

eLearning Gamification Prototype Development using User Centered Design Approach

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ABSTRACT

Abstract eLearning is one of the tools used by the educational institution. Unfortunately, many eLearning systems were not fully utilized by the user. These problems occur because of a lack of interaction in the eLearning system, dulling the learning process. Another problem is the lack of preparation from the user. This research tried to tackle these problems using gamification. The gamification adopted in this prototype is Medals, Ratings, and Discussion. The development prototype development using User Centred Design to gather the requirements and system flows. The use of these elements is hoped to be able to elevate the eLearning adoption. The results of this research are the prototype of the gamification features and the business process of discussion in the eLearning system

Keywords: eLearning, eLearning Barrier, Gamification, Prototyping, UML, User-Centered Design

INTRODUCTION

eLearning has become an essential tool in learning these days. The eLearning platform is used not only by formal education institutions but also by informal education institutions. The utilization of the eLearning platform could elevate the institutions competitive advantages [1]. Sadly, many eLearning platforms, especially in formal institutions, failed.

A lot of research has been conducted to find the problems of eLearning implementation in formal institutions, especially higher education, such as the research conducted by Rafique et. Al. [2], Keramati et. Al. [3], Coopasami et. Al. [1], Hammad et. Al. [4], Aminu et. Al. [5] and Anna et. Al. [6]. These papers tried to see the challenges and barriers of eLearning implementation in their respective case. Through this research, we know that several factors implemented eLearning hard. The main issues we found in our previous research are boredom, Lack of Interaction, and the lack of preparation from both the students and educator [7] [4], [8], [9]. These found issues became the main problems in our prototyping development.

Gamification is one of the solutions to this problem. Much non-formal education adopts gamification to enhance their learner or students' engagement. Gamification is the adoption of game elements to engage the learner in a certain activity, such as a learning activity. The elements of gamification are badges, problem-solving activities, task progression, and so on [10], [11], [12]. Another research also mentioned that using gamification in learning can eliminate negativity and enhance the experience [13]. Therefore, formal education must also develop certain gamification in their eLearning system. In this research, the researcher will try to develop a gamification feature that can be adapted to the existing eLearning in any institution.

METHOD

As mentioned in the introduction, we will develop the prototype of gamification in eLearning using the Prototyping method in this research. The step of Prototyping Development is shown in Figure 1.

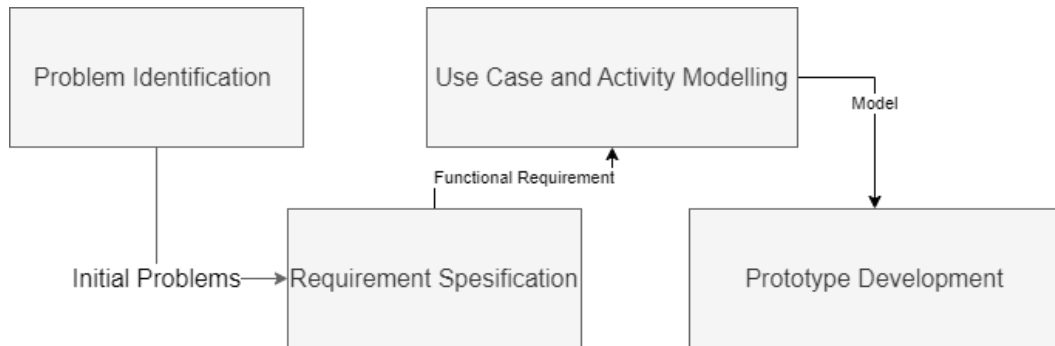


Figure 1. Prototype Development Step

The first step of prototype development is problem identification. We conducted a literature review and interviewed the stakeholders to gather the problems. After identifying the problems, we elicit the functional requirements for the Gamification feature. This step is critical because, without proper analysis, the development success process cannot be guaranteed [14][15]. Requirement elicitation is the process of gathering the requirement of an application or system information to meet the stakeholder need [16]–[18]. A lot of ways to conduct the requirement elicitation. One is User Centred Requirement Engineering, which Ehn et al. use.[19].

