

## A gamification framework to enhance students' intrinsic motivation on MOOC

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### Abstract

Technological development supports the distribution of education to various parts of the world through online education. One of the learning media that supports the distribution of learning is the Massive Open Online Course (MOOC). However, MOOC has a low number of students who complete the course. Therefore, this research proposes a "gamification framework" through studies and various approaches in the field of games, intrinsic motivation elements, social learning, and interactive learning environments to overcome the low motivation of students. The proposed framework has been evaluated through validation by experts. The results found that the framework fulfilled the rules and suitability of the instruments and game elements used to increase the intrinsic motivation of students in online learning. Although there are some changes in the function and type of game elements used. For further research, the framework will be used as a guideline to build the Gamified MOOC Platform.

**Keywords:** game elements, gamification framework, intrinsic motivation elements, MOOC, social learning

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### 1. Introduction

Online-based learning provides excellent benefits for the development of teaching and learning methods, from conventional methods through face to face in class shifting to distance learning even free and open. Online learning is also a technology product that can be used to help teacher and student learning processes dynamically and flexible [1]. According to Sfenrianto et al. [2], in rural areas, the acceptance of online learning is very high and very useful for students. Learning platforms that provide open and free courses that can be accessed by anyone and anywhere are Massive Open Online Courses (MOOCs). Kaplan and Hein [3] said that MOOC provides flexibility to students because it is open and not a limited number of participants. Meanwhile, according to Porter [4], MOOC has features that differentiate with other online learning platforms, among them is MOOC provides an opportunity for anyone to be able to follow the course offered without being limited by the number of participants, age, gender, citizenship and education level. Besides, MOOC is free and can be accessed from anywhere via the Internet by adopting conventional instruction-based instructional methods and content provided within a specified period.

However, although the MOOC has many advantages offered, it also has a weak side, one of which is the MOOC effectiveness rate associated with the low level of students completing the course compared to the number of students taking the course [5-7]. One of the factors influencing the lack of desire to complete the course is the low motivation of the students [8-11]. These are because the assumption of online-based learning is considered as a passive electronic medium because it only presents images, videos or texts, so students think not much different from when they learn independently using a book [12]. So it takes a more interactive learning media that can help teachers in distributing materials efficiently and enhance student engagement in learning [13].

One effort to solve the problems of motivation in online learning systems is gamification. Gamification itself means using design approaches as well as elements in the game to be implemented in a non-context game. [14]. However, it is not easy to attempts using gamification as an approach to encourage increased motivation. On the contrary, many uses of gamification elements especially reward elements such as points, badges, leaderboards in online-based

learning reduce the motivation of student learning [15-17]. This is because the effects of rewards based elements can indeed affect student motivation, but the fact is only in the short term [18-19]. Therefore, it is necessary to design the mechanism of the game elements of both dynamics and mechanics so that it can support the creation of students' intrinsic motivation in the long-term. Saputro et al. [20] said that several game elements can be utilized to encourage increased student intrinsic motivation. The investigation results of intrinsic motivational elements along with game elements shown in Table 1.

Table 1. The Game Elements based on Intrinsic Motivation Elements.

Intrinsic Motivation Elements	Appropriate Game elements
Autonomy	Level, unlock a level, meaningful choice, progress bar, Skill tree, Avatar World, narrative, leaderboards, onboarding, quests, mission, lives.
Competence	Badges, Leaderboards, performance graphs, points, XP, grades, level, dashboards.
Relatedness	Collaborative work, competition, badges, social status, leaderboards, quests, storyline, avatar, teammates.
Purpose	Virtual Map.

Intrinsic motivation elements can be used as references to determine the right game elements to encourage the creation of students' intrinsic motivation in participating in online courses. However, it needs to be studied more deeply about how to integrate the game elements in online learning along with the steps that must be arranged through the framework. Then how the framework is validated by experts in the field of games and online learning so that the game elements can be implemented correctly on the online learning platform.

There are currently various types of MOOC platforms from different countries, universities, and private companies. However, only a few MOOC platforms adopt gamification as one way to increase student interest and involvement to follow and complete the course. Of course, each platform uses a different method or gamification mechanism. Some MOOC or LMS platforms that have used game elements shown in Table 2.

