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## Gamified Android Based Academic Information System

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### ABSTRACT

Student is often lazy when it comes to studying, and how to motivate student was one of the problem in the educational world. To overcome the matters, we will implement the gamification method into an Academic Information System. Academic Information System is a software used for providing information and arranging administration which connected with academic activities. By implementing the gamification method, it is expected to improve student's interest on the study programs. Gamification itself is a process with the purpose of changing non-game context into a more interesting application by integrating game thinking, game design, and game mechanics. From the evaluation result, it is concluded that the application has been successfully built and the gamification method has been successfully implemented to improve student's interest and the most influential gamification features are point and reward.

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## 1. INTRODUCTION

Formal education is an important educational period which more than half of Indonesian citizen experienced. According the data from Portal Data Indonesia the number of participation in formal education in Indonesia is 63% [1]. However, it is not uncommon for student to feel bored when it comes to education. That attitude of the students does not involve a certain subject but almost all of the subjects in school [2]. Most of the time, the curriculum was put to blame. One of the principles of building the curriculum in Indonesia is diversified and integrated. It aims for caring of diversity in Indonesia. Those principles are also used in college [3], so it is not strange for students to have a subject they like and hate.

How to motivate students so that the students could be encouraged to study, more focused in things the students like, and have even willing to learn things the students does not like is a problem in education. Based on the research result by Roy [4], motivation could affect the student learning result up to 5.44%. Another research also explained that motivated students give a significant difference in result than students which are not motivated [5]. In response to that, there are many efforts done to motivate students and according to Hamari et al. [6], gamification is one of the proved methods that could increase students' motivation at some degree. Iosup and Epema [7] had tried to implement gamification method in technical higher education which proved to increase the percentage of passing students and foster interaction in the classroom.

This paper will explain on how to develop an academic information system with the gamification method so that students could be motivated in their study. It consists of five chapters. The first chapter is introduction, and following second chapter is about some basic theories on gamification and academic information system. Third chapter is about the gamified academic information system design as a research method used in this study. The testing results and analysis will be explained in chapter four. Lastly chapter five gives us the conclusion of this research.

## 2. THEORETICAL BASIS

### 2.1. Gamification

Gamification is a process that aims to change a non-game context (example: learning, teaching, marketing) becomes much more interesting by integrating games thinking, game design and game mechanics (game elements) [8],[9]. The use of gamification is very effective to create a work that is usually tedious, unpleasant, or less challenging becomes much more fun to do (example: filling out surveys, fill out a tax accreditation, writing paper, and many more). One approach that can be done is by providing an appreciation both virtual and non-virtual that can encourage someone to do “better” than others [8].

Gamification implements the dynamics and mechanics of psychology that makes the game challenging and addicting. It is a technique to provide information into the system and facilitate processes that spur such sharing type [10]. Gamification is meant to be implemented on non-gaming applications, such as enterprise business application, collaboration and communication application suites, and also learning applications. Figure 1 describes the elements of gamification, such as [10]:

1. Game Design

The way application needs logic, games are also internal logic in mind. In case, games do warning, it fails to engage the user for a long.

2. Behavior

High-end user engagement to influence the target behaviors level depends on the type of the game players Behavior.

- Achiever - who are focused on game-oriented goals.
- Explorer - who are innovative and love to find hidden part of the game.
- Socializers - who mainly focused in engaging and sharing with other user.
- Killers - who always want to create trouble with other user.

3. User Experience

Most interaction design is about process and knowledge worker efficiency where “Gamefulness” and “Playfulness” attributes are important in user experience design.



Figure 1. Gamification Concept [10]

### 2.2. Key Elements in Gamification

Gamification has some use cases for successful application in social media. Now it has become an innovative way to motivate people with the game mechanics [10].

The architecture of gamification essentially based on key elements such as [10],[11].

1. Rewards and Incentives

In order to remain competitive, an organization usually provides gifts and incentives to its members.

2. Badges

Gamification technique when linked with social features used medals or badges to show different levels of achievement when certain milestones are reached.

3. Leaderboards

By dividing the job into several parts based on domains and areas in the leader board, it can help people to know where they were supposed to be on his community so that competition can be built.

#### 4. Point and Score

In addition to giving gifts and incentives a game also can provide points that can provide the possibility of obtaining the prize. In giving points there are some things that are taken into account such as: the ability to respond rapidly, the level of participation, the quality of the results.

