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Gamification in MOOCs: A Review of the State of the Art

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Abstract— **A Massive Open Online Course (MOOC) is a type of online learning environment that has the potential to increase students' access to education. However, the low completion rates in MOOCs suggest that student engagement and progression in the courses are problematic. Following the increasing adoption of gamification in education, it is possible that gamification can also be effectively adopted in MOOCs to enhance students' motivation and increase completion rates. Yet at present, the extent to which gamification has been examined in MOOCs is not known. Considering the myriad gamification elements that can be adopted in MOOCs (e.g., leaderboards and digital badges), this theoretical research study reviews scholarly publications examining gamification of MOOCs. The main purpose is to provide an overview of studies on gamification in MOOCs, types of research studies, theories applied, gamification elements implemented, methods of implementation, the overall impact of gamification in MOOCs, and the challenges faced by researchers and practitioners when implementing gamification in MOOCs. The results of the literature study indicate that research on gamification in MOOCs is in its early stages. While there are only a handful of empirical research studies, results of the experiments generally showed a positive relation between gamification and student motivation and engagement. It is concluded that there is a need for further studies using educational theories to account for the effects of employing gamification in MOOCs.**

Keywords—Gamification; Massive Open Online Course (MOOC); literature review; research trends; motivation

I. INTRODUCTION

Interest in applying gamification in education is increasing given its capacity to capture and sustain students' attention, which is a prerequisite for students' success in educational environments [39]. Gamification has already been successfully used in marketing, work organizations, health, and environmental initiatives to achieve desirable outcomes by influencing user behaviors [12]. Emerging technologies, such as e-learning and enhanced capabilities of mobile technology, are key enablers of the growth of gamification [29]. Fueled by new technology trends in web and app development such as new JavaScript libraries and Motion User Interface (Motion UI), there are growing demands to leverage advanced techniques to renovate the current state of Massive Open Online Courses (MOOCs) designs and support learning [53].

Low completion rates in MOOCs cast doubts on whether MOOCs can potentially increase access to higher education since not all MOOC students are engaged throughout the courses [15]. The diverse engagement patterns of students in MOOCs suggest that learners may have different motives in learning and not all students are interested in completing the whole course. Moreover, learning in poorly designed MOOCs may not be motivating for students [16]. Therefore, it is possible that MOOCs can be enhanced by incorporating gamification elements in its instructional design to help students achieve their learning goals and overcome their learning challenges by keeping them motivated.

While studies on gamification suggest that gamification is an effective approach to enhance student motivation and behavior depending on the contexts and users [21], the extent to which gamification has been implemented in MOOCs and the effectiveness of the gamification elements when they were implemented are not known at present. To fill the gap in our understanding of gamification in MOOCs, the current paper reviews scholarly articles examining gamification in the context of MOOCs. The results of this review will shed light on the state of the art use of gamification in MOOCs and suggest directions for future research.

The current paper first defines the research questions guiding the review. The section that follows provides an overview of the role of motivation when learning in MOOCs, theories about motivation, and background on gamification. The methodology of the review and its limitations are covered in the fourth and fifth section. In the sixth section, results of the review are presented and discussed according to each research question. Results of the study are concluded in the final section with some suggestions for future research.

II. Research Questions

This study addresses the following research questions:

- What is the state of research on gamification in MOOCs?
- What are the research methods used in the studies?
- How are the gamification elements implemented?
- What are the reasons for implementing gamification in MOOCs?
- What are the theoretical frameworks used to justify gamification in MOOCs?
- What are the gamification elements that were implemented or proposed to be implemented in MOOCs?
- What is the effectiveness of implementing gamification in MOOCs?
- What are the challenges and limitations of implementing gamification in MOOCs?

III. Background

A. Motivation to Learn in MOOCs

From what started as an experiment by the Computer Science Department of Stanford University in 2011 to a buzzword in educational technology in 2013 [26], MOOCs have gathered much interest from higher education practitioners and researchers. MOOCs were seen as a solution to the rising costs of higher education by making education accessible to students who do not have the means to pursue education in conventional institutions [43]. However, on average, only less than 10% of the students complete the MOOCs they signed up for [24]. From the data collected from 221 MOOCs, Jordan [25] found that courses that were shorter and used auto grading had higher completion rates. In addition, the more recent courses had higher completion rates.. This suggests that the design of MOOCs is important and more recent MOOCs seem to do better at supporting students.

