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## Gamification in MOOC: A systematic literature review

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### Abstract

Research related to Gamification in MOOCs and the elements that support them has gained popularity and received particular attention in the last decade. Gamification in MOOC has several elements and goals to increase learner engagement, learner retention, and learner motivation to complete the course. This research uses a qualitative method with a systematic literature review approach to answer the research questions. This research resulted in 21 research papers on MOOC gamification. The purpose of the study is to identify gamification elements, the type of MOOC, and the impact of gamification in MOOC to optimize the completion rate of the course.

Keywords: Massive Open Online Course; MOOC; Gamification; Gamification Element; Systematic Literature Review

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### 1.0 Introduction

Since 2008, Massive Open Online Course (MOOC) has become a new way to give informal education for people who want to get more skills rather than traditional skills at school until university. MOOC also has been chosen by the people who want to get more knowledge but can't afford to go to formal education. From 2008 to 2019, education is developing very fast using technology for teaching and learning, and the number of MOOC learners keeps increasing. However, only 5% of users can complete the MOOC course that they have already started (Prinsloo & Ainslie, 2018). It also stated that although MOOC has been considered a disruption in the higher education industry, MOOC has a low completion rate (Wang & Song, 2021). Previous study also analyzed the factors that were very important to increase completion rate of MOOC (Su & Cheng, 2015). Some learners prefer skip course part in MOOC, and just watch the video part (Fu, He, & Xu, 2019). This condition means there is a problem with MOOC contents or the problem with the users. MOOC learners can't continue the course for personal reasons, such as being busy and bored, and there is no live interaction with the lecturer.

The quality of MOOC design should be investigated in more detail. The previous study has provided a set of criteria to make effective design of Technology Enhanced Learning (TEL) environments, such as content design, page layout, visual arrangements, use of illustrations, and colors (Yousef, Chatti, Schroeder, & Wosnitza, 2014). Technology is not everything, learner's motivation is essential to completing MOOC. Educators need to be creative to engage their learners to learn, so the trend of using Gamification in MOOCs was applied to make different learning experiences in MOOCs (Saraguro-Bravo, Jara-Roa, & Agila-Palacios, 2016)(Ortega-Arranz, Kalz, & Martinez-Mones, 2018). There are three phases of gamification : setting up of the business goals (preparation), the use of game elements,

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the systems and running it (Chembumroong, Sureephong, & Tongpaeng, 2019). Gamification used in MOOC to increase participants motivation, personalization, and promote interactivity among participants (Pursel, Zhang, Jablokow, Choi, & Velegol, 2016)(Gil-quintana, Camarero-cano, & Cantillo-valero, 2017)(Fu, He, & Qingxu, 2018)(Subhash & Cudney, 2018). Most of games are fun and motivate the students to learn (Hamari, 2017). Gamification is already considered as effective strategy for marketing and customer engagement (Hamari, Koivisto, & Sarsa, 2014). Serious games have been used to learn business, health, science, military, mathematics, computer science, and biology. A previous study said serious games could improve knowledge acquisition and content mastery. (Subhash & Cudney, 2018).

To implement gamification in MOOC, game elements and MOOC types must be identified as the impact of gamification in MOOC. Furthermore, people need to understand how to implement gamification and how does it work? (Robson, Plangger, Kietzmann, McCarthy, & Pitt, 2015)

The expected result of this paper is to identify gamification elements for MOOC, the type of MOOC that is suitable to implement game elements and to measure the impact of gamification in MOOC for MOOC students as a guidance and reference to implement gamification in MOOC. The benefit of the research is that MOOC Developers, such as Coursera, edX, and Udemy can adopt the Gamification elements as guidance to design Gamification Model to increase the course completion rate.

## 2.0 Literature Review

### 2.1 MOOC

A Massive Open Online Course (MOOC) is a course where the participants are distributed, and course materials are spread around the website. MOOC operates informal courses that can give learners a choice of when, how, and in what ways they engage. MOOC started in 2007 (Lung-Guang, 2019). MOOC providers have transitioned from offering free courses to paywall courses. Several MOOC providers cooperate with higher education institutions to provide blended MOOC, which can create new professional credentials and graduate program (Littenberg-Tobias, Joshua, 2019). In MOOC, the model of study primarily is an informal and non-accredited learning activity. So, the motivation to join course in MOOC is less than formal education (Littenberg-Tobias, Joshua, 2019). MOOC are preferentially made with video lectures, online readings, assignments, and quizzes (Mesquita, Toda, & Brancher, 2015). However, serious game in MOOC can make learning process fun and motivate the students to learn (Hamari, 2017).