#### 5. Competition

Competition is something that can describe a situation in which success can be calculated from the results of achievement. In the competition a player will try to beat the other players, but in game design is usually made into a match between teams.

#### 6. Social Connection

Games today cannot be separated with a social media where players can share information, help each other, or compete in a game.

#### 7. Level and Reputation

Everyone needs a degree of satisfaction in achieving a goal. In gamification it could be made more concrete and visible to others through a level value and reputation. It becomes a gift that gives a sense of high achievement for users.

### 2.3. Academic Information System

Academic is a field that studies on the curriculum or learning in its function to increase the knowledge in terms of education or learning, can be managed by a school or educational institution [12]. While information system refers to both the system that delivers information and communication services to an organization, and the organization function that plans, develops, operates, and manages the information systems [13].

Academic Information System is software which is used to present and organize information related to the administration of academic activities. With the use of software, academic administration activities is expected to be managed properly and the required information can be obtained easily and quickly [14]. Through the Academic Information System (AIS) that students can see the grade, finance, and also the absence list of the students as well as other data related to the students' academic record. The data presented may vary between academic bodies with one another, but most of the data presented is generally the same and follows existing standards [14].

### 3. RESEARCH METHOD

To build a system with gamification methods, the game mechanics needs to be set first. Game mechanics used in this study are as follows.

#### 1. Level and Experience

Experience (exp.) and level system applied to the assignment system built. Experience will be given when the student completes an assigned task. When experience earned reach a certain point the student level will rise.

#### 2. Badges (Achievement)

Badges on the system are given to the user when the user reaches a certain stage in the application. There are three things that are taken into account in the granting of badges, the level of users, number of events that followed, and the number of tasks completed. In total there are nine badges which can be obtained by users.

#### 3. Leaderboards

Leaderboard implemented in two parts, a class ranking which is based on the value of each subject and the overall ranking of students based on level.

#### 4. Point and Reward

In addition to gain experience, when completing the task, students are also given points that can be exchanged for rewards that have been provided. This feature is created so that students can obtain directly visible when completing tasks.

#### 5. Social Connection

Games nowadays cannot be separated with a social media. In the development of this system, we implement a feature to search and view the profiles of other students to support social features.

For the design of user interfaces, the applications used flat design with colors that resemble colorful modern game in which mostly have a simple display but still interesting. Some screenshots of the application that has been built are shown on Figure 2 to Figure 6 to explain the results of the application design and development.

