Developing Web Based Grammar Learning Application Using Gamification Method and UX Design

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Abstract: Currently, an effective and efficient learning approach is needed to teach English education to students in order to face the era of globalization. Especially in Indonesia, this ability has been taught to students, especially students since they were at the elementary school level. However, based on the facts, most students' English skills are still below the standard. Therefore, this study builds a game-based learning approach. According to the survey, the TOEFL score in the grammar section is the lowest compared to reading or listening. Learning applications are still monotonous, such as there are only a collection of questions and several other supporting elements. In addition, currently learning applications are also less interactive with users, therefore I use the gamification method and UX Design approach to develop a website-based application that can help users interact with the application so that it can motivate them to learn grammar. Some of the elements that are applied are grades or scores, levels, difficulty levels, etc. Not only that this application is also implemented and tested on users. From the test results, users provide positive feedback on the development of this application. So that the development of this game-based application can increase user interest in learning English grammar in the future.

1 INTRODUCTION

The rapid and significant development of technology has made humans inseparable from technology. Technology has helped humans to ease their work and busyness. For example, the use of television technology that helps in obtaining information, transportation technology to help users move places, and one of the technologies that affect humans in facilitating their work is information technology. Information technology has now been used by all circles of society, for example in the form of using applications on computer and mobile devices (Yunanto, Herumurti, & Kuswardayan, 2018).

In connection with this information technology, there are many applications that are available in various sources such as on the marketplace. Various applications have also been developed by developers such as bitdegree.com and progate.com. Some of these existing applications have their own purposes, for example for entertainment (Yunanto, Herumurti, Kuswadayan, Hariadi, & Rochimah, 2019), health and education or learning (Andhik Ampuh Yunanto,

2021). One of the important roles of technology in education is to create media. Information technology also supports individual learning, collaborative, content management, activity management, formal, informal, and work (Yunanto, Herumurti, Kuswadayan, & Rochimah, 2018). One of the most common educational systems supported by information technology is E-learning.

However, the increasing number of learning applications or e-learning systems that are currently rampant tend to have monotonous content. Based on observations on the Google Playstore, educational themed applications have a lower number of downloads compared to other themed applications. One application that is very popular with young people today is a game-based application (Yunanto & Rochimah, 2017).

Because of this, many game developers and researchers use games for certain purposes other than as a medium of entertainment. One of the popular topics among researchers is about utilizing the latest technology, games, and education. Many recent studies have reported the benefits of educational-

based computer games in promoting students' motivation to learn (Herumurti, Kuswardayan, Khotimah, Yunanto, & Yusuf, 2019). Digital game-based learning has been considered as a very potential issue among various approaches in the development of learning technology (Herumurti, Yuniarti, Rimawan, & Yunanto, 2019). In addition, the games being developed today also apply modern technologies such as artificial intelligence, computational intelligence, text processing, virtual reality, and game simulation (Kuswadayan, et al., 2019).

Since the era of globalization that has engulfed the world because of the importance of English as an international language, interactions between countries have become more open and freer. For this reason, the ability of foreign languages such as English is one of the skills that must be possessed by everyone, especially college graduates. However, based on existing surveys, the English language skills possessed by most students are still very minimal and lacking. This can be seen from the results of the TOEFL test that has been followed by students where the scores obtained tend to be below the standard. For example, a survey of new students who took the TOEFL test tended to score below the 477 marks by more than 70%. Not only that, not a few final year students also find it very difficult to complete the graduation requirements because of the failure of the TOEFL test. So that most students fail to graduate for this reason. This is a very basic problem and must be resolved in Indonesia (Yunanto, Herumurti, Rochimah, & Kuswardayan, 2019).

From the description above, it shows that currently an effective and efficient learning approach is needed to teach English education to students in order to face the era of globalization. Therefore, this study builds a game-based learning approach. Because according to the survey, the TOEFL score in the grammar section is the least compared to reading or listening. So this research focuses on developing game-based English grammar learning applications. The research aims to improve the user's ability to master English grammar in a more enjoyable way. This research is also useful for students in helping to do the TOEFL test, especially for grammar material.