Table 2. Gamified MOOC & LMS Platform

MOOC Platform	Game elements	References
Openlearning.com	Kudos (Reputation points), Badges, Progress Bar	[21-23]
p2pu.org	Badges, the Progress bar	[21], [24]
Iiversity.org	Badges, Persona, Progress bar	[25]
Open.hpi.de	Reputation Point, Badges, User Status, Progress Bar, Experience Points	[26-28]
Moodle	Badges (Plug-in), Competition	[29, 30]
Thecn.com	Anar Seeds (Reputation Points), Badges, the Progress bar	[31]

The MOOC platform offered today is taking advantage of the gamification approach with a variety of goals, both for improving student motivation and student involvement in the course. However, the gamification approach, especially in determining the elements used in the gamification is still limited rewards system of activities performed by the user. These are in line with Ortega-Arranz et al. [32] that the use of gamification in the MOOC platform is still relatively new because there are always a few MOOC platforms that use gamification. Also, it is found that existing gamification implementations are even similar in execution in small-scale contexts learning, which only utilised PBLs and accomplishes tasks. In other hands, Nielson [33] explained that the use of PBLs in the MOOC belongs to the intermediate gamification category, but it should be understood that merely placing PBLs in the MOOC is not a good strategy and in some situations, it will only demotivate students. However, if used with appropriate consideration, with the process of levelling the points or badges well, then it can be a suitable strategy in the MOOC. While included in the advanced gamification category are avatars, bonuses, competitions, content unlocking, and levelling, accumulated points for redeemed goods. Another challenge is various other game elements such as virtual goods and others not explored, although some such as duels, ratings, status bar and avatar customisation already applied [32]. Based on this problem, several questions need to be answered, namely;

RQ1: How are the strategies offered related to efforts to increase intrinsic motivation of students through gamification so that they want to complete the online courses that are followed? This research question aims to describe the strategies needed through the full stages of the gamification framework to support the creation of students' intrinsic motivation in following and completing the course.

RQ2: What is the result of the expert's evaluation of the proposed framework and components for increasing the intrinsic motivation of students in MOOC? This research question is to get consideration and feedback from experts related to the proposed framework to meet the expected results.

## 2. Research Methods

The study consists of three stages; the first stage is to review the various MOOC platforms that use gamification to get an overview that has been done by previous researchers. The next step is to formulate a gamification framework based on approaches that are considered appropriate. Whereas at the last stage is evaluating the proposed model through the assessment of experts. This research stage shown in Figure 1.



Figure 1. Research methods

## 3. Conceptual Framework Formulation

This session will examine various approaches to get the right formula. Several approaches are used in developing the framework as follows;

### 3.1. Meaningful Purpose Psychology (MPP) Approach

In science Logo teleology or also called "Meaningful Purpose Psychology (MPP)", Behaviour can be initiated by something that has to mean; it will spur motivation and in turn, trigger the purpose or action [34]. Still, according to Marrero, a purpose more leads to the fulfilment of meaning, then the form of mastery of the material achieved is something that must mean for the student. Unlike when a student has no meaningful purpose, it will not result in anything from his participation in the course. MPP theory also explains that meaning, motivation and purpose influence the formation of the identity of someone. There are three types of identity, namely person identity, social identity and role identity [35].

### 3.2. Gamified Learning Interactive Environments (ILE) in MOOC

In the learning environment of the MOOC, there are various learning activities offered. Students who take the course will interact with these events. Interaction in the learning environment in question are some elements that directly tangent to the student. Grover et al. [36] explained that in the learning method, especially in MOOC there is interactive learning environment consisting of four parts of the course, which is content, instruction or pedagogy, assessment and community.

### 3.3. Social Learning Approach on Gamified MOOC Learning Environments

Observing, understanding and imitating is one way that individuals can learn. Bandura [37] introduced social learning theory or also called observational learning, which is a theory that shows that one can learn through direct experience or observation and modelling.

Learning It can also from what he read, hear and see the media, as well as from people in the neighbourhood. However, people is not a creature that merely mimics whatever he sees, but humans can also choose what behaviours have an impact on him and which are not. Therefore, Bandura perfected the theory of social learning by adding behavioural and cognitive aspects. Skill to sort and choose this as the cognitive aspect in question. According to Spencer [38], social learning theory is suitably applied to online learning models such as MOOC, where the instructor builds a model through the content, while students can make observations individually and socially and use the results of his remarks to master the course offered. That based on the primary principle of social learning, the application of strategy in social learning can be applied to online based learning in several ways.