Margaryan [3] assessed the instructional design quality of 76 MOOCs and found that while course materials were well-organized and presented, the courses were generally poor in instructional design quality according to the First Principles of Instruction [33]: a) solving real problems, b) activation of prior knowledge, and c) demonstrating, d) applying, and e) integrating of new knowledge. This suggests that most MOOCs, at present, are not student-centered nor strong in student support. Poor instructional design quality may hamper students' motivation to learn.

Many students do not start the MOOCs they enrolled for and many drop out at different points in time during the course [11]. The motivation to learn is important for students to follow through their initial interest in enrolling and sustain engagement in the course [52]. One way to support students is to examine how features involving gamification can be applied in MOOCs to enhance motivation, and ultimately, learning in MOOCs.

B. Theories about Motivation and implications on research

Supporting students in achieving their personal goals in MOOCs is important because not all students harbor intentions to complete the courses they enrolled in [46]. Motivated students engage themselves in goal-directed activities [10]. Therefore, it is crucial to understand how theories conceptualize motivation and identify the factors that affect students' pursue of goal-directed activities. A brief description of five major theories about motivation is given below (for review, see [10]):

- Expectancy-value theory [5] views motivation as an effect of the perceived value of the task and one's belief in becoming successful in the task.
- Social-cognitive theory [6] views the main source of motivation to be self-efficacy, the belief of one's competence to learn.
- Goal orientation theory [17] links one's motivation with whether one is concerned with mastery of task or performance on the task.
- Self-determination theory [39] is derived from the assumption that motivation is related to human's need for competence, autonomy, and relatedness.
- Attribution theory [7] is concerned with how learners view their source of success or failure.

Cook and Artino [10] raised five issues regarding motivational research. Since research on gamification often linked the effect of gamification on motivation [21, 50], these four issues on motivational research may apply to gamification research as well. The first issue concerns the precision of defining and operationalizing motivational constructs. Even though the theories are not in conflict, each theory emphasizes different aspects of motivation. Therefore, it is important to clarify which theoretical perspective is applied in research on gamification. The next issue concerns the measurement of motivational outcomes. The instrument and timing of measurement as well as the measured outcome have an impact on the conclusions that can be drawn from the studies. The third issue concerns examining implications of the theories in the studies. Theory-based empirical evidence should be provided to support the effect of the gamifications. For example, if a study uses social-cognitive theory to examine the effect on gamification, it should measure the effect of gamification on self-efficacy. The fourth issue concerns building of theories about motivation for learning. Building theories about motivation requires studies to examine not only if gamification works but also why it works, for whom it works, and the conditions in which it works.

Theories about motivation provide a framework to examine the effect of gamification. Therefore, one of the foci of the current paper is to examine whether research on gamification employs theories about motivation to examine the effects of gamification on learning.

C. Gamification

Differentiation between serious gaming and gamification is important because of their implications for the game or

game element design. Designers define serious games as developing a game for a specific and non-entertainment goal [41]. Serious games can be defined as "any form of interactive computer-based game software for one or multiple players to be used on any platform and that has been developed with the intention to be more than entertainment" ([47], p. 6). On the other hand, gamification refers to the use of game elements in other non-game settings. Instead of fully developed games, gamification relies on using game design elements.

According to [41], gamification elements that can be used in non-game contexts can be categorized at five levels:

- Interface designs: such as badges, leaderboards, and levels
- Design patterns: such as time constraints and resources
- Design principles: these can be guidelines related to clear goals and enduring of the game play
- Models: following theories like triggering curiosity and creating a challenging environment
- Design methods: such as playtesting and play-centric designs

Gamification elements may take a different approach as Robinson and Bellotti stated [13]. They have classified gamification elements according to seven major components: a) intrinsic incentives such as curiosity, challenge, entertainment, social reward, personal returns and societal returns; b) extrinsic incentives: like discounts, time, lottery, virtual goods and currency; c) social features: which involve social performance, interaction modes, relationships and accountability; d) general framing; e) performance framing; f) feedback such as audio signals and graphical indicators; and finally g) resources and constraints that formulate user participation [13].

In view of myriad gamification elements, Hamari et al. carried out a literature review of empirical studies on gamification from 2010 to 2013 and listed motivational gamification elements of points, leaderboards, badges, levels, stories, goals, feedback, rewards, progress, and challenges [21]. The authors concluded that gamification is an effective approach to enhance motivation. While gamification and MOOCs have been widely investigated and reviewed as separate terms, combining these two terms is novel, and to our knowledge, not yet been done.

