Design and Development Bineka: A Platformer 2D Game for Learning Indonesian Language

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Abstract

In this era, the usage of game-based language learning is common. This is caused by the habits of students who are curious about the existence of games in their daily lives. This study outlines the procedures and methodology for designing and developing 2D game platforms for Indonesian language instruction. The problem-defining, genre-designing, theme-designing, gameplay-designing, and game-functionality-testing phases of this game's development. During the early stages of development of a 2D platformer game for Indonesian language study, positive findings were obtained.

Keywords
Game design and development, platformer 2D game, Indonesian language learning.

1. Introduction
In order to adapt to the digital environment, instructors must be creative. One way to accomplish this is through the gamification of learning. It is expected that gamification will motivate students to study. Point accumulation is an important aspect of the game. The accumulation of these points will impact their motivation and commitment. However, gamification must take learning objectives into account. In order to provide successful learning outcomes, a smart gamification design focuses on the needs and characteristics of the user (Dinata 2021).

University students are required to take an Indonesian course. To yet, however, there has been no game-based support for learning Indonesian MKUD. This work aims to develop a prototype for gamification of MKUD in Indonesian universities. This will inspire students to study Indonesian. In order to boost student engagement in learning and make it more pleasurable without their understanding, the most important part of gamification is having the correct concept and clear objectives (Heni 2016). Additionally, students can assess their language skills.

Indonesian is considered a challenging topic. Students struggle with linguistic competence, subcompetence structure (61.07%), and vocabulary (52.6%); listening competence (41.88%), speaking (18.89%), reading (21.15%), and writing (20.02%); and good literature at the level of information (45.69%), concept (40.9%), perspective (41.74%), and appreciation (47.1%) (Basuki, Suryani, and Setiadi 2017). Researchers predict that by the use of gamification, students would be able to overcome problems in learning Indonesian. Especially with the use of spelling, which takes a better comprehension.

At least three elements must be considered when applying gamification: (1) student learning demands, (2) alignment with learning objectives, and (3) teacher creativity in designing it.
First, a student's educational requirements. Based on the initial needs analysis, the Basic Indonesian General Course does not feature gaming. In fact, gamification is equally necessary for students learning a foreign language. Second, the content provided through gamification must correspond with the learning objectives. The purpose of learning objectives is to help students realize their full educational potential. The learning objectives will be useless if the gamification is ineffective; hence, the construction

of the gaming approach requires the suitable mechanism (Kiryakova, Angelova, and Yordanova 2014). Thirdly, the instructor's originality in creating it. Teachers can express their creativity through gamification based on games. According to the first needs analysis, the Indonesian course has no gamification depicting Indonesian culture (Yildirim 2017). Therefore, the researchers designed a gamification prototype with an Indonesian-culture-based theme. The gamification's topics and characters highlight this point.

There are five studies related to gamification. First, the application of gamification in Chilean mathematics instruction. Conectaldeas, an integrated mathematics program, was able to increase mathematics learning by 0.27 standard deviations (Araya et al. 2019). According to the study's findings, students are also more motivated to learn mathematics when utilizing computers. Second, the Faculty of Education's use of gamification for students in 2014 (Ding and Shen 2020). The results demonstrated that pupils responded positively to the application of gamification. In addition, the most notable gamification aspects are logical processes, emotions, progression systems, accomplishment points, and badges. Third, the application of gamification to Engineering Department students. The results indicated that gamified learning received a more positive response than standard learning (Kasinathan et al. 2018). Fourth, the use of gamification in English-language classes. According to research, gamification can give motivating elements that improve students' enthusiasm to work on difficulties, particularly in the grammar section (Redjeki and Muhajir 2021). Fifth, the application of gamification to Software Engineering Department students. The results of this study are as follows: 1) the attendance rate on the use of online learning-assisted gamification learning models in the online RPL program reached 98.28 percent; 2) the pretest and posttest scores increased by 15.82 points from 66.38 to 82.12; and 3) there are four social skills that become nurturant effects, namely: 1) expressing opinions, 2) clarifying ideas, 3) criticizing non-individual ideas (Criticizing An Idea, Not a, Not a Person) and 4) expressing reasons (Rusmaini, Sesriyani, L. Anwar 2021).

