Towards Personalization to support Learners' Motivation on Gamified MOOC Platform

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Abstract. Online learning expands along with the development of information technology. One model of online education that widely used because it is open and massive today is the Massive Open Online Courses (MOOCs). However, the problems that arise at the MOOC are related to the high drop out rate caused by the lack of motivation of users to complete the course. Various approaches are taken to deal with this, one of which is by utilising elements of the game through gamification and personalisation to understand the factors needed by learners in the learning environment. This research proposes a personalised design through self-determination. The results of the study have implemented on a new Gamified MOOC platform that pays attention to learner personalisation regarding competency, autonomy and relatedness.

1. Introduction

Online learning methods continue to evolve by optimising the use of technology and information, mainly to deal with the industrial revolution era 4.0. One of the online learning methods used today is Massive Open Online Courses (MOOCs), where MOOC has developed a higher education boundary by providing learning models - long distance on a large scale, free, and accessible to anyone and where even in this world. Although MOOCs are a relatively new trend in learning, MOOCs still present the same problems as other online education in the teaching and learning process [1]. Various problems in online learning are of concern to researchers, ranging from the issue of the low level of completion of courses [2], [3], [4], [5], until the need for personalisation of learning in MOOC [6], [7], [8].

Personalisation in learning can help increase student motivation because it can provide an independent learning experience for students without supervision and control from others. Based on descriptive analysis conducted by Mora et al., [9] it was found that Personalisation has more impact on increasing student motivation compared to a generic approach in all things about students' behavioural
and emotional involvement. So that the personalisation of learning can be a promising theme for further research. According to Jebali and Farhat [10], various personalisation parameters have been formulated through the search for literacy. Personalisation in the context of learning can be realised through Learning style, Teacher's personalisation strategy, Learner knowledge, Learner behaviour, Learner interaction with MOOC, Learner interaction with resources, Learner preferences context and learner skills. Whereas according to [6], pedagogically, the most popular method for personalising the MOOC is through learning path personalisation, assessment and feedback, and personalisation of services related to learning, material and assignments. To realise these parameters, personalised and effective learning design is needed. One of them is by using the gamification approach in learning.

Gamification defined as the use of design and game elements outside the context of the game. [11]. Various studies have implemented gamification in online learning because gamification is proven to have a positive impact on education [12], [13]. However, from existing research, there are still many researchers who have not considered personalisation on the learner side in the game system used [9]. Personalisation itself can harmonise psychological resources with one's behaviour so that it can improve performance effectiveness, enjoyment of use, identity and emotions through autonomy, competence and relatedness in its application [14], [15]. Therefore, this study proposed a gamification design that refers to personalisation to support the creation of student motivation through gamification within the MOOC platform based on their basic psychological needs. Furthermore, the design used as a guide for building a new MOOC platform that pays attention to personalisation of learners to increase their intrinsic motivation in following and completing courses.

2. Related Work
Archila and Drews [16] proposed a personalised framework through gamification in the learning environment based on learning models (affective, cognitive, etc.) at the MOOC. The structure offered can only be implemented in the Learning Management System (LMS) or MOOC Platform that supports Learning Interoperability Tool (LTI). The teacher has the authority to integrate the elements of the game and the type of feedback to open or block learning content based on student learning styles, personality traits and student competencies. Feedback and badges are sent to students if students have spent a certain amount of time in one or more activities that followed or when the emotional level of a student reaches certain conditions. Emotional level measurements using 22 passionate pairs from Ortony, Clore and Collins (OCC) models. Measurement variables based on time, activity, repetition, sequence, level and student model events. While the gamification elements used are feedback, levels, unblock, badges, and mechanics.

In Line, Roosta et al [17] categorised gamification elements to suit the style of student motivation by conducting surveys using the Achievement Goal Questionnaire-Revised (AGQ-R). The aim is to get the type of gamification element that is suitable to be applied to the online learning environment. Based on the survey there were four types of elements that were considered to meet the requirements for meeting personality learners, namely leaderboards, badges, progress bar and feedback. Experiments were conducted on 100 students using the DoosMOOC platform which was divided into two groups. The results of the evaluation found the effectiveness of the personalization approach to their motivation to take part in the forum and complete the quiz.