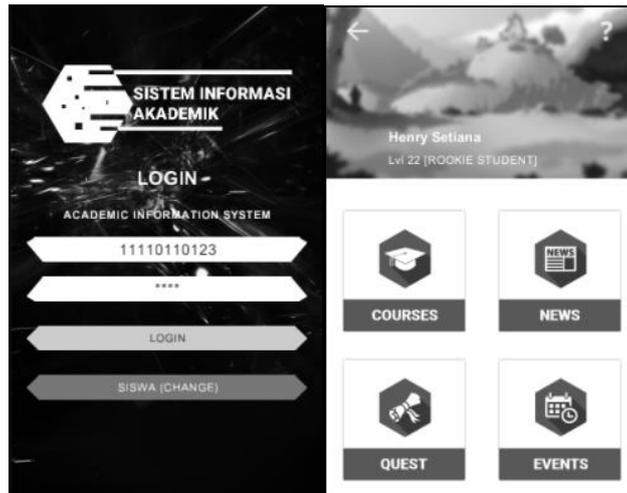


Figure 2. Login and Student Main Menu Pages

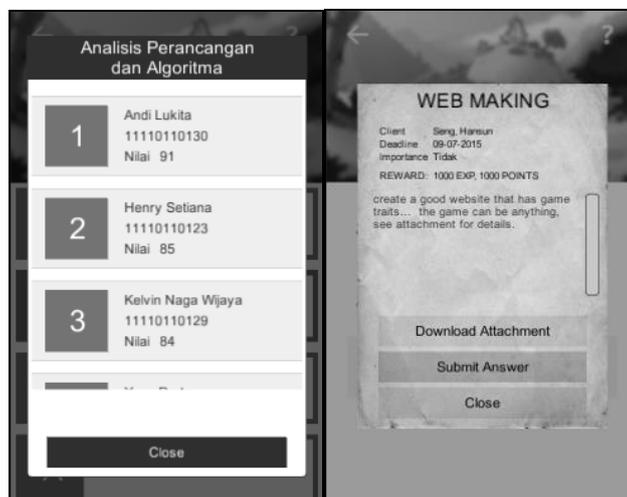


Figure 3. Student Score Ranking and Quest Detail Pages

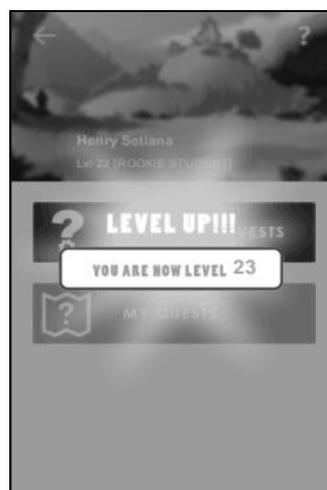


Figure 4. Level Up Notification

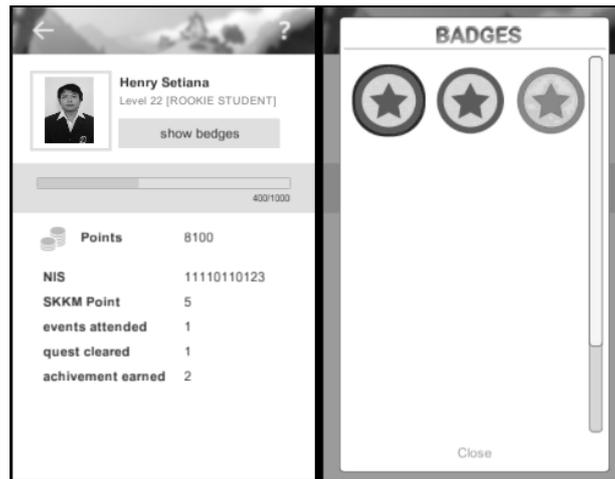


Figure 5. Profile and Badges Pages

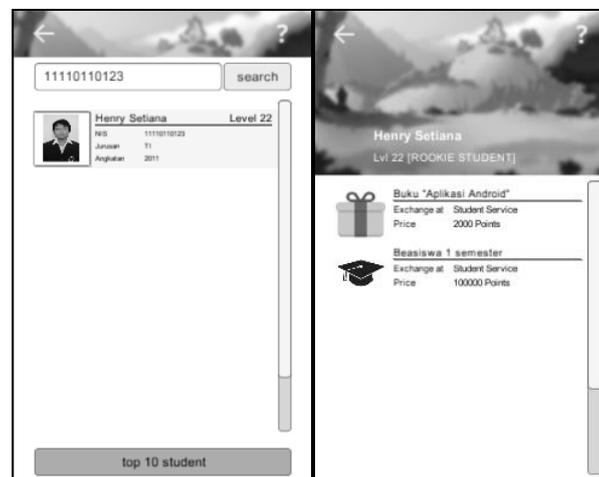


Figure 6. Social and Rewards Pages

#### 4. RESULTS AND ANALYSIS

This part explained about the results of the system testing. The results are based on questionnaire result of 30 respondents which had tested the application. Here is the result of each questionnaire questions.

##### 1. Respondents Data

After data recollection, we earn that respondents age ranged from 19-23 years old and are student of Universitas Multimedia Nusantara.

##### 2. Gamification Implementation

Based on data counting, 27 from 30 respondents answered different sensation when using the application. From those 27 respondent, 23 respondent answered they feel like playing a game. From those result it can be converted to a percentage, therefore we get a result of 76.6% from the respondents feel like playing a game.

##### 3. Users Motivation

Aside from gaming feeling, the questionnaire also asked about how the respondents motivation effected by the implemented gamification.

After calculation, it is showed that 27 of 30 respondents said that they will be motivated if the system is applied. Some respondents who do not get the feeling of playing games, still answered that they will be motivated by the features of gamification applied to the system. In percentage terms, it was found that 90.00% of respondents are likely to be motivated. This proved that gamification is well accepted in university students as the respondents were young people of age 19-23.

4. Feature Comparison

To determine which features are most influential, the questionnaire also included about the ranking order of features effect on motivation. Influence calculated by giving points to the features according to the order of assessment, first place gets 5 points. The second position gets 4 points, third place gets 3 points, fourth place gets 2 points and fifth gets 1 point. Based on calculations it is known that the most influential feature is 'points and rewards' feature. Details are displayed in Figure 7.