In this research, we used Ehn et al. approach in requirement elicitation. Ehn et al. used User Centred Requirement engineering methodology to elicit the requirements. Ehn et al. approach are [19]:

1. Requirements Elicitation.

In this step, we identified the user group and elicited the prototype's requirements. The elicitation process was conducted using interviews and observation.

2. Requirements Analysis.

In this step, we categorized the system requirements and developed the conceptual model for the prototyping flow guideline. After we found the system requirements, we made the models of the systems. In this research, we only develop two UML models: An activity Diagram and a Usecase diagram. We do not create other UML because we only develop a non-usable prototype. Therefore, class diagrams and sequence diagrams are not needed yet.

The prototype development was conducted after the requirements were gathered. In this step, we develop the prototype using Figma. Figma is an application usually used to make a prototype. Figma can be used for collaborative projects and is easy to use [20].

RESULT AND DISCUSSION

The first step in the development process is gathering requirements from the initial problems. As mentioned before, the initial problems of this research were gathered from the literature review in our previous research [21]. We use interviews and observation to conduct the elicitation process. The interviewees are the stakeholders of the learning process, such as

students and the lecturer. Table 1 shows the result of requirements elicitation. In this research, we only analyze and develop gamification and its supporting features to answer the problems identified in eLearning systems. The requirement elicitation results can be seen in Table 1.

Table 1. Requirement Elicitation Results

Problems	Functionality	Use Case
Lack of Interaction	1. The system could facilitate the interaction of the learning community via interactive features	Add new Discussion Add Rating Answering the Discussion Get Discussion Notification Get Activity Notification
	2. The system could summarize the material given in the class	Show Class Summary Input Class Summary
Boredom	3. The system Could implement Gamification features to the discussion and learning process	Give Medals Get Task Progress Notification Give the leaderboards notification
Lack of Preparation	4. The system could give notifications about the materials to be learned.	Notification about the materials to be taught both for students and the lecturer Notification about tasks deadline

After we gathered the requirements and the use case of the eLearning Gamification features, the next step was creating the conceptual models of the prototype. As mentioned before, we use Usecase and Activity Diagram. Use case diagram is used to model the interaction between one or more actors in the systems, and activity diagrams are used to model and show the process in the systems [22] [23]. Figure 2 shows the Use case diagram.

In the use case diagram shown in Figure 2, we can see that almost all the Gamification features are not only accessible by students but also by lecturers. This way, lecturers could monitor their student's progress and control the discussion process. The students also do the controlling process. Students who know about certain topics could review and rate the answers given in the discussion, and the lecturers act as moderators. The process will be discussed in the activity diagrams.

The next of the process is developing the activity models to show the gamification process in the eLearning systems. Figure 3 shows the activity diagrams. From Figure 3, we can see that lecturers and students do not have many different activities. The main difference activities of lecturers and students are in the moderation of answers that the system will show. The lecturer function as moderator of the discussion and ensures the quality of the discussion. Another function of the lecturer is to give medals to the best answer in the discussion. This function is also used to ensure the quality of answers given by the user. By using the medals elements, students could have the motivation to give the best answers they could give. The use case is shown in Figure 2.