2 THEORETICAL BASIS

From the introduction that has been presented previously, it can be concluded that the problem domain raised in this study is the lack of students' ability in English, especially TOEFL grammar and

the number of English learning applications that are still monotonous.

Based on the problems that have been described, it can be seen that Indonesia needs to improve its English language skills. Therefore, an English learning application will be developed using a gamification and UX Design approach. The concept of gamification is expected to increase students' motivation and commitment in continuing to hone their ability to learn English, especially TOEFL grammar. This research is to combine educational elements and game elements in an application. Furthermore, the hope of this research is that an approach like this can help develop learning applications, especially English so that they become more attractive to use by users.

2.1 Related Research

2.1.1 Development of Game-Based English Grammar Learning Applications (Yunanto, Herumurti, Kuswadayan, & Rochimah, 2018)

This research builds a game-based learning approach. This research focuses on developing game-based English grammar learning applications. The research aims to improve the user's ability to master English grammar in a more enjoyable way. This research is also useful for students in helping to do the TOEFL test, especially for grammar material.

2.1.2 Application of Game Elements in the Development of English Learning Applications (Yunanto, Herumurti, Rochimah, & Kuswardayan, 2019)

This research proposes an approach, namely the application of game elements in learning applications. Some of the elements that are applied are the value or score, level, level of difficulty, main character, enemy character, feedback results, and so on. All of these elements are expected to form a fun element so that it can increase user interest. And this research still focuses on one case study, namely learning English Grammar. So the main thing to do in this research is to combine educational elements and game elements in an application. Furthermore, the hope of this research is that an approach like this can help develop learning applications, especially English so that they become more attractive to use by users.

2.1.3 Development of an English Learning System Using a Gamification Approach (Pambudi, Bachtiar, & Pradana, 2019)

This study discusses the development of a Java programming learning system. This research applies the concept of gamification as an effort to increase students' interest in learning Java programming. The concept of gamification is applied to the Java programming learning system to increase student motivation in learning and continuing to practice.

Subsequent research that becomes a reference in this study discusses the analysis of checking vocabulary and spelling in case studies of Indonesian texts. This study examines the development of a system that is useful for checking grammar and spell errors in writing Indonesian texts.

2.1.4 Application of Gamification Concept in Web-Based English Tenses Learning (Kariko & Ayuningtyas, 2021)

Researchers want to develop learning English tenses with the concept of gamification where learning is as if playing a game so that it feels fun and not boring. A learning that uses internet electronic technology so that anyone who needs it can access it from wherever he is. Henry thinks that e-learning is bad and boring, even though the content is good and we admit that the knowledge in it is useful. The practical answer is that the majority of e-learning is currently unable to attract the attention, interest, or full involvement of its participants. Therefore, researchers will apply gamification in English tenses learning websites so that electronic learning (e-learning) is no longer bad and boring.

3 METHODOLOGY

3.1 UX Design

User Experience Design or what is commonly called UX Design is the process of increasing user satisfaction (application users, website visitors) in increasing the usability and enjoyment provided in interactions between users and products (Hiererra, Meyliana, Ramadhan, & Purnomo, 2022).

In creating a User Experience (UX) project, process steps must be carried out in order to produce a tested and reliable result. The process used and the resulting document may vary from project/company to one another. Companies may follow different design and development methodologies. The discussion in this article will explain the stages of the

User Experience (UX) Design Process in general. The process stages in the UX Design Process in general are as shown in the chart below:
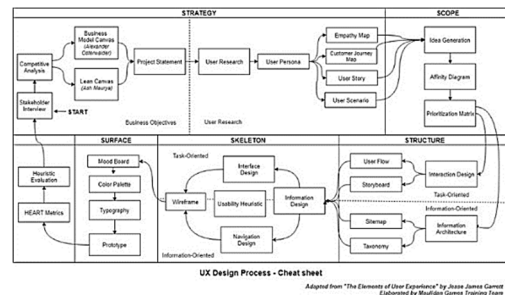

Figure 1: UX Design Process.

