

# Edugame for prevention of dengue fever diseases

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**Abstract.** The game can be an interesting medium to convey information because it has more interactive features and considers not boring. This study aims to make an educational game (Edugame) about the prevention of dengue fever diseases using the advancement of information technology in the form of Android smartphone. This game development uses Digital Game-Based Learning - Instructional Design (DGBL-ID) methodology consisting of five stages, namely analysis, design, development, quality assurance, implementation and evaluation. However, in this study, this game is developed until the development stage only. This game is made according to the general and specific instructional objectives, with description, demonstration, and game implementation methods. Through utilizing the technology, this game is expected to be able to attract the public to the prevention of dengue fever diseases transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitos. The final result of this study is an educational game prototype about the prevention of dengue fever that can run on any Android smartphone.

## 1. Introduction

Educational games are games explicitly designed with educational purposes, or which have incidental or secondary educational value. Educational games are games that are designed to help people to learn about certain subjects, expand concepts, reinforce development, understand a historical event or culture, or assist them in learning a skill as they play. Utilization of games in the field of health one of them is to deliver information about the prevention of dengue fever. Application information on dengue fever has been done by [1]. This application contains the definition of dengue fever disease and how to prevent the spread of dengue fever. Dengue disease itself is a disease caused by dengue virus infection that is transmitted through intermediate *Aedes aegypti* and *Aedes albopictus* to humans through its bite [2].

Games can be an interesting medium for conveying information [3, 4] because the game has more interactive features and is not boring compared to text information [5, 6, 7]. The presence of multimedia features in the game can provide more value in the delivery of information to users [8] in receiving the information submitted [9, 10, 11, 12, 13, 14, 15]. Educational games are games designed or created to stimulate thinking power including improving concentration and solving problems [16, 17].

Game development on dengue has been done before [18] using the Research and Development methodology. In this methodology game development is based on interface and game content only, but does not include gameplay rules such as general instructional and instructional in particular.

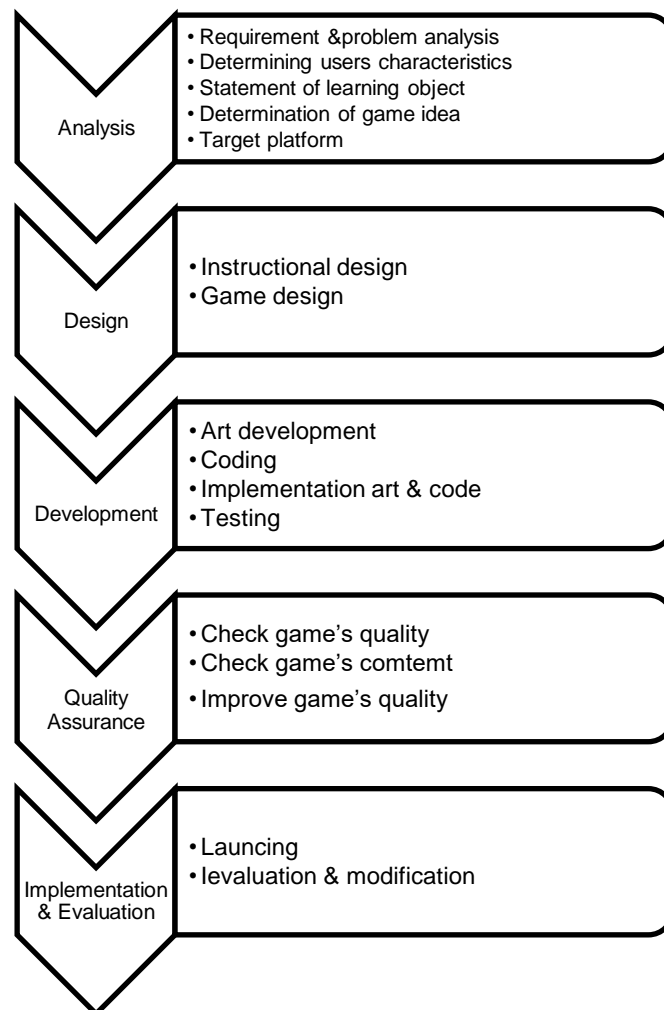
Redesigning dengue fever education using Digital Game-Based Learning (Instructional Design (DGBL-ID) methodology is expected to improve the existing dengue fever educational game. DGBL is a paradigm which utilizes the game as a medium for conveying the learning contents, it is all about



leveraging the power of computer games to captivate and engage end users for a specific purpose, such as to develop new knowledge and skills [19].