### 2.2 MOOC types

There are several types of MOOC. At first, cMOOCs can be considered a personal learning experience. The instructors have designed the course in terms of video and assignment. Learners have community about similar topics and can share their experiences with others through community, for example, on social media networks. xMOOCs stands for Extended-MOOC. This type of MOOC not only offers personal learning, but also has quizzes, assignments, and online group forums inside the MOOC platform (Fianu, Blewett, Ampong, & Ofori, 2018). MOOC also has bMOOCs model that stands for Blended-MOOC. bMOOC has bringing in-class interaction (F2F) and an online model of MOOC (Yousef, Chatti, Schroeder, & Wosnitza, 2015). There are others MOOC types which are cooperative MOOC (combines features both of the xMOOC and cMOOC, defined by three layers: technological, training, behavioral, gcMOOC (gamification cooperative MOOC) that adds a new gamification layer to the cooperative MOOC (Jarnac de Freitas & Mira da Silva, 2020), aMOOC (adaptive MOOC which Synaptic Global Learning developed in 2014) (Chauhan, Taneja, & Goel, 2016), fMOOC (fitness-MOOC-enhanced healthy aging through an embodied learning experience in MOOC) (Buchem, Merceron, Kreutel, Haesner, & Steinert, 2015), and gMOOC (gamified MOOC) (Antonaci, Peter, et al., 2017).

### 2.3 Social interaction and learning engagement in MOOC

In online learning, interaction behavior is critical, including 3 (three) significant types: learner-learner interaction, learner-instructor interaction, and learner content interaction. Social interaction can improve high learning engagement in a social networking environment. Here are several factors that affect MOOC learning engagement (Fang, Tang, Yang, & Peng, 2019). Learner satisfaction is essential that can be affected by immersive experience from social interaction with learning group identification. Immersive experience has related to interactivity. That's why implementing Gamification elements in the MOOC platform is crucial because it can give an immersive experience to the learners.

### 2.4 MOOC completion rate

Although MOOC attract millions of learners to enroll in their courses, the completion of most courses is very low. Most learners are not fully engaged with MOOC courses, and they choose to quit the courses that they are taking. Student engagement in MOOCs contains psychological and behavioral concentration, and students' psychological engagement promotes their behavioral engagement. Usually, the MOOC completion rate is higher if the instructors come from reputable universities or if the educational materials are already provided in complete series on the MOOC platform (Sun, Ni, Zhao, Shen, & Wang, 2019)

### 2.5 Gamification

Gamification uses the elements that usually appear in the game in non-gaming contexts (Ortega-Arranz et al., 2018). Gamification has put a design layer of game elements to enhance learning, increase engagement, and encourage positive behavior from students (Raed S

Alsawaier, 2016). However, gamification as a pedagogical concept is not must involve actual use of games or information technology. Instead, it includes Integrating design elements or activity patterns traditionally found in games into education (Buckley & Doyle, 2016).

### 2.6 Gamification in MOOC

Gamification is a method to increase learners' engagement in online learning. Previous research stated that Gamification used in MOOC to increase participants motivation, personalization, and promote interactivity among participants (Gil-quintana, Camarero-cano and Cantillo-valero, 2017) (Fu, He and Qingxu, 2018)(Subhash and Cudney, 2018). There are several main elements of MOOC gamification, and the challenge is the source of most elements of MOOC. Therefore, it means that people love to use gamification in MOOC because of the game's challenge. There are three phases of gamification : setting up of the business goals (preparation), the use of game elements, the systems and running it (Chembumroong, Sureephong and Tongpaeng, 2019).