3.2 Gamification

Nick Pelling first used the term gamification in 2002 in a TED presentation. Gamification is a learning approach using elements in games or video games with the aim of motivating students in the learning process and maximizing feelings of enjoyment and engagement with the learning process, besides that this media can be used to capture things that interest students and inspire them. to continue learning.

Gamification is using game mechanics to provide practical solutions by building specific group engagement. In more detail define gamification as a concept that uses game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning and solve problems. Glover concludes that gamification provides additional motivation to ensure that learners (learners) participate in complete learning activities.

3.3 System Diagram

Iterative and incremental development is a process that combines iterative design methods with an incremental build model. It is used by software developers to help manage projects. Iterative and incremental development models are complementary, which is why these processes are often used to achieve project outcomes. The following is an iterative and incremental development process:
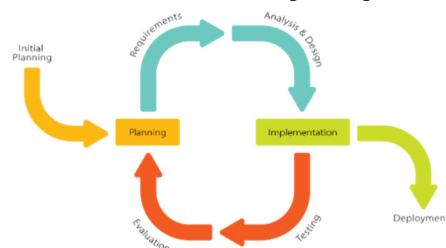

Figure 2: Iterative and Incremental Development.

The first stage is Initial Planning by conducting a literature study on the methods used in the applications made and conducting competitor analysis.

The second stage is Planning by conducting feasibility and interviews, observations, Quesener. If at the Feasibility stage the results are good, then go straight to the investigation stage and a form is given to the client to record the client's needs. In the investigation system, it can be in the form of interviews, questionnaires or observations. In this stage, the first thing to do is to provide a form to the user that is used to find out the user's request, then Requirements, namely after the problem is successfully understood, the developer describes it in the form of a document specification document. This specification contains the features and functions desired by the customer, and does not discuss the development method at all.

The third stage is Analysis & Design, namely analyzing what technology is used, analyzing the information obtained in the planning stage, and designing applications such as prototype design, application database design, then implementation, namely the stage of writing programs that have been analyzed and designed.

The next stage is application deployment, then testing the user, if there is feedback from the user, an evaluation will be carried out.
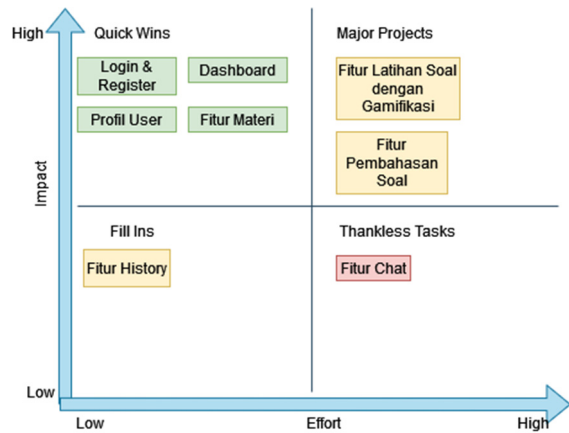
4 EXPERIMENTAL RESULT AND ANALYSIS

4.1 Requirements (First Iteration)

In this process determine what the software or application should be and what requirements are needed to run it. In addition, determining the resources needed to build the project such as a team or software support in the application development process. In the system to be built, the required requirement is the preparation of a framework that can support development.
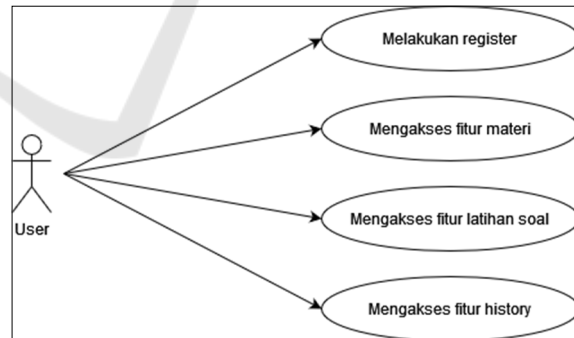
4.1.1 Prioritize Matrix

Grouping features that have been designed based on priorities to be more productive and help to form more effective time management.