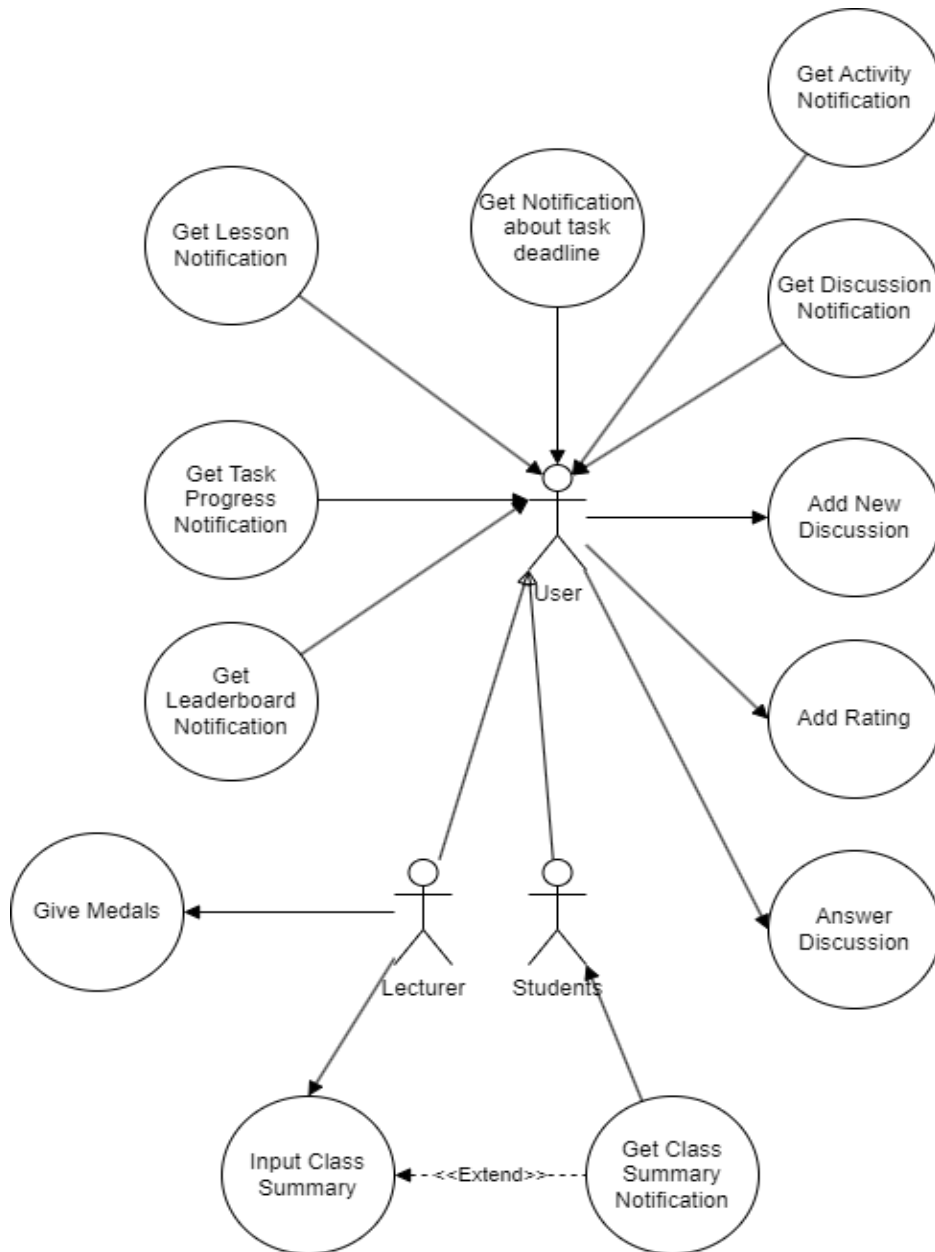


Figure 2. Use Case Diagrams for Gamification Features

Figure 4 shows the activity diagrams of leaderboards. In this activity, the system automates the leaderboard. The system calculates the student's points based on their activity on the eLearning system, such as the rating they got, Medals, their uptime in the systems, and task that they finished in certain periods, for example, in one semester or one month. The activity diagram discussion is shown in Figure 3.