IV. Methodology

The current paper extends Hamari et al.'s [21] study but focuses solely on the context of MOOCs. This will enable us to provide a more detailed overview of the current state of research on the combination of gamification and MOOCs.

We followed the procedure used by Machi and Mcevoy [27] to conduct this literature review. The procedure includes five steps: 1) selecting the topic and translating the personal interest or concerns into a research query, 2) developing arguments of your research and identifying the purposes or the main research questions, 3) searching the literature, then 4) assembling the data and surveying the literature, critiquing the literature, and finally 5) showing the review.

Following these steps, we first selected the topic 'use of gamification in MOOCs'. After that, we carried out a computer-based search in the Web of Science digital library (http://webofknowledge.com/) to identify articles related to the selected topic. Web of Science is a database powered by the Institute for Scientific Information (ISI). The library is selected for its valuable indexing information and the ease of usability for performing search queries with specific terms.

The chosen articles were retrieved in early November 2017 by searching for the combination of the following keywords:

("Gamification" AND ("MOOC" OR "MOOCs" OR "Massive Open Online Course" OR "Massive Open Online Courses")).

The search was carried out for the time period from 2008 to 2017. The inclusion conditions for the selected papers were that the articles should be written in English, accessible online, and meet the fundamental topic of the study by specifically examining the use of gamification in MOOCs. We excluded papers that used the term gamification but the actual context in which the gamification elements were deployed was not a MOOC or when the gamification approach was not clearly described. In addition, abstract papers and workshop proposals were also excluded as they do not provide enough information on the gamification elements used.

A. Assembling and Analysis

The initial search for the aforementioned keywords returned a total of 51 publications. All the publications' descriptive data i.e. title, year, venue, etc. were imported into a Google document where the authors commented and verified the content for each paper. The second stage included performing a deeper content analysis by which the authors coded each paper according to the following labels:

- Type of the study
- Followed theory or the motivation of the study
- Used game elements or gamification methodologies
- The impact of using gamification
- Challenges or limitations faced by researchers
- Sample size (if empirical)
- Studied MOOC platform
- Implementation environment
- Google Scholar citation index
- Year of publication
- Venue

Taking into account the selection criteria mentioned in the previous section, the papers that were selected for the final inclusion yielded 18 articles. The table (Appendix A) incorporates the final result matrix of our analysis.

V. Limitations of the Methodology

The selection of the papers was based on scanning topics on gamification and MOOCs from one digital library (Web of

Science). This method has two limitations. First, there could be publications that discuss the same topic but use different terms or specific gamification elements. For example, a study may examine leaderboards but do not mention gamification. Second, results of this review is limited to studies that were indexed in Web of Science.

VI. Results and Discussions

This section points out and discusses the literature results that we extracted from the reviewed articles as well as answers the proposed research questions.

A. Type of Studies

With respect to the type of studies, the reviewed articles on gamification and MOOCs are classified into four categories: empirical/quantitative, empirical/qualitative, empirical/mixed, and conceptual/theoretical. To answer the research question "*What are the research methods used in the reviewed studies?*", we listed the articles in Table I which reports the research methodologies used in the studies. Conceptual and theoretical papers had the highest count, followed by empirical mixed methods, only quantitative, and only qualitative method.

TABLE I. Type of Studies

Method	Paper
empirical/quantitative	[4] [28] [44]
empirical/qualitative	[40] [50]
empirical/mixed	[20] [31] [35] [36] [37]
conceptual/theoretical	[1] [18] [22] [23] [32] [42] [45] [51]

A key observation from Table I is the low number of empirical studies. This suggest that there is a need to empirically examine the effect of gamification in MOOCs. Acknowledging whether gamification is effective is a pertinent practical issue that should be considered in future research [21]. Likewise, the conceptual and theoretical studies of gamification play a complementary role to empirical research studies. Given that research on use of gamification in MOOCs is still in its infancy, theoretical studies that construct and explain the phenomena are probably needed to advance our understanding of how and why gamification might work.