2. Literature Review

Gamification in Language Learning

The application of gamification to language learning. Five research demonstrate that gamification is utilized to facilitate learning. Teachers of English must be able to construct gamifications to engage students, especially when it comes to group projects and not only individual competition (Mee, Rita Wong Mee, Pek Lim Seong 2021). The use of gaming in education. The English tenses are developed using Marczewski's Gamification Framework, and tests indicate that the framework has been successfully applied to the functional needs of users (Sari, Utami, and Fatta 2014). Gamification with the MDA Framework has motivated respondents to learn more thoroughly, utilize all gamification aspects, and shown that English learning with gamification can boost learning outcome based on the results of our paired t-test (Angelia, Suharjito, and Isa 2021).

Subsequent study has demonstrated that gamification can improve students' attitudes toward language acquisition, and that its effective application can enhance learning. This is because good feedback promotes pupils' desire to learn (Angelia, Suharjito, and Isa 2021). Based on the results of testing the hypotheses, the research findings are as follows: (1) gamification is more effective than conventional teaching method for improving tenses mastery; (2) students with high creativity have better tenses mastery than students with low creativity; and (3) there is an interaction effect between teaching methods and students' creativity on the students' tenses mastery (Krisbiantoro 2020).

Gamification is intended not just to motivate pupils, but also to facilitate the attainment of learning objectives. Therefore, the features of gamification should provide students with feedback so that they are motivated to tackle a question. Consequently, gamification must have procedures and components that are exhibited. Paying close attention to story, challenge, curiosity, character, interactivity, feedback, and freedom to fail is the most typical method for transforming traditional learning content into gamification-concept content (Sagirani et al. 2018).

3. Methods

This research provide an steps and approach to build and develop 2D platform game to be utilized in Indonesian language learning. Those steps are shown in Figure 1.

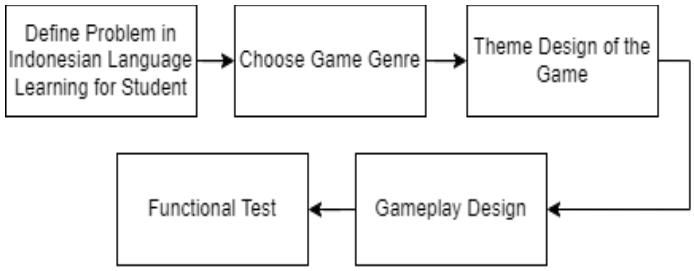

Figure 1. BINEKA Development Test

According to the Figure 1, this section will be divided into several sections including: Problem Defining, Game Genre, Theme Design, Gameplay Design, and Game Functional Testing.

3.1. Problem Defining

Regarding to the previous section, Indonesian Language is the important course in the University. Therefore, the Indonesian Language must be learned to all of the student members in the Indonesian University. However, Indonesian Language has its own difficulty to be learned. Hence, in this research, a new way and approach of Indonesian Language learning process was obtained using Gamification methodology.

3.2. Game Genre

Gamification has a lot of styles and genres, therefore, it is important to ensure and determine what is the best genre for the game. In this research, 2D platformer game was chosen because of its simplicity and its natural type in video game.

3.3. Design of the Game

Regarding to the reason of why the game was developed, Indonesia was chosen to be the main design of this game. Indonesia itself has a huge of cultures. Every part of Indonesia has different culture. There are several big islands in Indonesia including Java, Sumatera, Borneo, Sulawesi, and Irian. Every of them has its own specific culture and geographical landscape. Those geographical landscape are chosen to be implemented as background and environmental design in every game level.

3.4. Gameplay Design

The gameplay is the main important part of game. In this research, the gameplay takes a big role. A 2D platformer game has so many gameplay pattern. Therefore, it is really important to choose what is the best gameplay to be implemented as an learning media especially for Language learning.

As a form of cultural application which is a big theme in this research, an adventure-based gameplay mechanism is used. In this game, players must take gems or diamonds with the right color in order to get a score and continue the game to the next stage or level. The correct diamond hint also could be found in the pole where the game should start. If player was approaching the pole, the hint (or in this game should be an question) will appear, and if the player leave it, the hint will disappear. The game Finite State Machine was shown in Figure 2.