Meanwhile, Denden et al [18] conducted an investigation related to the relationship between types of learner personality (introverts or extroverts) with game elements that matched their characteristics. The Big Five Inventory (BFI) questionnaire consisting of 44 statements was distributed to 57 students to determine the personality type of students, including introvert, balanced or extrovert and the kind of gamification they liked. The results of the study show that the learner personality influences the determination of several game elements. From game elements such as leaderboards, points, levels, feedback, badges, progress bar, avatar and chat, balanced personality types and extroverts have no problems. However, the kind of personality introverts doesn't like the leaderboards element because they don't feel comfortable showing off their values to other students. It also includes a progress bar that can show the results of the development of learning to other students.
Based on previous research it can be concluded that various approaches have been used to determine the type of game elements that are appropriate by learner personalisation. Each researcher has the same goal, namely an effort to increase learner learning motivation. A summary of the types of game elements that are considered suitable for implementation on the MOOC platform based on learner personalisation shown in table 1.

Table 1. Summary of Game Elements which are considered to support learner personalisation

| Game elements | Researcher |
|---------------|------------|
| Feedback      | [16], [17], [18] |
| Level         | [16], [18] |
| Unblock       | [16] |
| Badges        | [16], [17], [18] |
| Leaderboards  | [17], [18] |
| Points        | [18] |
| Avatar        | [18] |
| Progress bar  | [17], [18] |
| Chat          | [18] |

Table 1 shows there are several elements of the game agreed upon by previous researchers. However, it should be underlined that from the elements of the game offered, several elements are elements of rewards (Points, Leaderboards, Badges). If the design and utilization are not right, these elements can demotivate learners [19], [20], [21], [22], [23]. These are because if the element rewards given continuously, then there will be a peak where students will feel bored, especially if all the rewards they have got. So that mechanisms and dynamism are needed to balance these conditions. So, it can balance their learning motivation for a long term.

3. Research Methods

This research divided into three stages, namely literature review, design and implementation. The literature review stage is a stage to see how the previous researcher determined the appropriate elements of the game to be personalised. The design stage is a stage for designing gamification that supports personalisation on the MOOC platform, while the implementation stage is the stage of how the gamification that supports learner personalisation is applied. The steps of research shown in Figure 1.

![Figure 1. Research Methods](image)

The literature review stage has been carried out in the previous session where various game elements found that could support the learner personalization. Next step discussed the design stage. In the design phase is divided into two parts, namely the design of architectural models and personalization designs through gamification on the MOOC platform or can be called the G-MOOC platform.
3.1. The Architecture Model
The G-MOOC platform is built on a web-based platform consisting of a variety of learning content as well as its interactions, both interactions between students with content, students with other students as well as students with instructors. The architectural model offered is shown in the figure 2.

![Figure 2. G-MOOC architectural Model](image)

The instructor is tasked with developing the learning process through the various content provided on the MOOC Platform, such as improving course descriptions, uploading the syllabus, compiling material, uploading video links, preparing quizzes or assignments and final exams etc. Students are assigned to access the various courses available, take courses, do quizzes or assignments, discuss both with teachers and with other students, and access achievements through their dashboard. Both the student and the instructor will receive a report on the progress of the activity followed or the outcome of the lesson. The MOOC prototype built did not use existing MOOC platforms or LMS as some researchers did. These are due to the limitations of the MOOC platform, and the existing LMS can cause the implementation process of the framework to be more difficult. These are in line with what [24] in his research. Therefore, by building the MOOC platform itself then the integration of MOOC with gamification can be easier.

3.2. Personalization through Gamification Design
According to Ryan and Deci [25], The Intrinsic motivation can be formed when a person's basic needs are met through the need for competence, the need for autonomy and relatedness. The competence is the desire of individuals to gain mastery of achievement. The autonomy means to have meaningful choices, while the relatedness is to interact and connect with others in the social environment [26]. To support the personalization of learner learning activities several game elements are determined based on fulfilling the basic human needs as follows;

3.2.1. The fulfillment of competencies. The fulfillment of learner competencies attained if the learning content provided has clear descriptions and objectives. So the learner can know what the learning goal obtained after the learner takes the course [27]. To support the achievement of success element rewards can be used as feedback, including points, levels and leaderboards.