Quick wins is a quadrant that requires light effort but the impact of the results is enormous. In this quadrant there are login & register features, dashboards, user profiles and material features. Major

Figure 3: Prioritize Matrix.

projects are a quadrant that contains tasks that have a large impact on results, but the effort is also not easy. In this quadrant there are features of discussion of questions with gamification and features of discussion of questions.

Fill ins is a quadrant with light work effort and the result is also light. In this quadrant there is a history feature. Thankless Tasks is part of the quadrant whose effort is heavy because it is not worth the small results. In this quadrant there is a chat feature.

4.1.2 Use Case

The following is a use case diagram of the application to be made:

Figure 4: Use Case Diagram.

The picture above describes the use case diagram of the application to be made. There is one role, namely student. The following is an explanation of the use case above:

- Register

    Students register first because they do not have an account.

- Access material features

  Students can study material that is already available on the EduMar application.

- Access the practice questions feature

  Students can work on a package of questions and test questions that are already available on the EduMar application.

- Access the history feature

  Students can see the scores obtained, the practice questions that have been done, the material that has been studied and the points that have been obtained.

4.1.3 Sitemap Website EduMar

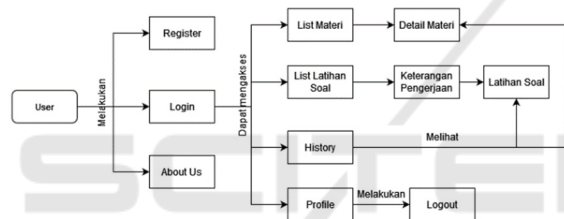The following is a website sitemap to explain the application flow if used:

Figure 5: Sitemap Website EduMar.

When opening the application for the first time, the user will see a dashboard display with a menu in the upper right corner, namely about us, login and register. When the user does not have an account, register first by entering the full name, email and password, if so, you can login. After logging in, there is a menu in the upper right corner, namely material, practice questions, history and profile. On the material menu there are several lists of materials that are already available and when the title is clicked it will go to the next page, namely material details.

In the practice menu there are two categories of practice questions, namely structure and written expression, each category has 3 question packages, each package contains 10 questions that must be done, when package 1 has not been completed, the next package is not open. Next, if you click on package 1, you will go to the work description page where there is a choice of a back button and a start button, if you want to start, click the start button, then questions that must be done will appear. If the answer is correct then the score will increase, otherwise if the answer is wrong then the score will not increase and

discussion of questions will appear. In the history menu there are values that have been obtained, points that have been achieved, the total material that has been studied, and the total practice questions that have been done. In the profile menu, there is information for the account that has been registered, namely in the form of full name and email and there is a logout button.

4.1.4 ERD (Entity Relationship Diagram)

The following is an ERD or database design that will be applied to the EduMar application:
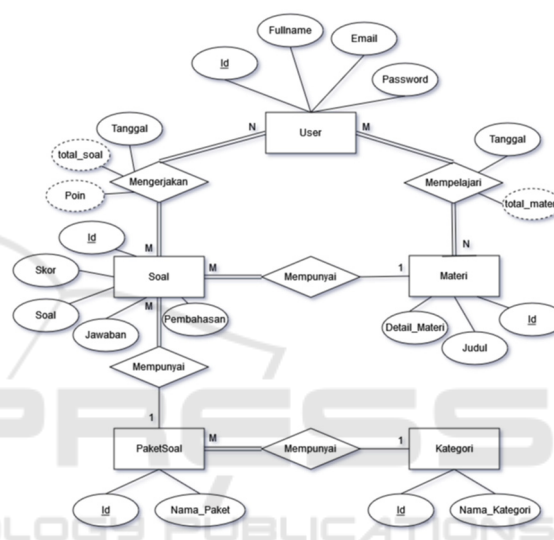

Figure 6: ERD application.