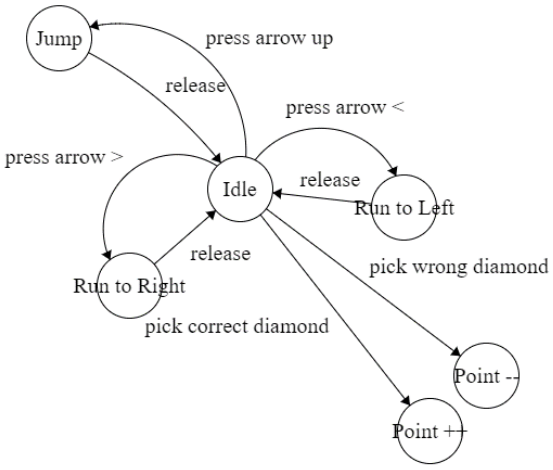

Figure 2. Finite State Machine of BINEKA

According to the Figure 2, there is score to be reached by the player by take a correct diamond. If player take a false or wrong diamond, the score will be decrease by 10 point, however, if the player chose the correct diamond (correct answer), the score will increase by 30. Score became crucial especially they became a condition to unlock the next level in the game. Therefore, player must chose a correct diamond.

Figure 4. BINEKA Gameplay Trailer

3.5. Functional Test

As a research, the product needs to be tested to ensure that every part of the whole game was perfectly worked. In this research, an A/B testing method was used. There are several research that use A/B testing such as "Food Recipe Finder Mobile Applications Based On Similarity Of Materials (Pangestu, Supianto, and Utaminingrum 2018). A/B testing used because of its simplicity and effectively related to the functionality of the game itself. The idea of A/B testing was to test every part of the game such walk mechanism, jump mechanism, point mechanism and many more that related to the game.

4. Results and Discussion

The game itself called BINEKA, which is a 2D platform adventure game. The result of BINEKA menu and configuration was shown in Figure 3.

Figure 3. BINEKA Game Menu

Referring to the Figure 3, the Indonesia culture and geographical theme are chosen to be implemented and blended. it is also in line with what is in the game. In this prototype, only 1 theme is used. The result of the game development prototype was shown in Figure 4.

This research also took around 15 peoples to be a part of testing the game. The testing scenario is a questioner that must be filled by the participants of test. Around 7 questions must be answered related to the gameplay of the game. The result of A/B testing also shown in TABLE I.

TABLE 1. A/B Testing Functionality Result

Referring to the TABLE I, there are total 97 out of 105 or around 92.38% agree that the functionality on this development game was working well.

5. Conclusion

Positive results were obtained during the initial phase of creation of a 2D platformer game for learning Indonesian language. Through a number of phases, including Problem Definition, Game Genre, Theme Design, Gameplay Design, and Game Functional Testing. It is hoped that this game will one day make a positive contribution to the world of education and Indonesian language learning. The improvement and completion of games, the usefulness of utilizing games in learning, and the perspectives of teachers and students towards the use of games for accomplishing learning objectives can be the focus of future research.

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Biographies

Pandu Meidian Pratama is a Language Center lecturer at the Binus University of Malang. For higher education, the focus of teaching is Indonesian Language. In addition to teaching Indonesian at universities, several national and international journals have published articles on Indonesian for Foreign Learner (BIPA), linguistics, language and gender, and the Indonesian Language Proficiency Test (UKBI). The author is currently working on an augmented reality prototype project for BIPA learning and gamification for teaching Indonesian in universities.

Mufidah Nur Amalia is a lecturer Indonesian at the Language Center of Bina Nusantara University. Not only teaching Indonesian for native speakers, she also teaches Indonesian for Foreign Speakers (BIPA). In fact, she was once sent by the Ministry of Education and Culture to teach Indonesian at the Embassy of the Republic of Indonesia in Vientiane. Currently, she wants to focus on developing the Indonesian Program for Foreign Speakers (BIPA) at Bina Nusantara University.

Gamal Kusuma Zamahsari is an Indonesian Language Lecturer, and Academic Development Officer at Bina Nusantara University, Malang Campus. He earned S.Pd. in the field of Indonesian Language, Literature and Local Language Education from Malang State University, Indonesia. Master of Indonesian Language Education from Postgraduate State University of Malang, Indonesia. Gamal Kusuma Zamahsari has played a role in the Indonesian language for foreign speakers (BIPA). He has pursued various international programs in the field of BIPA such as Critical Language Scholarships, Darmasiswa Scholarships of the Republic of Indonesia, KNB Scholarships,Nihongo Partners Japan Foundation in Malang and Bunga Program Kanda University Japan. Besides, he has also been a language ambassador to carry out diplomacy missions through Indonesian language teaching and research in Thailand.

Gusti Pangestu is currently a lecture in Computer Science Department in Bina Nusantara University @Malang. He also a student in Doctoral of Computer Science. He finished his bachelor's degree in 2016 and his Master degree in 2019. Both of bachelor and master are focused on app development and artificial intelligence. He start his career on researcher and lecturer started from 2020.

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