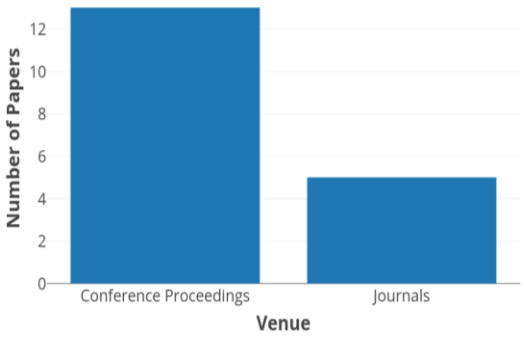

Figure 1. Publication venues

B. Publication Stats

We examined the publication venues of the studies reviewed. Figure 1 shows that there were more publications in conference proceedings than in journals. The majority of publications were submitted to conference proceedings (72%) while journal articles represent only one-third of the total reviewed studies. This reflects the novelty of the topic and the emerging nature the research on gamification in MOOCs

Next, we examined the number of the publications across the years (see Figure 2). There was only one paper in 2013, four in 2014, three in 2015, six in 2016, and four in 2017. The drop in the number of articles from 2016 to 2017 is most likely due to the time it takes for the 2017 articles to appear in the indexing databases like the ISI Web of Science digital library. It appears that there is a rising trend in the number of articles that examined use of gamification in MOOCs and perhaps, more and more researchers are becoming interested in employing gamification elements to enhance learning in MOOCs.

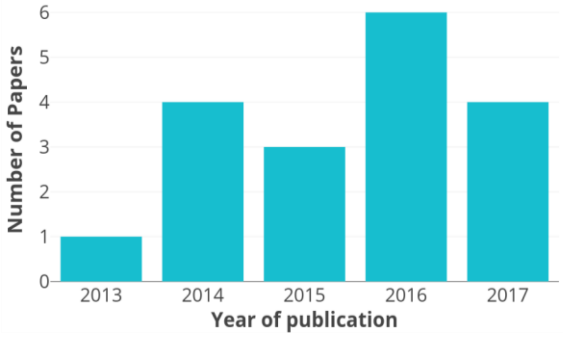

Figure 2. Collected articles distributed by year

After that, we cross-referenced the relevant publications using Google Scholar (http://scholar.google.com) to obtain their citation impact. Descriptive finding of counting references provides awareness about the knowledge production and consumption patterns in the scholarly area [2]. Table II shows the top five cited papers.

TABLE II. The Five Most Cited Publications

Paper	Year	Google Scholar citation
[18]	2013	116
[37]	2016	22
[50]	2016	20
[4]	2014	19
[45]	2014	10

To briefly report findings of the impact of the two subjects i.e. gamification in MOOCs, we have done a simple citation analysis of the 18 articles. In total, there were 213 references collected. The conceptual study by [18] constitutes (54.4%) of the total citations.

Figure 3 depicts a density plot of the publication citations according to years. To avoid skewing the graph by outliers, we excluded the year 2013 because the paper published that year was the only paper and its citations were more than half of the total citations. The x-axis in the plot depicts the number of citations but in logarithmic scale to ease plotting while the y-axis depicts the density of publications per years.

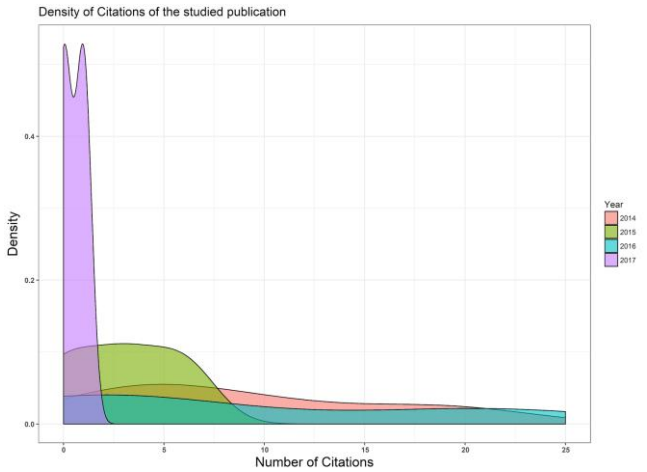

Figure 3. Density plot of citations per year

C. Implementation of Gamification

One interesting research area we examined in this literature review is examining how the gamification elements were deployed in MOOCs. Although MOOCs are environments that mainly depend on web browsers, MOOCs also use other web and mobile technologies to deliver the lessons. Therefore, we examine the media used to implement the gamification elements. The results showed that most articles conceptualized the use of gamification on web browsers or the empirical data collected were based on gamification elements that were deployed on web browsers. However, there are five studies that used both mobiles and web to implement gamification. Table III shows the media used to implement gamification of the studied scholarly publications. Two out of 18 papers did not explicitly mention the gamification implementation environment, as such, they were excluded from this table.