In Figure 6 there are 5 entities including users, materials, questions, package questions, and categories with each entity having several attributes. In the user entity, there are id, fullname, email and password attributes. The question entity has id attributes, questions, answers, discussions and scores. The question package entity has an id and package name attribute. Category entities have id attributes and category names, while material entities have id, title and material details attributes.

In addition, there are connected relationships between existing entities. User entities have many to many relationships with question and material entities with each relationship having a date attribute to record the log and there are derived attributes, namely total questions, total material and points, while question entities with material entities have a many to one relationship. The question entity has a many to one relationship to the question package entity, while the question package entity has a many to one relationship to the category entity.

4.1.5 PDM (Physical Data Model)

The following is a PDM or database model that will be applied to the EduMar application:
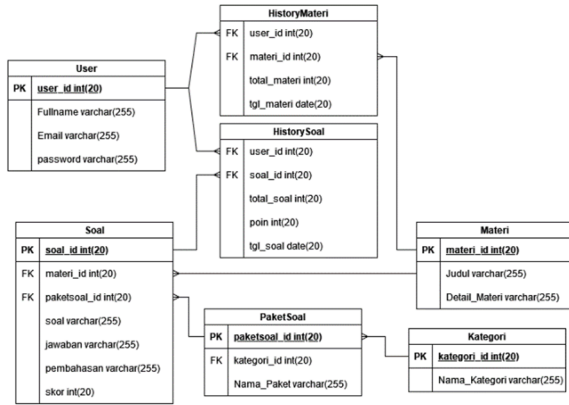

Figure 7: PDM EduMar application.

In Figure 7 there are 7 tables with the following explanation:

- In the user table there is a user_id with type int as the primary key, as well as full name, email, and password with type varchar.

- In the material table, there is materi_id with type int as the primary key, as well as title and detail_material with type varchar.

- There is a new table that will appear when the transaction is made, namely 2 history tables, namely the question history table and the material history. In the history table, there are user_id and question_id with type int as foreign key, total_hasil and points with type int, and tgl_hasil with type date.

- In the material history table, there are user_id and materi_id with type int as a foreign key, total_material with type int, and tgl_material with type date.

- In the question table, there are questions_id with type int as the primary key, material_id and packets_id with type int as a foreign key, questions, answers, and discussions with type varchar, and scores with type int.

- In the question package table, there is a package_id with type int as the primary key, category_id with type int as a foreign key, and package_name with type varchar.

- In the category table there is category_id with type int as the primary key, and category_name with type varchar.

4.1.6 Prototype

Designing a system schema that forms the model and standard size or scalability that will be worked on later. As well as adapting to the initial needs of software development to find out some of the features and functions that have been previously. So as to be able to find errors early before implementing and releasing the product as a whole. The following is the prototype of the edumar application in Figure 8 and Figure 9.
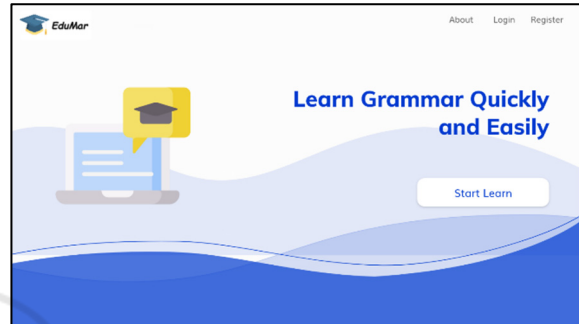

Figure 8: Landing Page.

Figure 9: About Us Page.

