

Gamification in Education: Innovative Solutions through Learning System Development to Increase Student Motivation and Interest

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ABSTRAK

Gamification in education is an innovative solution to increase student motivation and engagement. This research aims to develop an interesting and interactive gamification-based learning system. The method used is Feature Driven Development (FDD), which supports application development in stages and iteratively. With FDD, features such as points, levels, challenges and rewards are integrated into the application, allowing for adaptation to evolving needs. The research results show that the application of gamification in e-learning has succeeded in increasing student interest and participation. Through leaderboards and badges, students are encouraged to compete and achieve achievements. Interactive narratives at each level and quest features strengthen students' emotional involvement in learning. In addition, gamification overcomes the shortcomings of traditional learning methods which are often monotonous. The implementation of gamification creates a learning experience that is both fun and challenging. Students are more motivated to complete learning assignments and actively participate in class discussions.

ABSTRACT

Gamifikasi dalam pendidikan merupakan solusi inovatif untuk meningkatkan motivasi dan keterlibatan siswa. Penelitian ini bertujuan untuk mengembangkan sistem pembelajaran berbasis gamifikasi yang menarik dan interaktif. Metode yang digunakan adalah Feature Driven Development (FDD) yang mendukung pengembangan aplikasi secara bertahap dan iteratif. Dengan FDD, fitur-fitur seperti poin, level, tantangan, dan hadiah diintegrasikan ke dalam aplikasi, sehingga memungkinkan adaptasi terhadap kebutuhan yang terus berkembang. Hasil penelitian menunjukkan bahwa penerapan gamifikasi dalam e-learning berhasil meningkatkan minat dan partisipasi siswa. Melalui leaderboard dan badge, siswa didorong untuk berkompetisi dan meraih prestasi. Narasi interaktif di setiap level dan fitur quest memperkuat keterlibatan emosional siswa dalam pembelajaran. Selain itu, gamifikasi mengatasi kekurangan metode pembelajaran tradisional yang seringkali monoton. Penerapan gamifikasi menciptakan pengalaman belajar yang menyenangkan sekaligus menantang. Siswa lebih termotivasi untuk menyelesaikan tugas belajar dan berpartisipasi aktif dalam diskusi kelas.

PENDAHULUAN

Gamification is the use of game design elements in a non-game context. Gamification provides positive benefits in the field of education, namely increased motivation and involvement (active role [1]) of participants in gamified learning activities. These benefits are accompanied by increased student scores. These positive benefits are an attraction to make gamification an option in managing class/lecture activities. Implementing gamification requires careful, thorough and flexible planning. Technology is developing very quickly [2], Mobile Marketing Association (MMA), in a study published on [www.tek.id](#) in October 2018, stated that the number of mobile gamers in Indonesia reached 60 million. This is due to the ease of distribution of games that are now not only available on consoles, but also on smartphones and tablets, so that various types of games can be accessed and played easily by the public. Playing games has become a routine activity for people from all walks of life, both men and women, and of all ages.

The study shows that 25% of the activities done through smartphones are gaming, with an average duration of 53 minutes per day. Other activities include social media (17%), watching streaming videos (12%), browsing (10%), and online shopping (7%). Interestingly, mobile gamers are not only dominated by men, as 51% of mobile gamers are female, while the remaining 49% are male.

This shows that the popularity of mobile gaming is expanding among women. In terms of age, it is not only young people who are interested in gaming. Studies show that a quarter of the total gamers are

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in the age range of 16-24 years and 25-34 years, with a percentage of 27% each. While 24% of gamers are 35-44 years old, and another 17% come from the 45-54 age group. In addition, 56% of mothers with children under the age of 10 also play mobile games frequently. These findings indicate that mobile games have great potential as an advertising platform because they are able to reach various demographic groups. According to Park and Bae (2014), gamification is a new trend that applies game elements, such as points, levels, rankings, and rewards, to non-game contexts. The beauty of gamification is that it rewards the achievement of a specific task or goal. These elements such as points, leveling up, and ranking can motivate both internally and externally, and increase participation in various activities [3].

Gamification in Education

Gamification in learning is not [4] a new idea. The use of game elements in learning contexts has been going on for a long time. However, with advances in technology and a deeper understanding of student motivation and engagement, gamification has received greater attention in recent years. The rationale for gamification in learning arises from the notion that traditional learning methods often lack appeal to students. Many students feel bored, unmotivated and do not see the connection between the subject matter and their daily lives. This can hinder effective learning and reduce understanding and retention of the information taught (Almeida et al., 2023).