## 3.0 Methodology

The methodology used in this study is SLR - Systematic Literature Review. Several similar studies have been carried out with this Systematic Literature Review method (Jarnac de Freitas & Mira da Silva, 2020) (Rincón-Flores, Montoya, & Mena, 2019) (Rohan, Pal, & Funilkul, 2020). Researcher conducts literature review based on several steps as follow:

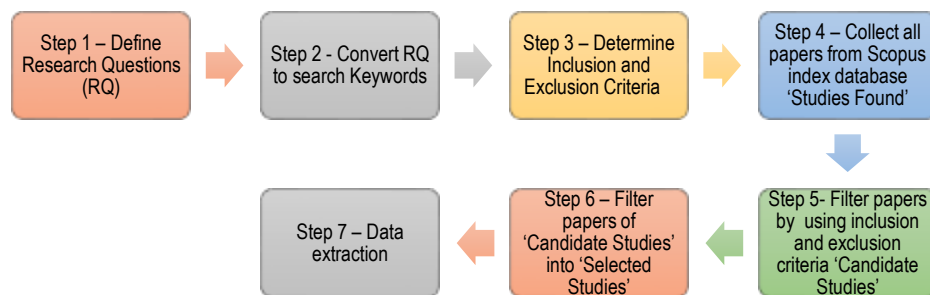


Fig. 1: Steps for Systematic Literature Review

In the first step, Author defines research questions (RQ) related to the study. The research questions for this study as follows:

1. What kind of Gamification elements have been most used in MOOC?
2. What types of MOOC have been most used to implement gamification?
3. What's the impact of gamification on MOOC?

To answers the research questions, Authors convert SQ into search keywords "MOOC Gamification", "MOOC Model", MOOC OR Gamification". The literature search that was performed by using the following sources: ACM Digital Library database: <https://dl.acm.org/>, AIS Electronic Library (AISeL): <https://aisel.aisnet.org/>, Emerald Insight <https://www.emeraldinsight.com/>, IEEE Explore: <https://ieeexplore.ieee.org/Xplore/home.jsp>, Sage Journal: <https://journals.sagepub.com/>, Science Direct: <https://www.sciencedirect.com/>, Springer: <https://jast-journal.springeropen.com/>, Taylor and Francis: <https://taylorandfrancis.com/>, Wiley Online Library: <https://onlinelibrary.wiley.com/>

In the third step, after obtaining the keywords' results, Author determined the Inclusion and Exclusion Criteria. The Inclusion criteria are the year of papers from 2011-2022 to know the trend of Gamification in MOOC. The articles contain the MOOC model, MOOC type used in gamification, gamification elements, and the impact of gamification elements on MOOC. The Exclusion criteria are as follows:

- The year of publication of the research is before 2011
- Duplicate publication of the same research outside of the systematic literature review
- Gamification in the non-education sector.

After determining the Inclusion and Exclusion criteria, Author continues the fourth step by collecting all papers from the Scopus index database that are marked as 'Studies Found'. Author chooses the Scopus index database because it's already trusted. After getting all articles from the Scopus index database, the Author continues to the fifth step by filtering papers by using inclusion and exclusion criteria and marking the papers as 'Candidate Studies'. The sixth step is doing another filter by reading each content of the papers and marked as 'Selected Studies.' This step aims to determine the papers related to the study and get insight into new ideas about the research. After that, the Author uses 'Selected Studies' for data extraction.

## 4.0 Result and discussion

### 4.1 Data Extraction

Several searches with selected keywords at the origin of the papers found 212 papers of the expected criteria. From 214 papers, there are 74 papers marked as 'Candidate Studies.' After conducting more studies in 74 papers, obtained 21 papers to find the research questions. The extraction of detailed data can be found in Table 1.

Table 1. Selected papers by Scopus indexed database used

No	Publisher	Studies Found	Candidate Studies	Selected Studies
1	ACM Digital Library	31	12	4
2	AIS Electronic Library	3	0	0
3	Emerald Insight	7	1	0
4	IEEE Explore	67	31	11
5	Sage Journal	8	3	0
6	Science Direct	63	14	1
7	Springer	19	9	4
8	Taylor&Francis	4	2	1
9	Wiley Online Library	10	2	0
Total		212	74	21

Table 1 shows the 9 (nine) database which indexed by Scopus. For selected studies, 11 papers come from IEEE Explore. Author also recaps the year of papers publications, as follows:

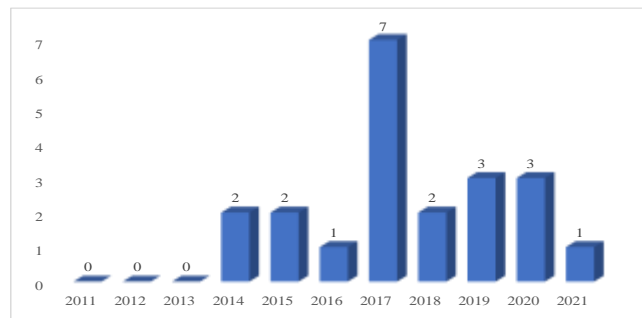


Fig. 2: Year of Papers Publication

From Figure 2, based on inclusion criteria of the year of publication from 2011-2021 (ten years of research publications), the most research publications appeared in 2017 because the development of gamification mostly started in 2014 (Antonaci, Klemke, Stracke, & Specht, 2017). The step of data extraction also defines the selected paper with the region and countries to gain information about which region and countries mainly research MOOC Gamification. It can be seen from Table 2 that MOOC Gamification research is mainly done by researchers from Europe, especially from Austria, Germany, Netherlands, Portugal, Russia, and Spain.

Table 2. Selected papers by the regions &amp; countries

Region	Countries	Total
Asia	India, Malaysia, Thailand	7
Australia	Australia	1
Europe	Austria, Germany, Netherlands, Portugal, Russia, Spain	16
North America	Mexico, USA	2
South America	Columbia	1
Grand Total		27

#### 4.2 Authors demography

From 21 selected papers, 57 Authors come from 76 disciplines and 26 Universities.

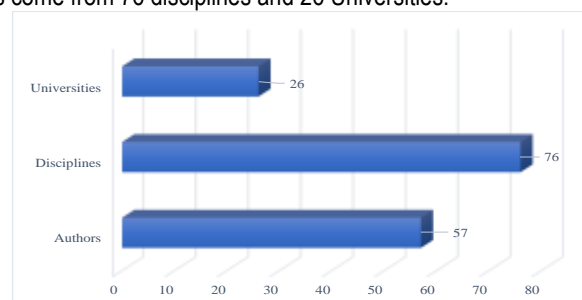


Fig. 3: Authors' Demography

The Top 3 (three) authors' discipline expertise comes from Computer Science & Engineering with 33 authors (43%), Humanities & Education with eight authors (10%), and Information Science & Management with seven authors (9%). 18 Authors came from other Department that is still unknown because they didn't state inside the papers. It can be concluded that using an implementation of

Gamification in MOOC is a multidiscipline area that can be combined among Computer Science & Engineering, Humanities & Education, and Information Science & Management. The details about the Authors' demography can be seen in Figure 3, and the Authors' discipline can be seen in Table 3.

Table 3. Authors' discipline

No	Discipline of Authors	Number of Authors	%
1	Computer Science&Engineering	33	43%
2	Education Technology	3	4%
3	Faculty of Gamedesign	2	3%
4	Human Computer Interaction	5	7%
5	Humanities&Education	8	11%
6	Information Science&Management	7	9%
7	Others	18	24%
	Grand Total	76	100%

#### 4.3 Productive Institutions

The most productive institutions for Gamification in MOOC research are King Mongkut's University of Technology Thonburi (Thailand), with three papers and 11 Authors. In total, 25 institutions have done research Gamification in MOOCs.

#### 4.4 Gamification Elements in MOOC

To answer RQ no. 1 "What kind of Gamification elements have been most used in MOOC?", Author conducted recapitulation of data from 21 selected research published papers. Based on selected papers, 46 gamification elements are usually used in MOOCs. The details can be seen in Table 4.