TABLE III. GAMIFICATION IMPLEMENTATION ENVIRONMENTS

Medium	**Paper**
Web	[4] [18] [22] [28] [32] [36] [37] [40] [44] [45] [50]
Hybrid*	[20] [23] [31] [35] [51]
* Hybrid stands on using Mobile and Web technologies	

There is an increased use of mobile applications and gamification in educational settings. Duolingo (http://www.duolingo.com) provides an excellent example of pairing gamification and mobile through their smart app. A recent study by [49] exhibits how mobile devices interventions can support learning in formal and informal contexts. Combining mobile and web could be a possible direction for future research given that mobiles are widely accessed throughout the day compared to web browsers. The results of this review suggest that there is a lack of available scholarly studies that supports this approach.

In view of the results in Table III, we correspondingly listed the MOOC environments that were used by researchers of the studied publications (see Appendix A). Although there are some MOOC environments that are privately-hosted or do not exist, we noticed that Hasso Plattner openHPI (https://open.hpi.de/) was the most active player of employing gamification in MOOCs. There were some experiments that were done on open edX [31], MiriadaX [37], and mooc.House [44].

D. Theories and Drivers

Table IV shows the reasons behind implementing and proposing gamification in MOOCs. To answer the research question of "*What are the gamification elements that were implemented or proposed to be implemented in MOOCs?*" the literature review reveals that gamification was mainly used to enhance motivation followed by enhancing student engagement. In spite of the fact that the other reasons were used marginally, the review conveys that gamification is used to support collaboration, create entertainment and fight boredom, improve autonomy, and build up loyalty. We have also observed that gamification was utilized to build up personalization and recommendation systems [1, 35].

TABLE IV. REASONS FOR USING GAMIFICATION IN MOOCS

Reason	**Paper**
Enhance motivation	[23] [31] [32] [35] [36] [37] [40] [42]
Enhance engagement	[4] [20] [28] [31] [32] [50] [51]
Create entertainment	[4] [31]
Recommendation/personalization	[1] [35]
Build up loyalty	[22] [42]
Deepen learning	[37]
Support collaboration	[31]
Improve autonomy	[23]
Foster goal achievement	[1]

Although the reasons behind employing gamification in general describe the drivers of why it is used in MOOCs, we believed that the most vital part is to examine what theories underlie using gamification and whether the reviewed studies based the design of their intervention involving gamification on any theories. Therefore, for the research question "*What are the theories mentioned in the papers?*", we found only two papers [44] and [45] mentioning the following theories: Self-Determination Theory, Drive Theory, and theory about the four motivational drivers (i.e. RAMP: relatedness, autonomy, mastery, and purpose)

Nevertheless, it is evident that there is lack of using well-defined theories in the use of gamification elements in MOOCs. Chang and Wei [50] mentioned in their literature study that most of the reviewed papers have not provided a conceptual framework when employing gamification which strongly demonstrates to the need for theoretical studies that construct and explain the phenomena of utilizing gamification in MOOCs.

E. Gamification Elements

Table V provides an answer to the research question "*What are the gamification elements that were implemented or proposed to be implemented in MOOCs?*". We summarized the gamification elements used in the reviewed studies. It is worth noting that we picked the top five used elements in Chang and Wei's study [50]. There was a total of 19 elements found in the studies. Table V identifies the large heterogeneity of different elements either proposed or used in the studies. Although PBL (Points, Badges, and Leaderboards) are usually reported as the most used variants of gamification elements [1, 21], we found the most commonly used elements in the application of gamification in MOOCs are badges, leaderboards, progress, and challenges. Therefore, for MOOCs, progress and challenges are more frequently employed than points.