By utilizing game features, such as points, levels, challenges and rewards, gamification aims to increase learner engagement in learning. This approach is based on the premise that games can trigger positive emotions, such as excitement, engagement and achievement, which can increase learners' intrinsic motivation. In addition, gamification also utilizes psychological principles. Utilizing gamification in learning requires using strategies such as game mechanics, aesthetics, and game thinking to engage people, provide encouragement and motivation, and learn to solve problems [5].

Benefits of Gamification

According to Jusuf (2016), gamification learning model has several advantages compared to other learning models, including: (1) The learning process becomes more fun; (2) Encourages students to complete their learning activities; (3) Helps students focus and understand the material being studied; (4) Provides opportunities for students to compete, explore, and achieve in the classroom.

METHOD

Type, nature and research approach

This research uses the Feature Driven Development (FDD) method as an approach to application development. FDD, as described by Palmer and Felsing (2001), consists of five sequential stages that must be passed during the system design and development process. These stages include activities that gradually clarify the needs of the system and ensure every feature developed works properly. One of the advantages of this method is its iterative nature, where the design and development process can be done iteratively. This iterative process is in line with Agile principles, which allow developers to quickly respond to changing needs and dynamic business requirements. In application development, changes often occur along with technological developments or changing user needs, so this method is considered very flexible and adaptive.

Because the application to be built has several features that will be integrated with gamification concepts such as points, levels, challenges, and awards, the author feels that the Feature Driven Development approach is very suitable. With FDD, application development is focused on the specific features to be added to the system, which will help make the application more interesting and interactive. Therefore, this method was chosen because it is able to support the development of gamification features in an organized and efficient manner, ensuring each feature is prioritized and thoroughly tested before being implemented into the application.

Implementation

In the implementation, the developer's task is divided into two, front-end and back-end. The method used in the implementation of back-end development is Feature Driven Development. There are several stages in the implementation of Feature Driven Development: The following stages are in Feature Driven Development (FDD), namely: (1) Build an Overall Model; (2) Build a Feature List; (3) Plan by Features; (4) Design by Feature; (5) Build by Feature.

The simple and iterative process makes Feature Driven Development suitable for use in making Learning System Development to Increase Student Motivation and Interest, especially in developing and implementing features [6].

Stages of gamification design

Gamification Design Stages in the Article "Gamification in Education: Innovative Solutions through Learning System Development to Increase Student Motivation and Interest"

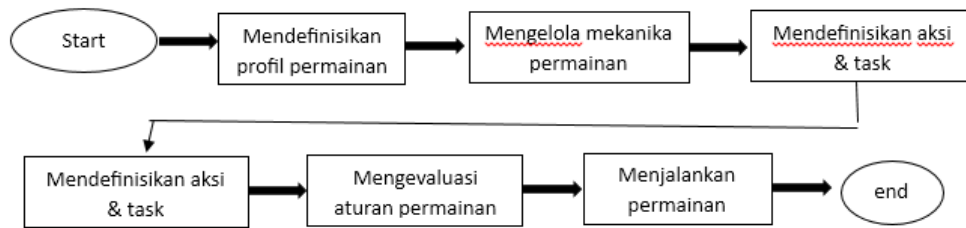


Figure 1. Flow of Design Stages

In the stage of selecting game mechanics, the game selects the game mechanics to be used. The game mechanics that have been selected will be activated and can be defined in more detail at the stage of configuring game mechanics. The stage of defining actions and tasks is carried out by defining the actions and sets of actions that will be assessed in the game. In the next stage, the actions and tasks that have been defined by the platform will be scanned and inserted into the game rule template. The result of this process is the game rules. The game master can then evaluate the game rules by adding, subtracting or modifying the rules. After all the game rules can function properly the game can be run.