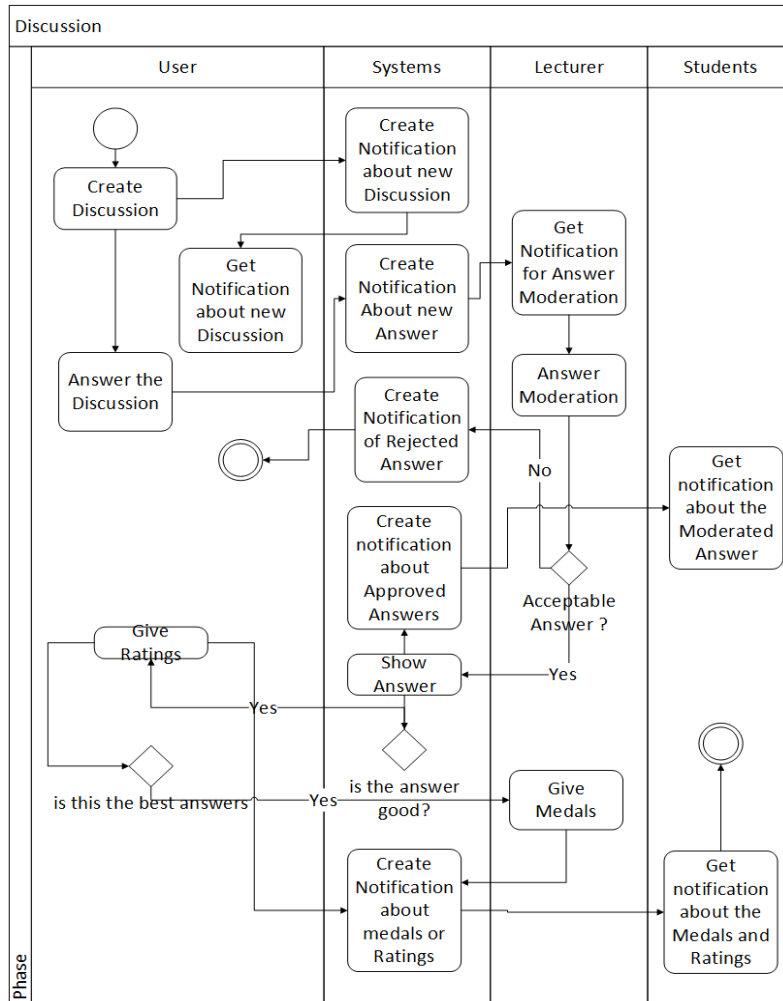


Figure 3. Activity Diagram Discussion

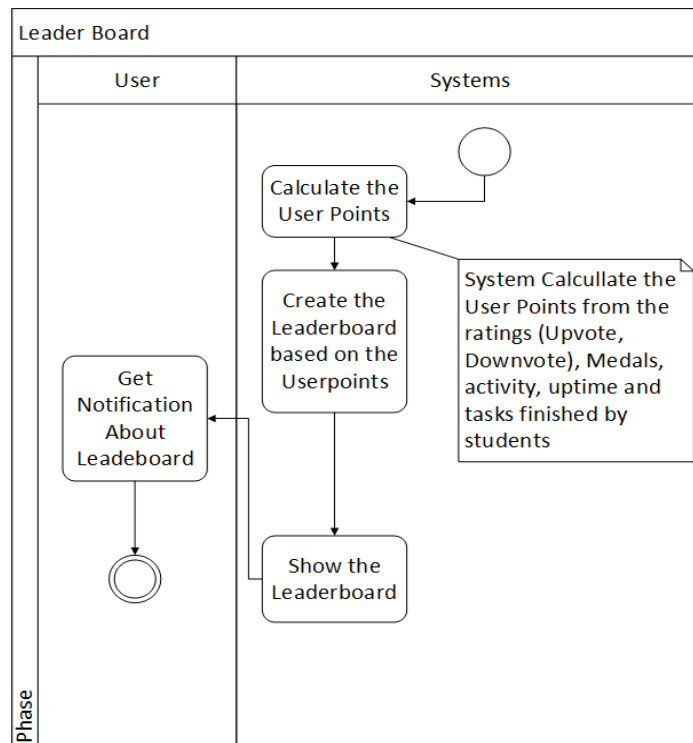


Figure 4. Leaderboard Activity Diagrams

After the activity diagram is developed, our next step is developing the system prototypes using Figma. In this research, we only developed the User front page, Leaderboard page, and discussion page. Figures 5 to 6 show the Prototypes.

The first page the user opens after they log in is the homepage of the user. On this page, a user can see what their enrolled class are, the progress of their tasks, the leaderboard, and their schedule. The user homepage is shown in Figure 5.