### 3.4. MARC Intrinsic Motivation Elements

There are six elements of intrinsic motivation elements, namely; competence, mastery, autonomy, relatedness, meaning, and purpose [20]. Those six elements that have a relationship, proximity and shared a goal are simplified. The competence is a condition in which participants or players feel they have mastered something well enough when they think to make a significant difference, and then they will look for new ways to increase their competence [39]. Based on Skill Acquisition Model, there are seven stages in the mastery of the skill level of activity, namely; novice, advanced beginner, competent, proficient, expert, master, and practical wisdom [40]. This means that competence is one of the steps that must be passed by a person for a master level. Therefore, both are combined into "competence to mastery". Competence for mastery is a process in handling the external environment where effectiveness measures are used to control results and gain the skill of experience. The MPP theory used for providing a meaningful purpose for the students' when they interact with the contents, between students, or with an instructor in the MOOC. The game elements based on MARC are shown in Table 3.

Table 3. Game Elements based on MARC Intrinsic Elements

MARC Intrinsic Motivation	Dynamics Elements	Mechanics Elements	Game Components
Competence in mastery	Emotional creations	Challenge Positive feedback	Quest / Task /Boss Battle Various Points, such as; Base Experience Points (XP), Heal Points (HP), Skill Points (SP), Virtual Goods (Gold Points)
	Progression	Transaction Resources Acquisition	Custom Leaderboards; Global Leaderboards, Heroes Leaderboards, Level (Base Level, Job Level) Armour Store Unlock Skill and items collection Onboarding/Description Avatar Path and skill selection
Autonomy	Narrative/Story Self-Expression Freedom of choice Freedom to fail	Collaboration & Competition Feedback	Teammates/Tribe and Team Battle Friend activity notification, Extoll Points (EP) Tribe Leaderboards Virtual Map, Altruism, Heroes Journey
Relatedness	Relationship		
Meaningful Purpose	Progression Meaningful objectives		

## 4. Result and Discussion

This section discussed the proposed gamification framework based on the formulations that have been formed and how the framework is evaluated through expert evaluation.

### 4.1. MARC Gamification Framework

The four approaches discussed in section 3 are formulated and used as references to develop a new gamification framework called the "MARC gamification framework". Thus, the research question (RQ) 1 has been answered. The content on the MOOC platform structured by two approaches, both learning methods to change the behaviour and cognitive aspect and motivation support to maintain the intrinsic motivation and students' engagement when

interacting within the contents on MOOC platform. The MARC gamification framework consists of several essential approaches along with its sub-supports that can help the MOOC design phase that provides a different learning experience with other standard MOOCs. The social learning approach also helps the students to be more independent and active following the course series offered, so that the students' expectations are more interested and continue to be involved in each series of courses offered.

#### **4.2. The Observational Learning within Learning Instruction.**

The Learning instruction in the MOOC should provide the subject with clear objective and goals to give meaning to the students involved. In this section, gamification has a role in providing learning through meaningful instructional instruction; Using narrative stories or models such as "Heroes Journeys" and using multiple paths on a virtual map to give students the freedom to choose which sub modules will be solved first. With that, the learner will get a complete activity with the meaning and desire.

#### **4.3. Retention and Context within Forum Discussion and Collaboration.**

Discussion forums are used as a medium for exchanging ideas and questions between instructors and students and learners. That way the memory of the material ever recovered was called back. In addition to the forum, also provided the media to actualise themselves through personalised social networking and other communication media such as chats and messages. Gamification is used to raises retention through teamwork and relatedness to shape social identity; provide positive feedback for each action in the discussion forum (Extoll Points), Use learner performance to improve their social status, and Provides ease in self-expression through avatars. Collaboration among students in the course is also a way to increase student engagement and activeness within the MOOC. The more active and often involved in the MOOC the stronger the students desire to re-login into the course platform. To realise it, can with Build relationships and teamwork using tribe elements.

#### **4.4. States of Mind Trough Task, Quiz or Exam.**

Tasks and quizzes provide opportunities for students to test their abilities against the modules that are followed. Thus, students can measure the level of their understanding of the course modules offered. Also, the final exam provides an opportunity for students to measure the level of mastery of the course material. Provide students autonomy choose their destiny and learn from failure; Provides freedom to the learner to choose which path or task to complete first and an opportunity for students to learn from failure when following the quiz or exam (Boss Battle).