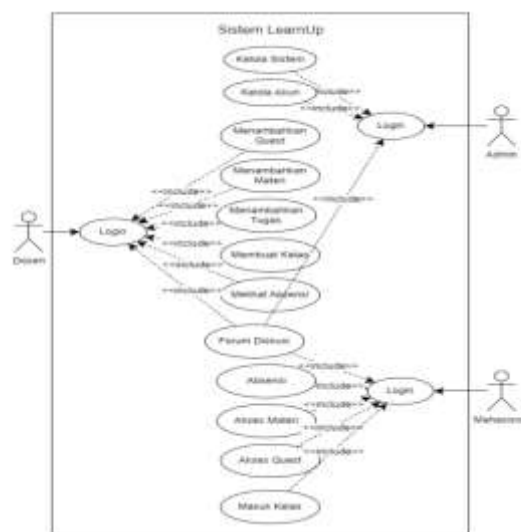
Game rules

Game rules use the principle of if-then rules. The representation of game rules follows the format specified in the Domain Specific Language (DSL) of the Nools library (<https://github.com/C2FO/nools>). Actions and tasks are the basis for creating game rules. In the premise part, some properties of the action and task entities are taken as comparison data such as game code, and action/task code. In the conclusion part, the point or reward property is taken to be used as input in the process of updating the player's points and rewards in the game. With this principle, actions and tasks that have been defined by the system can be auto-generated into game rules by providing default templates.

RESULT AND DISCUSSIONS

Use Case

The diagram shown is a Use Case Diagram of the system showing how actors interact with system features. There are three main actors namely Admin, Lecturer, and Student. All actors must go through the Login process before accessing other features. Admin actors have the authority to manage accounts and systems, while Lecturers can add quests, materials, assignments, create classes, view attendance, and engage in discussion forums. All lecturer features are interconnected with include dependencies, which indicates that the features require a login process and are interrelated with each other. Students, after logging in, can access quests, materials, attendance, as well as discussion forums, enter classes, and take attendance.





After entering the selected quest, users will face “enemies” in the form of questions, with a limit on errors in answering these questions [7]

Leaderboard



Leaderboard serves as a tool to display the ranking of score achievements between players. This feature is designed to motivate players to continue to be encouraged and feel challenged to be the best among other players [7]

Narrative



The narrative in this e-learning gamification is designed interactively at each stage of the level that the user goes through. With the narrative, the learning process becomes more interesting and immersive, creating a more enjoyable learning experience and motivating users to continue to the next level [7]

Badges



Badges are designed to reward students for certain achievements during the learning process. Their main purpose is to increase student motivation and engagement. Each badge represents a specific achievement, such as completing an assignment, participating in a class, or participating in a class.

The application of gamification in e-learning has been proven effective in increasing learning motivation and student interaction. Gamification successfully overcomes various shortcomings of e-learning usually by creating a more interesting, interactive, and fun learning environment [7]

The application of gamification in e-learning also aims to create a more interactive, fun, and motivating learning experience for students. By utilizing game design additions such as points, badges, challenges, and leaderboards, gamification makes learning more engaging and encourages active participation. Users can feel the element of competition and reward, which increases their motivation to complete learning tasks. In addition, gamification also helps overcome weaknesses in traditional e-learning, such as lack of engagement and motivation. The concept allows students to learn in a more dynamic way, spurring their emotional and intellectual engagement in the learning process [8]

This approach makes learning more interesting, interactive and relevant, so that students are more actively involved in the learning process. Gamification also encourages independent learning, collaboration, and creativity, and provides immediate feedback that helps improve their overall understanding [4]

Gamification helps students develop accuracy and enhances the learning experience, especially for individuals with introverted personalities or low levels of openness and agreeableness. Gamification has also been shown to create a more interactive and engaging environment, although results may vary based on learners' personal characteristics [9]

CONCLUSION

The application of gamification in education has proven to be an innovative solution that can increase student motivation and interest in the learning process. Through the use of game elements such as points, levels, challenges and rewards, gamification not only creates a more engaging learning environment, but also overcomes the shortcomings often found in traditional learning methods that tend to be monotonous. This research shows that by utilizing gamification features, students can be actively engaged, feel challenged, and gain a more immersive and enjoyable learning experience. In addition, the competition mechanism introduced through leaderboards and badges provides extra encouragement for students to achieve and complete their assignments better. In short, gamification has proven to be effective in increasing participation and academic achievement, making it an invaluable tool in the modern education system.

To maximize the effectiveness of gamification in education, it is recommended that educational institutions conduct training for lecturers and curriculum developers in designing and implementing gamification features effectively. In addition, it is important to conduct regular evaluations of the gamification application to adapt to the evolving needs of students and ensure that the learning content remains relevant and engaging. The development of gamification applications should also pay attention to feedback from users to improve the learning experience and overcome potential barriers that arise.

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