Table 4. Gamification elements in MOOC

No.	Gamification elements	#Papers	References
1	badges	16	(Jarnac de Freitas & Mira da Silva, 2020) (Rincón-Flores et al., 2019) (Reischer, Khalil, & Ebner, 2017) (Chauhan et al., 2016) (Buchem et al., 2015) (Antonaci, Klemke, et al., 2017) (Khalil, Wong, De Koning, Ebner, & Paas, 2018) (Romero-Rodriguez et al., 2019) (Rohan et al., 2020) (Antonaci, Peter, et al., 2017) (Rohan, Pal, Funilkul, Chutimaskul, & Eamsinwattana, 2021) (Hagedorn, Renz, & Meinel, 2017) (Rohan, Pal, & Funilkul, n.d.) (Calle-Archila & Drews, 2017) (Staubitz, Willems, Hagedorn, & Meinel, 2017) (Bakar, Yusof, Iahad, & Ahmad, 2018)
2	leaderboards	12	(Krause et al., 2015) (Reischer et al., 2017) (Rincón-Flores et al., 2019) (Antonaci, Klemke, et al., 2017) (Khalil et al., 2018) (Romero-Rodriguez et al., 2019) (Rohan et al., 2020) (Antonaci, Peter, et al., 2017) (Rohan et al., 2021) (Rohan et al., n.d.) (Jarnac de Freitas & Mira da Silva, 2020) (Bakar et al., 2018)
3	points	10	(Reischer et al., 2017) (Rincón-Flores et al., 2019) (Chauhan et al., 2016) (Antonaci, Klemke, et al., 2017) (Rohan et al., 2020) (Antonaci, Peter, et al., 2017) (Rohan et al., 2021) (Rohan et al., n.d.) (Jarnac de Freitas & Mira da Silva, 2020) (Staubitz et al., 2017)
4	progress	8	(Rincón-Flores et al., 2019) (Bakar, Yusof, Iahad, & Ahmad, 2017) (Gené, Núñez, & Blanco, 2003) (Khalil et al., 2018) (Rohan et al., 2020) (Rohan et al., 2021) (Rohan et al., n.d.) (Jarnac de Freitas & Mira da Silva, 2020)
5	communication channels	6	(Rincón-Flores et al., 2019) (Rohan et al., 2020) (Antonaci, Peter, et al., 2017) (Rohan et al., 2021) (Rohan et al., n.d.) (Jarnac de Freitas & Mira da Silva, 2020)
6	levels	6	(Chauhan et al., 2016) (Bakar et al., 2017) (Rohan et al., 2020) (Rohan et al., n.d.) (Calle-Archila & Drews, 2017) (Jarnac de Freitas & Mira da Silva, 2020)
7	challenges	6	(Rincón-Flores et al., 2019) (Khalil et al., 2018) (Romero-Rodriguez et al., 2019) (Rohan et al., 2020) (Rohan et al., n.d.) (Bakar et al., 2018)
8	goal indicators	5	(Aparicio, Oliveira, Bacao, & Painho, 2019) (Rohan et al., 2020) (Antonaci, Peter, et al., 2017) (Rohan et al., n.d.) (Jarnac de Freitas & Mira da Silva, 2020)
9	story telling	5	(Rincón-Flores et al., 2019) (Rohan et al., 2020) (Antonaci, Peter, et al., 2017) (Rohan et al., 2021) (Rohan et al., n.d.)
10	virtual goods	5	(Chauhan et al., 2016) (Rincón-Flores et al., 2019) (Rohan et al., 2020) (Rohan et al., 2021) (Rohan et al., n.d.)
11	voluntary activity	4	(Bakar et al., 2017) (Gené et al., 2003) (Rohan et al., 2020) (Rohan et al., n.d.)
12	social status	4	(Krause et al., 2015) (Gené et al., 2003) (Rohan et al., 2020) (Rohan et al., n.d.)
13	avatar	4	(Rincón-Flores et al., 2019) (Rohan et al., 2020) (Rohan et al., 2021) (Rohan et al., n.d.)
14	ranking	4	(Bakar et al., 2017) (Gené et al., 2003) (Rohan et al., 2020) (Rohan et al., n.d.)
15	competition	3	(Rincón-Flores et al., 2019) (Rohan et al., 2021) (Rohan et al., n.d.)
16	scores	3	(Rincón-Flores et al., 2019) (Aparicio et al., 2019) (Rohan et al., 2020)
17	rewards	3	(Rincón-Flores et al., 2019) (Rohan et al., 2020) (Reischer et al., 2017)
18	clues	3	(Rohan et al., 2020) (Antonaci, Peter, et al., 2017) (Rohan et al., n.d.)
19	empowerment	3	(Rohan et al., 2020) (Antonaci, Peter, et al., 2017) (Rohan et al., n.d.)
20	time limits	3	(Antonaci, Klemke, et al., 2017) (Rohan et al., 2020) (Jarnac de Freitas & Mira da Silva, 2020)
21	certification	3	(Bakar et al., 2017) (Rohan et al., 2020) (Rohan et al., n.d.)
22	feedback	3	(Rohan et al., 2020) (Rohan et al., n.d.) (Calle-Archila & Drews, 2017)
23	skills	3	(Rohan et al., 2020) (Antonaci, Peter, et al., 2017) (Rohan et al., n.d.)
24	awards	2	(Khalil et al., 2018) (Rohan et al., 2020) (Rohan et al., n.d.)
25	battles	2	(Rincón-Flores et al., 2019) (Buchem et al., 2015)