TABLE V. GAMIFICATION ELEMENTS

Gamification element*	**Paper**
Badges	[1] [20] [22] [28] [31] [36] [37] [40] [42] [44] [50] [51]
Leaderboards	[1] [28] [31] [36] [45] [50]
Progress	[1] [22] [40] [44]
Challenges	[4] [18] [20] [51]
Ranking	[23] [40] [42]
Levels	[1] [28] [31]
Points	[1] [44] [50]
Reward	[1] [18] [36]
Tasks unlock	[23]
Team play	[31]
Time constraints	[31]
Karma	[42]
Storyline	[1]
Where's Wally game	[50]
Google+ +1	[37]
Long/short-term goals	[28]
Social networking tools	[45]
Rating	[18]
Virtual goods	[50]
* Excluding [35]	

F. Effectiveness of Gamification

With respect to the research question "*What is the impact of implementing gamification in MOOCs?*", the majority of the empirical study publications have shown a positive impact on motivation and engagement when using gamification in MOOCs (see Table VI). Only one paper reported partial positive results of using gamification in MOOCs. There was no other paper that reported either no-significant or negative impact of using gamification. This carries great potential of using gamification to support learning in informal settings.

TABLE VI. GAMIFICATION IMPACT IN THE REVIEWED EMPIRICAL STUDIES

Reason	**Paper**
Positive	[4] [20] [28] [31] [35] [37] [40] [44] [50]
Partially positive	[36]
No effect	-

G. Limitations and Challenges

Since there is a scarcity in scholarly publications in the two fields, coding articles for limitations and challenges that faced the researchers was questionable for us. Out of 18 articles, ten works mentioned limitations that set a barrier to either evaluate empirical experiments or validating conceptual model (see Table VII). The answer to the research question "*What are the challenges and limitations of implementing gamification in MOOCs?"* is tackled differently in the studies. The most reported challenge was that gamification approaches were applied for a certain type of learners and not generalized. Three studies outlined that results of their work is based on beta testing. Another key issue that was observable in the reviewed studies is the complicated structure employing gamification. Studies where implementation environment involves mobile devices have brightly declared that connecting mobile devices and gamification approaches with the web MOOCs include deployment obstacles [31, 51]. Additionally, shortage of testing environment as well as ineffective testing sample size were reported in [1, 23], [20, 32], respectively.

TABLE VII. LIMITATIONS AND CHALLANGES

Reason	**Paper**
Specialized group	[18] [23] [31] [35]
Pilot study/beta testing	[31] [35] [45]
Complicated structure	[31] [37] [41]
Testing environment shortage	[1] [23]
Ineffective sample test	[20] [32]

VII. CONCLUSIONS AND FUTURE DIRECTIONS

Many students find it challenging to follow through the MOOCs that they have enrolled in [11]. They either do not begin the courses at all or leave the courses early. This suggests that students may need some form of motivational support to help them achieve their learning goals in MOOCs by keeping them engaged in goal-directed activities. With the success of using gamification in marketing and health-related industries to change user habits [12], it is plausible that gamification could improve student success in MOOCs by enhancing their motivation to learn. However, the extent in which gamification has been implemented in MOOCs is not known yet. Therefore, the current research reviews studies on the use of gamification in MOOCs to get a better understanding of the current state.

Studies on gamification in MOOCs were identified from the Web of Science library. Only 18 articles met the selection criteria of this review. Results from the articles reviewed suggest that the state of research on gamification in MOOCs is fairly new. Almost half of the papers reviewed described the concepts in which gamification can be implemented in MOOCs but did not test out the efficacy of using gamification in MOOCs. Moreover, the theories about motivation are not explicitly mentioned in the studies. Even when theories are mentioned, the studies do not measure outcomes associated with the specific theory on motivation [45].

Based on the results, three recommendations for future research are provided. First, there is an urgent need to empirically test the effectiveness of gamification elements in

MOOCs. A MOOC is an evolving online learning environment that allow emerging technologies to be integrated. One of the main challenges of MOOCs is to support the differing motivations of the diverse group of students. Therefore, it would be of interest for researchers to examine whether gamification can be an effective way to enhance student motivation, and as a result enhance student success in MOOCs.

The second recommendation is linked to the first recommendation: when empirically testing the effectiveness of gamification elements, the predictions should be based on theories so that the existing theories can be extended to learning in MOOCs. We argue that knowing why, when, and for whom gamification works is as important as whether gamification works [10]. Therefore, research on gamification in MOOCs should not neglect the importance of defining and operationalizing the concepts according to existing theories so that a deeper understanding of the underlying mechanism can be developed.