#### **4.5. Challenge and Progression within Rewards and Punishments.**

The weight of the course material is challenging, from the easiest to the next step with the time and ability of the students. Tasks or quizzes are also offered by stratum considering the difficulty level, not too easy and not too difficult. The goal is that the student's mastery can be realized. Rewards are used as impulse motivation from the external side to the achievement of the activities undertaken. The given reward can be accumulated for other benefits, or it could be a multilevel model. The opposite of rewards, punishment is an effort to keep students' caution in acting. With the existence of penalty, students are required to be wiser in acting or taking decisions. In this way, the level of attention and retention of course materials can be maintained. Gamification, in this case, provides challenges and achievement to support competence and mastery; build learner emotional involvement through the problems presented in each quest through each path so they can gain meaningful experience in learning. Provide a dashboard for learners as well as instructors as a medium to show progress events and facilitate the measurement of performance that is running or has been passed (Performance Graph and leader boards). Provide element transaction through gold points that have been obtained by students to buy new armour (Armor market). Give Positive feedback for every action performed by the learner, both for the individual and in the social environment. (Base experience points, gold points, skill points, heal points, Extol Points). The MARC gamification framework shown in Figure 2.

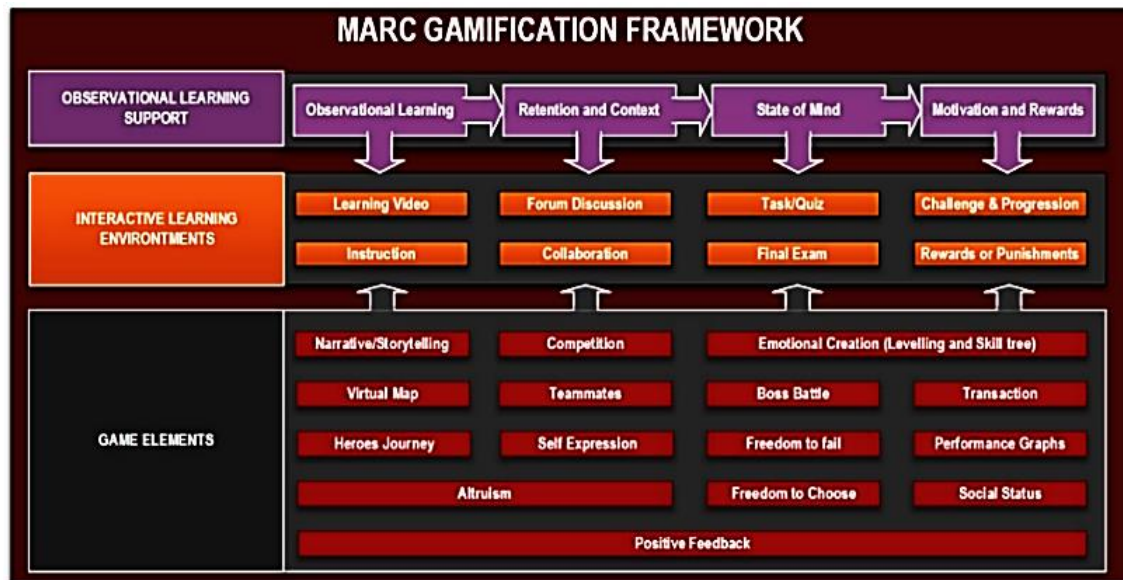


Figure 2. MARC gamification framework

#### 4.6. Evaluation Result and Analysis

Based on the proposed gamification framework, the main objective to be achieved is how to increase the intrinsic motivation of students to complete online courses followed by gamification and its elements. However, before this framework was proposed, the first evaluation was carried out. The evaluation process was carried out by dividing the evaluation form into six experts consisting of three practitioners in the field of game creators from industry, as well as three other people from academics in open access learning. On average they have worked for six years in their fields. The purpose of this test is to see whether the gamification application strategy along with the fifteen elements of the proposed game can provide fulfilment for the creation of students' intrinsic motivation in online courses.