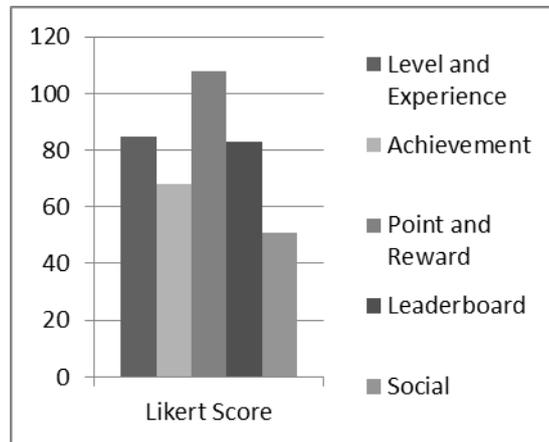


Figure 7. Feature Comparison Graph

5. Level and Experience Feature Influence

One of the implemented features into the system gamification is level and experience. To determine the influence of this feature in academic information systems that are built, it will be analyzed based on the Likert scale that has been listed in the questionnaire. The respondents will answer how much influence the features of experience and level in the motivation of the respondent by providing the numbers 1 to 5. Number 1 indicates that the feature does not affect the motivation, while the number 5 signifies that the feature greatly affect the motivation. The Likert values obtained is 117 points with a maximum value of 150, when converted to a percentage the result is 78%. The result means that this feature is giving an effect to the audience but the effect is still limited. It is most likely due to the short testing period that makes the audience cannot reach a certain level that can give The calculation results can be seen in the diagram in Figure 8.

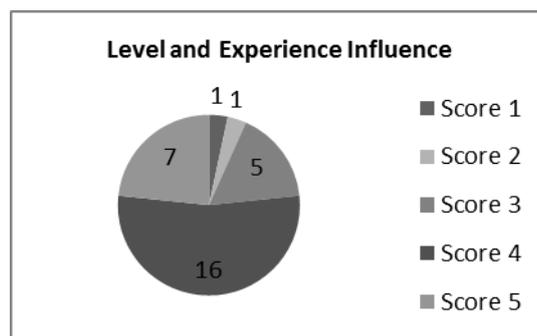


Figure 8. Level and Experience Influence Chart

6. Achievement Feature Influence

Based on the analysis in Figure 9, it appears that the answer tends to fall on option number 3, followed by the number 4 and number 5. From the percentage using Likert calculations can be concluded that 71.3% of respondents are motivated by the achievement features.

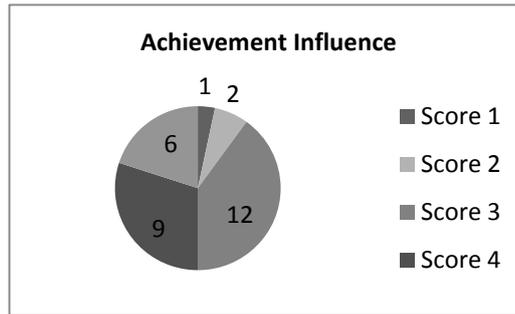


Figure 9. Achievement Influence Chart

#### 7. Point and Reward Feature Influence

Using the same calculation with the previous two influences, the questionnaire also included questions about the influence of point and reward feature using the Likert scale. Calculation Results can be seen in Figure 10. After calculating the percentage, obtained 88.66% respondent motivated. From the results of the percentage that fell at intervals of 80%-100% it can be concluded that the respondents feel very motivated by the feature of point and reward. This feature is giving the highest influence rate. It is most likely due to the instant benefit received by the respondents when achieving a certain milestones. It can be said that by giving a certain reward or recognition to student in their study give the highest influence to their motivations.

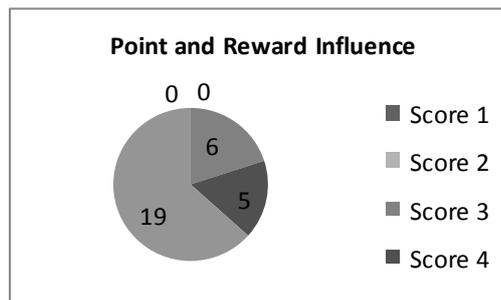


Figure 10. Point and Reward Influence Chart

#### 8. Leaderboard Feature Influence

The questionnaire also included questions about the influence of the leaderboard features using a Likert scale. The percentage level is 74% of the respondents found motivated. Based on the percentage value can be concluded that leaderboard feature has quite an effect on student motivation, although not maximal. Results of calculation can be seen in Figure 11.