The third recommendation relates to the implementation of gamification elements in MOOCs. Implementing gamification elements can be complex because it involves integrating game design elements into course designs. Therefore, researchers should consider a multidisciplinary approach by collaborating among researchers in education, psychology, design, user experience, and learning analytics. There are many variables that may affect the effectiveness of gamification, for example the usability of unlocking tasks, design of leaderboards, and types of points awarded. Therefore, taking a multidisciplinary approach may make research on gamification in MOOCs more efficient.

In conclusion, the current review shows that research on gamification in MOOCs is developing and has not matured yet. There is room for research to be conducted using different gamification elements and different theories about motivation. With the flexibility of integrating new technologies, there is a lot of potential for research on gamification in MOOCs.

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Appendix A

Paper	year	Type of study	Theory/Driver	Gamification elements	Impact	Limitations and challenges	MOOC platform	Google Sch. citation	Venue	N	Gamif. App
[31]	2017	Empirical: mixed methods	-support collaboration -Improve motivation -enhance interaction -Create entertainment	-Badges -Levels -Time constraints Leaderboards and points -Teamplay	positive	- beta testing - Special group - overall structure	Open edX	0	Journal	Three rounds (9 + 34 +25)	Hybrid
[23]	2016	Conceptual	-improve autonomy -improve motivation -leveling	-unlocking -ranking	NA	-only for school children -looking for outreach	GamES MOOC Platform	0	Conference	NA	Hybrid

[35]	2016	Empirical:mixed	-build a recommendation system - improve motivation	22 game elements (bonus, level, progress, quest, status, gifts, countdown…)	positive	-pilot study -only for school children	NA	0	Conference	61	Hybrid
[20]	2015	Empirical:mixed	-improve physical user engagement (healthy ageing)	-badges -challenges (battles)	positive	-small sample - overall structure	eX-PLE	6	Conference	20	Hybrid
[51]	2015	Conceptual	-improve physical user engagement (healthy ageing)	-badges -challenges (battles)	NA	- overall structure	eX-PLE	0	Journal	NA	Hybrid
[45]	2017	Empirical: quantitative	-SDT -Drive Theory -RAMP	-badges -progress -experience points	Positive	NA	mooc.House	1	Conference	7748	Web
[42]	2017	Conceptual	-enhance motivation and loyalty of the user	-badges -karma -ranking awards	NA	NA	Coursera, edX, MiriadaX, UniMOOC	0	Journal	NA	NA
[1]	2017	Conceptual	-personalized learning goals -foster student achievements	-(Points, Levels, Badges, Leaderboards, Prizes and Rewards, Progress Bars, Storyline and Feedback)	NA	-shortage of testing environment	NA	1	Conference	NA	NA
[50]	2016	Empirical: qualitative	-improve student engagement	Top five: leaderboards, virtual goods, points, trophies and badges, Where's Wally game	Positive	NA	More than 10 MOOC platforms	20	Journal	5020	Web
[36]	2016	Empirical: mixed	-increase student's motivation	-Badges – Leaderboard forums - Students Classifier League -Reward strategy	Partially positive	NA	Telescope MOOC platform	4	Conference	1678	Web
[40]	2016	Empirical: qualitative	-increase motivation	-progress -ranking -badges	Positive	Na	Moodle MOOC	4	Conference	45	Web
[37]	2016	Empirical: mixed	-deepen learning -increase motivation	-google+ +1 -badges	Positive	-badges overlap (platform gamification integration)	MiriadaX	22	Journal	2182	Web
[28]	2015	Empirical: quantitative	-Enhance engagement	- leaderboards, badges, long-term goals, short-term goals, leveling, onboarding, & engagement loops.	Positive	NA	NA	3	Conference	NA	Web
[32]	2014	Conceptual	-Enhance	NA	NA	-collecting	BrasilEduca	3	Conference	NA	Web

			engagement and motivation			empirical data					
[4]	2014	Empirical: quantitative	-Improve user engagement -fight boredom	-challenges	Positive	NA	NA	19	Conference	100	Web
[22]	2014	Conceptual	-Improve onboarding	-badges -progress bars	NA	NA	openHPI	4	Conference	NA	Web
[45]	2014	Conceptual	-SDT -Drive Theory -RAMP	-social interactions -social graph: leaderboard, activity stream	NA	-beta testing -overall structure	openHPI	10	Conference	NA	Web
[18]	2013	Conceptual	-rewards	-leveling -rating of forum entries -challenging quests	NA	- Specialized group	openHPI	116	Conference	NA	Web