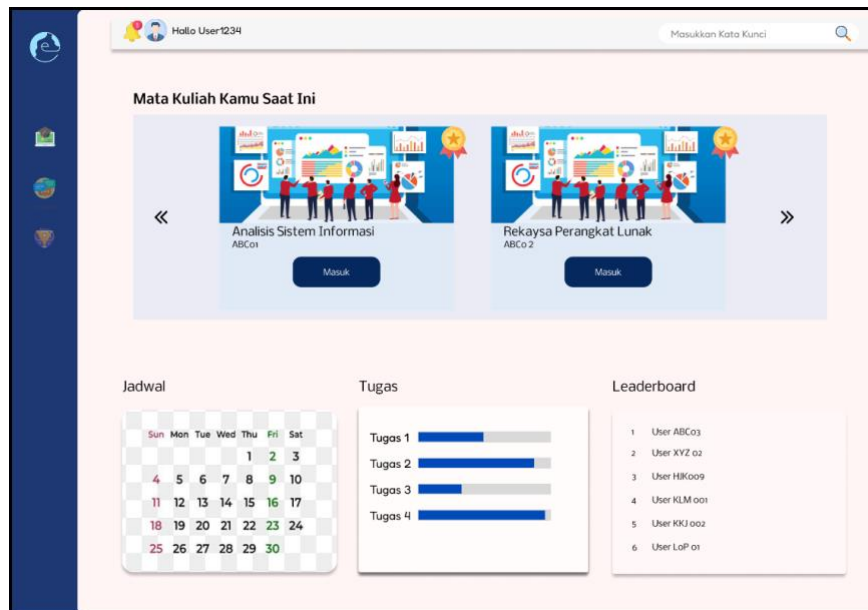


Figure 5. User homepage

The second page we develop is the materials page. This page shows what materials the students need to learn. On this page, students can click the materials they want to study. After clicking this page, students can make new discussions or answer other discussions or questions. Figure 6-8 shows the Material and Discussion process that happens in the eLearning system.