4.1.7 Gamification

This study applies gamification elements including values or scores, rewards and challenges. The application of this element will be placed throughout the system with the aim of increasing user interest in learning TOEFL grammar at Edumar.

- Points

  The first element is point. The point in question is the value obtained by the user. points can increase systematically as long as the user learns the material and works on a package of questions. The more points the user gets, it means that he has understood the material being studied.

The point system that will be used in this application is Experience Point. Experience Point is a point that shows the user has had a lot of understanding of the material being studied, as well as working on a package of questions in the application according to the number of points. This point will affect the user's reward so that to get a reward, you must have enough points.

- Rewards

The second element is reward. The reward is in the form of a total of all points earned. The rewards obtained are used to determine the user's progress, the faster the user collects points, the higher the reward criteria that have been determined by the system. In addition, the system will provide profile points for each user to complete the package of questions and test questions that are already available. Each package of questions and test questions will have different points depending on how the user answers the available questions. This point can be used as a reward or reward for the user which can be used to unlock items. Each item has a different cost point. The items referred to are as follows.

Table 1: Reward Conditions.

No	Nama	Deskripsi	Item
1	Beginner	Collect 50 points	Can do test questions
2	Intermediate	Collect 150 points	Get the link of the learning video
3	Advanced	Collect ≥300 points	Get toefl book link to donwload

- *Challenge*

The third element is challenge. Challenge is an activity in the application that can make users feel challenged to go further into the application. Challenges can be many when the user has started to bond with the application. The challenge in question is in the form of test questions that are already available on the practice questions menu. There are 30 questions in this test which will be answered by the user. This test question will open if the user has worked on the available question packages and collected the points described above. The test questions given are in the form of a collection of questions with material that has been studied and questions that have been done before

4.2 Implementation (Second Iteration)

After the prototype is complete and the results show that it is acceptable, the next stage is implementation or development. At this stage, the Edumar system will be built where the architecture is shown in Figure 10.
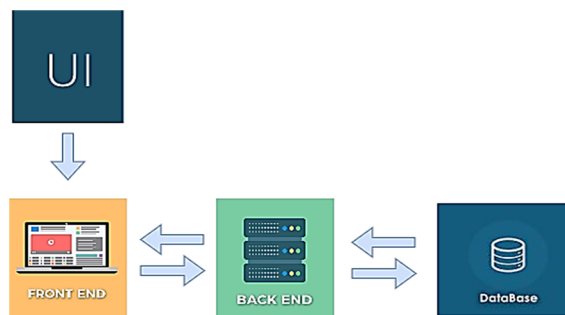

Figure 10: Implementation Design.

The first stage carried out the implementation of the frontend. In this process is the implementation of the final test results into the frontend view of the application. For this research, the implementation phase will be carried out using the React JS framework. After completing the frontend, proceed to implement the backend which uses Laravel. Some of the APIs that will be built are CRUD for user data, material data, practice questions and history data.

Furthermore, the process of collecting practice questions and discussions has been carried out, namely looking for references to TOEFL books such as Longman books, Kaplan TOEFL books and looking for other TOEFL book references. Each question will be entered in the system along with the answer. Discussion of the questions in the form of correct answers and a brief discussion of the grammar formulas in the questions. The next stage is to create a database to store the CRUD data set that has been created on the backend.

5 CONCLUSION

This final project aims to make it easier for students to learn English grammar with UX design and gamification methods. In this application there are material features, practice questions and history. The material available is in the form of grammar material, as well as practice questions taken from TOEFL questions which are presented with scores and discussion of questions. In this application there are elements of gamification, namely points, rewards and challenges. The first element is point, the point in question is the value obtained by the user. The second

element is in the form of a reward, the reward is in the form of a total of all points earned. The rewards obtained are used to determine the user's progress, the faster the user collects points, the higher the reward criteria that have been determined by the system. The third element is challenge, Challenge is an activity in the application that can make users feel challenged to go further into the application. Challenges can be many when the user has started to bond with the application.

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