The evaluation was conducted in response to the two main points of the distributed evaluation questionnaire, namely their response to all steps in the proposed framework, as well as the game elements presented based on the framework. Table 4 displaying the evaluation results of experts related to the four stages of the proposed gamification framework.

Table 4. MARC Gamification Framework Evaluation Results

MARC Gamification Framework	Experts					
	1	2	3	4	5	6
Provide learning through meaningful learning instruction	√	√	√	√	√	√
Raises retention through teamwork and relatedness to shape social identity	√	√	√	√	√	√
Provide students autonomy choose their destiny and learn from failure	√	√	√	√	√	√
Provide Challenges and achievement to support competence and mastery	√	√	√	√	√	√

Based on the evaluation results, six experts stated that they agreed to the four steps of the proposed gamification without any comment given. The next point is how the expert opinion relates to the fifteen elements of the proposed game. From the evaluation results, almost all game elements were agreed upon by experts, although some of them provided notes and additions related to several aspects of the game. Some of the things highlighted by the experts shown in Table 5.

Based on the experts' evaluation results, it found that there are some elements of the game that are deemed inadequate and need to remove, but there are also expert opinions that suggest adding another component such as the mentoring elements to provide an opportunity for the learner to share experience in completing the courses.

Table 5. Game Elements Evaluation Results

Comments from Experts	Game elements
Be careful between the Gamification and Game-Based Learning (GBL) as I see most of the items in your instrument are merely towards GBL.	All
Rename Heal points (HP) to Progression Points and Checkpoints if the function is to unlock the path.	Heal Points (HP)
Armour store can be used, if it does not affect the gameplay.	Armour Store
Extoll points can deteriorate all the point given above and will disturb the socially based experience given because there will be a gap between the player who completes in achievement when finishing the boss battle.	Extoll Points (EP)
Heal Points are not required. To unlock Path, use Skill Points only.	Heal Points (HP)
Provide mentor status as a reward title for students who have completed the course to provide an opportunity for students to share their experiences in completing the course with other students.	Mentoring
It needs attention in designing the level so that the level of difficulty and skill can run balanced.	Levelling

Therefore, based on feedback from experts related to the game elements to be used, we decided not to use "Heal points" to unlock the "path", but the function renamed as "Progression Points". Also, we will also add "Mentoring" elements in the form of achievement titles for students who have completed the course. The mentoring feature is offered optional when students have completed the course. The advantage of being a mentor is that they can get additional "Extoll Points (EPs)" if they are involved in discussions and answer questions from other students in the discussion forum. The aim is that students who already have mentors will be more active in discussion forums.

Associated with game elements used by one of the experts leads to Game-Based Learning (GBL) we can conclude that it does not happen because we only use game elements instead of building simulation or game. These are consistent with what Kapp [41] said that the learner in the gamification model does not play from start to finish as it does in a game, but they participate in a learning activity in the form of an online course that utilises video and learning contents. The difficulty level built depends on the instructional materials created by the instructor followed by rewards in the form of various types of points given. Although we will also provide value points by default, the instructor reserves the right to determine how many points a student can gain at each meeting or quiz. With the evaluation results of the experts and the revisions we made, the research question (RQ2) can be elucidated well.

## 5. Conclusion

Based on this research, it can be concluded that MOOC is one of the open online learning models. However, MOOC still has weaknesses related to support for students' intrinsic motivation. Therefore, it is proposed a new gamification framework to be applied to the MOOC platform that focuses on efforts to increase students' intrinsic motivation when taking online courses. The framework can also be used as a guide in building a new MOOC platform that will be carried out on the next research. Form the evaluation results conducted by experts, an agreement was made regarding the proposed framework. All proposed stages are stated appropriate in an effort to increase students' intrinsic motivation. There are elements of the game added, namely the title element "mentoring" to show the students' mastery of the material. In addition, there are also elements that are replaced based on expert advice.

From the proposed framework, we recognize that our research also has limitations. Among them is reviewing the framework and supporting elements only through the evaluation of six experts. We did not conduct a previous survey of students to get feedback from them especially on the elements of the proposed game. Subsequent research, the proposed framework will be used as a guide to design a new MOOC platform and will be evaluated based on how well the platform's ability to support students' intrinsic motivation through login intensity levels, student performance results and how well the platform meets the learner's basic needs through meaningful purpose, autonomy, mastery and relatedness.

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