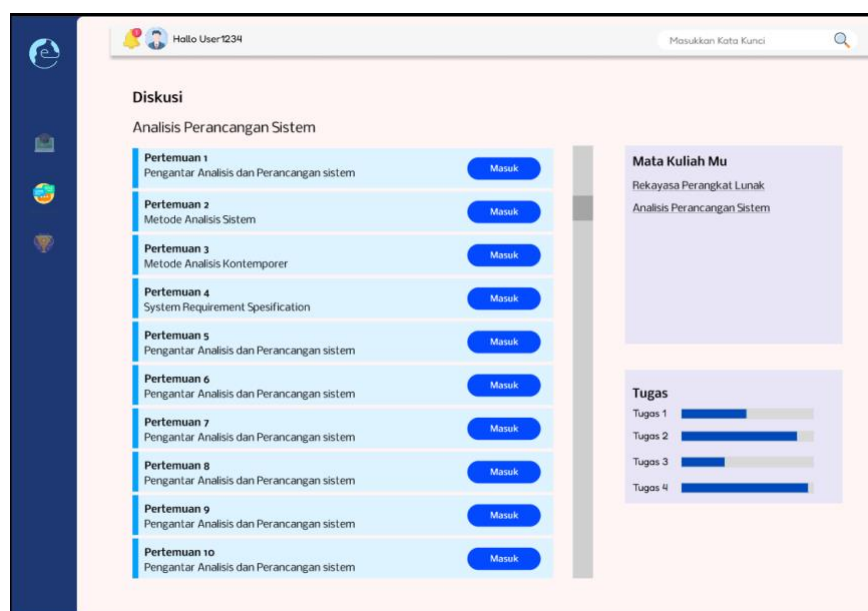


Figure 6. Course Materials Page

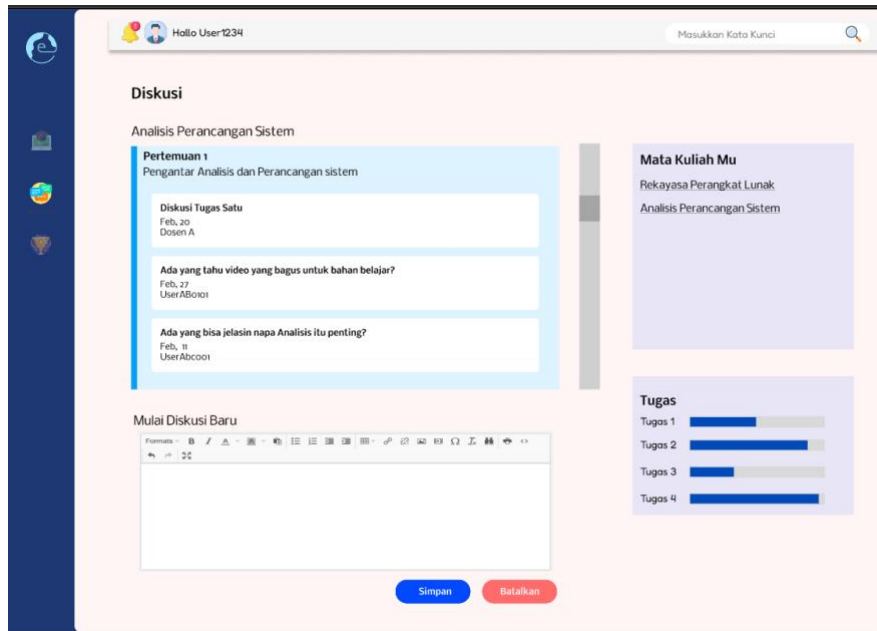


Figure 7. Course Discussion Page

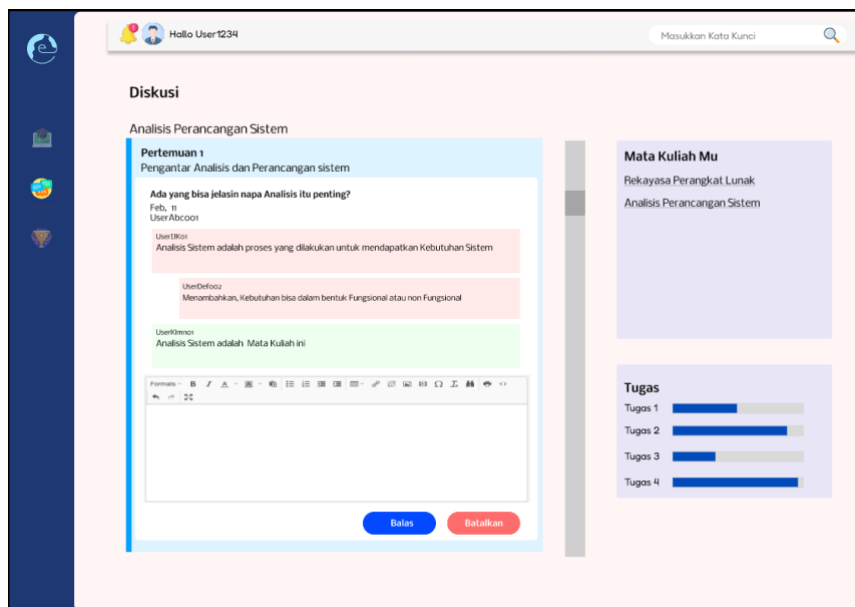


Figure 8. Adding Discussion

The next page we develop is the leaderboard page. On this page, the user (Students and Lecturer) can see the leaderboard of the periods. We hope to use this feature to elevate the use of eLearning systems. As a side note, this paper was not yet tested if the feature designed in this prototype can enhance the students' learning results or could enhance the engagement of the eLearning members. This prototype can be seen as a conceptual model which can be implemented based on the previous research mentioned. We will test the result of the feature implementation in our next research since we need to observe in a specified time frame to see the change in the members' behaviour.

CONCLUSION

eLearning adoption has a lot of barriers. These barriers include lack of interaction, boredom, and lack of preparation. These barriers made the users uninterested in the eLearning system implemented. Using gamification is one of the methodologies to enhance engagement and create fun environments in the learning process. In this research, we adopt medals review and discussion as feature to enhance the interaction. Using gamification also could a fun aspect of the learning process. We hope that adopting the prototype and process of gamification we propose could help in this goal.

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