26	flashcard	2	(Jarnac de Freitas & Mira da Silva, 2020) (Bakar et al., 2018)
27	karma	2	(Rohan et al., 2020) (Rohan et al., n.d.)
28	quests	2	(Rohan et al., 2020) (Rohan et al., n.d.)
29	virtual map	2	(Rohan et al., 2020) (Rohan et al., n.d.)
30	voting	2	(Aparicio et al., 2019) (Rohan et al., 2020)
31	card life	2	(Rohan et al., 2020)(Gené et al., 2003)
32	online quiz	2	(Vaibhav & Gupta, 2014) (Rohan et al., 2020)
33	achievements	1	(Rincón-Flores et al., 2019)
34	AR interactions	1	(Rohan et al., 2020)
35	billboard	1	(Rohan et al., 2020)
36	chances	1	(Rincón-Flores et al., 2019)
37	clear learning	1	(Aparicio et al., 2019)
38	content unlocking	1	(Chauhan et al., 2016)
39	emotions	1	(Rincón-Flores et al., 2019)
40	guild	1	(Antonaci, Peter, et al., 2017)
41	mechanics	1	(Calle-Archila & Drews, 2017)
42	peer review	1	(Jarnac de Freitas & Mira da Silva, 2020)
43	personalization	1	(Rohan et al., 2021)
44	secret tips	1	(Chauhan et al., 2016)
45	smooth learning curves	1	(Antonaci, Peter, et al., 2017)
46	unblock	1	(Calle-Archila & Drews, 2017)
	Total	154	

From Table 4, it can be concluded that there are 46 elements of gamification in MOOC to make the learners enjoy the online course. In brief, the elements can be classified as personal elements and social elements. Personal elements means really have impact to learner, and social elements are the elements that need collaboration with another learners. Therefore, these elements must be included in designing a MOOC model with a Gamification approach.

#### 4.5 MOOC type that suitable for Gamification

Then, to answer RQ No. 2, "What types of MOOC have been most used to implement gamification?", Author conducted a recapitulation of data from 21 selected research publications papers and summarized the impact of Gamification on MOOCs. The details can be seen in Table 5.

No	MOOC Type	#Papers
1	MOOCs	16
2	xMOOC	4
3	cMOOC	2
4	gcMOOC	1
5	aMOOC	1
6	fMOOC	1
7	gMOOC	1
	Grand Total	26

Most MOOCs suitable for implementing Gamification are the standard online learning platform, so it's straightforward to embed it on a MOOC platform.

#### 4.6 Gamification impact on MOOC

Furthermore, to answer RQ No. 3, "What's the impact of gamification on MOOC?", Author conducted recapitulation of data from 21 selected research publications papers. The details can be seen in Table 6.

No	Gamification Impact	#Papers
1	engagement	14
2	motivation	8
3	retention	3
4	intention	2
5	collaboration	1
6	creating fun	1
7	goal achievement	1
8	interaction	1
9	participation	1
10	relationship	1
11	satisfaction	1
12	user intention	1
	Grand Total	35

Based on Table 6, it can be concluded that implementing gamification elements into MOOC can positively impact learner engagement, increase learner motivation, and increase learner retention, participation, and goal achievement. So, Gamification can increase the MOOC completion rate.

## 5.0 Conclusion and recommendation

From this systematic literature review, 46 elements of the game must be included in the gamification design in MOOC. There are also 8 (eight) MOOC types suitable for implementing the gamification model, which can be a consideration for MOOC developers when developing Gamification in MOOC. In addition, there are 12 impacts of gamification in MOOC that prove gamification in MOOC was worked to increase the completion rate of MOOC. Therefore, this research still has limitation in terms of factors that identified to implement gamification element in MOOC.

For future research, many factors can be identified to get more vital information to implement gamification in MOOC, such as the variables used to design gamification in MOOC, the basic framework of MOOC gamification theory, and compare the implementation of gamification in MOOC from several selected countries. In addition, the future work also regarding the new gamification model of MOOC that combines all gamification elements and add new elements.

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