement, and overall MOOC completion rates. Such research could provide deeper insights into the sustained effectiveness of motivational enhancements in online learning environments. Ultimately, this review contributes significantly to the ongoing refinement and development of MOOCs. By offering a detailed understanding of various motivational strategies and their impacts, it lays a solid foundation for the enhanced design and delivery of MOOCs, aiming to improve the educational experiences and outcomes for learners globally. This groundwork not only supports current educational endeavors but also sets a directive for future advancements in the field.
6- Abbreviations

| MOOC  | Self-Determination Theory | PRISMA | Preferred Reporting Items for Systematic Reviews and Meta-Analyses |
| SRLT  | Self-Regulated Learning Theory | PRT    | Psychological Reactance Theory |
| EVT   | Expectancy-Value Theory    | CVTAE  | Control-value theory of achievement emotions |
| ECT   | Expectation Confirmation Theory | CLT    | Constructive Learning Theory |
| ALT   | Adult Learning Theory      | ELT    | Experiential Learning Theory |
| TAM   | Technology Acceptance Model | FT     | Flow Theory |
| TTAT  | Task Technology Adaptation Theory | MRT    | Media Richness Theory |
| TNE   | Theory of Network Externalities | CT     | Constructivism Theory |
| SCT   | Social Cognitive Theory    | ST     | Sociocultural Theory |
| TRQ   | Theory of Relationship Quality | TPB    | Theory of Planned Behavior |
| TRA   | Theory of Reasoned Action  | MT     | Motivation Theory |
| ITI   | Implicit Theory of Intelligence | HTFT   | Herzberg’s Two-Factor Theory |
| RIDT  | Rogers’s Innovation-Diffusion Theory | UDL    | Universal Design for Learning |
| CHAT  | Computer Human Automated Talk |

7- Declarations

7-1- Author Contributions
Conceptualization, Z.A.; methodology, Z.A.; validation, Z.A.; formal analysis, Z.A.; investigation, Z.A.; resources, A.B.; data curation, A.B.; writing—original draft preparation, Z.A.; writing—review and editing, Z.A. and A.B.; supervision, A.B.; project administration, A.B.; funding acquisition, A.B. All authors have read and agreed to the published version of the manuscript.

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Not applicable.

7-5- Informed Consent Statement
Not applicable.

7-6- Conflicts of Interest
The authors declare that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

8- References