Points in this study are the primary game elements of the entire gamification process offered because these elements have a close relationship with other game elements. Various types of points provided for learners through learning activities that are followed by them. However, this does not
mean that this element is purely an element of rewards, but points collected can help learners to complete their learning activities. Thus, learners can choose and target what type of points they will receive and use. Various kinds of points offered shown in table 2.

| Points                | Function                                                                 |
|-----------------------|--------------------------------------------------------------------------|
| Base Experience Points (BEP) | BEP obtained from completing learning content. Its function is to increase the level and to rank on the leaderboards. |
| Progression Points (PP) | PP obtained from completing weekly meetings (Quests). Progression Points are used to unlock meeting modules (Path) inside the virtual map. |
| Skill Points (SP)      | SP obtained when the learner completes the quiz. SP can be used to activate skills possessed by each avatar. |
| Extol Points (EP)      | EP is a point that can be obtained by learners if they are active in the forum and can be used to buy rare armours to enhance their avatars persona. |
| Gold Points (GP)       | GP is a point that obtained by the learner if they complete the quiz. The function of the GP is to buy Silver and Gold armour. |

3.2.2. The fulfilment of autonomy. To provide the learners' autonomy, the course is built using the storyline. The goal is that the learners who take the course get a different experience as if they are completing a game. It can enhance their experience in learning [28].

The structure of the content and features of the G-MOOC platform is not different from the content structure of the MOOC platform in general, where there are learning content such as short video materials, text, forums and online quizzes. The difference is that each learner can determine his activities personally through the gamification elements used. Also, the terms used to adopt the term in the game. The G-MOOC course called "Heroes Trials" wherein there is a meeting module named "Quest", and the sub-meeting in the quest is named "Path".

Elements of the game that can provide freedom for the learner to determine how to complete the course include avatars, armour, skills and virtual maps. There are three types of avatars offered to the learner to be able to choose when they first take the course. The three avatars provided to the learner shown in Figure 3.
Based on Figure 2, it can be explained that each avatar has different characteristics, skills and armour. The three avatars are The Knight, The Sorcerer and The Priest. The Knight can produce BEP, The Sorcerer is dominant for PP, and the priest can deliver SP. If all three forces in team collaboration, it can help the process of completing a course more efficiently and pleasantly. Because in a team all three have the skills to be able to share the points they produce between them.

The next element is a Skill. Each avatar has 11 different skills and can only be activated if the avatar level and skill points possessed by the learner are sufficient. Each power can provide support for achieving different experiences. Among them are through skill learners can build teams (collaboration), share points owned (Altruism), attack other teams by reducing their points (competition) or protection carried out by one individual in the group from another team's assault (sacrifice).

3.2.3. The fulfilment of relatedness. For social relations between learners to be realised in a learning environment, in addition to teamwork, a forum in the form of a discussion forum is also provided. With discussion forums, learners can interact with other learners and instructors. There are rewards given from the activity of each learner through extol Points obtained from each "like" provided by the instructor or other learners in a discussion. These Extol the learner can collect points and exchanged with special armours to upgrade their avatars. The examples of platinum armour form EP shown in Figure 4.

![Figure 4. Platinum Armour from The Priest Avatar.](image)

3.3. Implementation

The results of the proposed design then implemented into the MOOC. Related to the type of material given in the course is not specific, it means that the instructor free to determine what course content would be developed. Also, the instructor is free to arrange the flow of sub-meetings through the virtual map model, whether to use a straight through or branching model. Virtual maps also provide personalization for learners in determining which sub-meetings have been completed first. Each sub-meeting that completed will open the way for the next sub-meeting. As such, each learner can have different experiences in completing the course. The form of the virtual map offered in G-MOOC shown in Figure 5.
The main view on the learner side made as simple as possible so that it is easy to remember and understand. Every course offered, displayed on their heroes trials page. There is also a leaderboard feature to present the results of the achievement of the BEP values of all learners in the G-MOOC, both performances in each course that followed, achievements through the team, or all BEP from all classes that have been followed. To avoid the dominance of learners in ranking leaderboards need a collaboration within the tribes to compete with each other through attacks carried out against other teams to reduce BEP other learners. That way, there is no longer the term mastery of a person in rank. The third display of the leaderboards in G-MOOC shown in figure 6.

4. Result and Conclusion
This study proposed design personalisation of students through gamification to increase their intrinsic motivation through self-determination. Furthermore, the design implemented on the new gamified MOOC platform. Various elements of the game are used to support the personalisation of learners in taking courses, so they can choose, and determine their destiny to complete the sessions they attend.
However, this study still has many limitations, where evaluation of the G-MOOC platform has not been carried out. So, the level of success and effectiveness of the game elements offered has not been proven. Therefore, in the next study, the G-MOOC platform will be tested both through direct use and through student feedback to determine the performance of the platform.

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