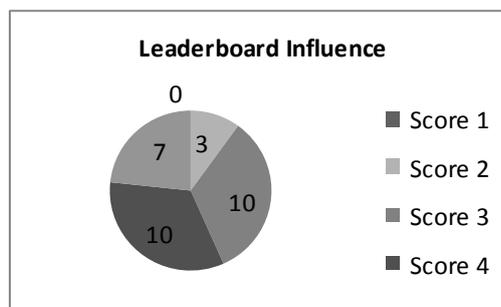


Figure 11. Leaderboard Influence Chart

#### 9. Social Feature Influence

The questionnaire also included questions about the influence of social features using a Likert scale. Based on the analysis results, it was obtained that 70.06% of respondents were motivated. Results of calculation can be seen in Figure 15. This feature give the lowest result and most likely is due to limited social system and short testing period making the feature is less exposed to the respondents.

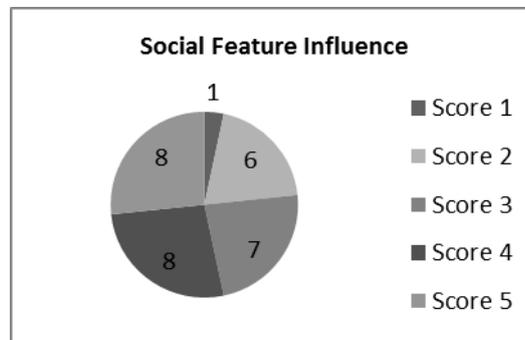


Figure 12. Social Feature Influence Chart

#### 10. Data Correlation

Comparing the result data on Figure 7 with individual feature influence level, the influence ranking of the features has the same ordering. Point and reward feature has the highest influence with 108 point in feature comparison and 88.66% of influence to the audience, while the social feature has the lowest rank with 51 point in the feature comparison and 70.06% of influence. This is most likely due to the short testing time been taken in the experiment.

#### 11. Discussion

In contrast with other research of gamification in education that bring negative result [15], in our finding the most influential feature is the reward feature. While in their research [15] Hanus and Fox highlight that Gamified systems that strongly featuring rewards may have negative effects on the long run, our research actually give different results. This might due to difference in culture of the respondent and the fact that our test duration is short term. But from this we can conclude that reward feature still can give positive result to audience and that a further research might be necessary.

Similar with other research in western education system [16],[17], we found that gamification is also correlated with participation in voluntary activities and assignments in local education system of Indonesia. Though this time we yet to research the correlation between gamification with the passing students, other research have concluded that higher motivation relate to higher education score and achievement [4],[5]. Based on that fact, gamification seems to be giving positive effect on student score and achievement too.

While the research results give positive effects, the result is heavily relate with the context where the gamification method is implemented into, in this case an academic information system and its respondents. As stated in the conclusion made by Hamari et al. [6] we agree that the result is very dependent with our test case. As such, the age group of the respondents has a huge effect on the result given. We believed that our respondents which ranged in age group of 19-23 can have the most positive effects in gamification. Similarly other researcher also stated in his research that the effect of gamification is decline with age [17]. Although the research gives a positive result, it is still a fact that the gamification system effects may vary from person to person. As such just like what stated by Dicheva et al. [18], more empirical research might be needed to accurately determine the effect of gamification.

## 5. CONCLUSION

Based on the results of this study, it can be concluded that the application of academic information system with gamification method has been successfully designed and built. It is also concluded that the gamification features applied could motivate the students, while the effect is not significant. Only one of the features that have a significant impact which is 'point and reward' feature. This is presumably because the space scope is too broad therefore the applications built could not deliver maximum results. Through our finding, gamification seems to match naturally with younger generation lifestyle thus creating a positive effect in their education.

In addition, through this research we found that gamification is also correlated with participation in voluntary activities and assignments in local education system of Indonesia. Based on that fact, we conclude that gamification seems to be giving positive effect on student score and achievement too.

Further research should improve implemented game elements, changing the design of the display to make it more resembles a game and add more interesting features. It is also recommended to develop applications with gamification method which is more focused, such as the application of learning in a certain subject. Another research to further develop the gamified academic information system to campus information system also could be done.

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