## 2. Methodology

The method used in this study is a digital game-based learning instructional design (DGBL-ID) which consists of five steps comprising analysis, design, development, quality assurance, implementation, and evaluation. However, in this study, the step ends in development. The conceptual framework of the edu-game on the solar system is described in figure1.



**Figure 1.** Work breakdown structure [19].

The first step of the development is analysis. The problem analysis does not employ interview and questionnaire since the problems to solve are elaborated based on a study [1] on the need for educational media to prevent the dengue fever disease. Meanwhile, requirement analysis is done to determine what should be in the educational game being developed. This step also determines what operating system and hardware platform to apply in the game. The hardware to be used is a smartphone and the operating system to be applied is Android.

The second step of the development is designed. This step is divided into two types including game design, which adopts theories on game design [20]. Besides, there is also the instructional design which contains the objectives of general instruction, specific instruction, learning materials and methods. The planning used in this study refers to instructional design development process [21].

The third step is development, where art, code, and basic testing are done. And the last step is the development of lesson plan for history subject. This step is not carried out since it is only used for history subject. The steps of quality assurance, implementation, and evaluation are also not conducted since the game is a prototype.

### 3. Result and discussion

#### 3.1. Analysis

This step involves information collection of dengue fever disease which will be delivered in the educational game. Problem Analysis reflects the problems in education the preventive actions of dengue fever disease [1]. The user characteristic determination is based on the materials (prevention of dengue fever disease). The main learning objective of the game is to give valuable lessons on preventing dengue fever disease. Game ideas consist of information about what triggers the disease and where they can find information about the disease caused by *Aedes aegypti* and *Aedes albopictus* in this game. The platform of the game is limited to smartphones with the Android operating system.

#### 3.2. Design

This step basically focuses on planning what things are needed for the game based on the theories of game design [22] and instructional design [23].

**3.2.1. Instructional design.** The general instructional purpose of the game is that users are expected to identify the causes of the dengue fever disease and how to prevent it. The educational game development methodology should include ID part and game development part so that can increase the learning effectiveness through an educational game. To develop an well educational game, all activities must clear and it is an iterative process [19]. Meanwhile, the specific instructional purposes are shown in table 1.

**Table 1.** Specific instructional purposes, learning methods, and learning materials of the game

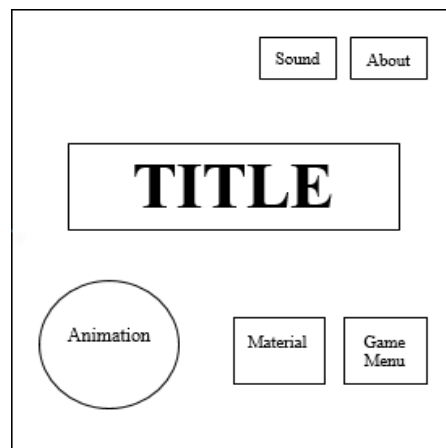
No	Item	Descriptions
1	Specific instructional purposes	1. Identifying media which can be the nest for the <i>Aedes aegypti</i> . 2. Explaining human habits which can trigger the disease
2	Methods	1. Description 2. Demonstration 3. Game
3	Materials	Description of how the mosquitos causing the disease reproduce and media for their reproduction

**3.2.2. Game design.** This process is conducted to design the features in the game. The process consists of Storyline, Characters, and Environment, Scoring, Control, Interface, Level details, and Localization plans.

The storyline in this game consist of 3 part: material, game menu and about the application. The part of the game menu is closing, hoarding, draining, and quiz. The character in the game is the character of the user who must complete all the tasks in each stage. Environment setting in this game is the environment around the house such as yard and bathroom, which can be a breeding place of *Aedes aegypti*.

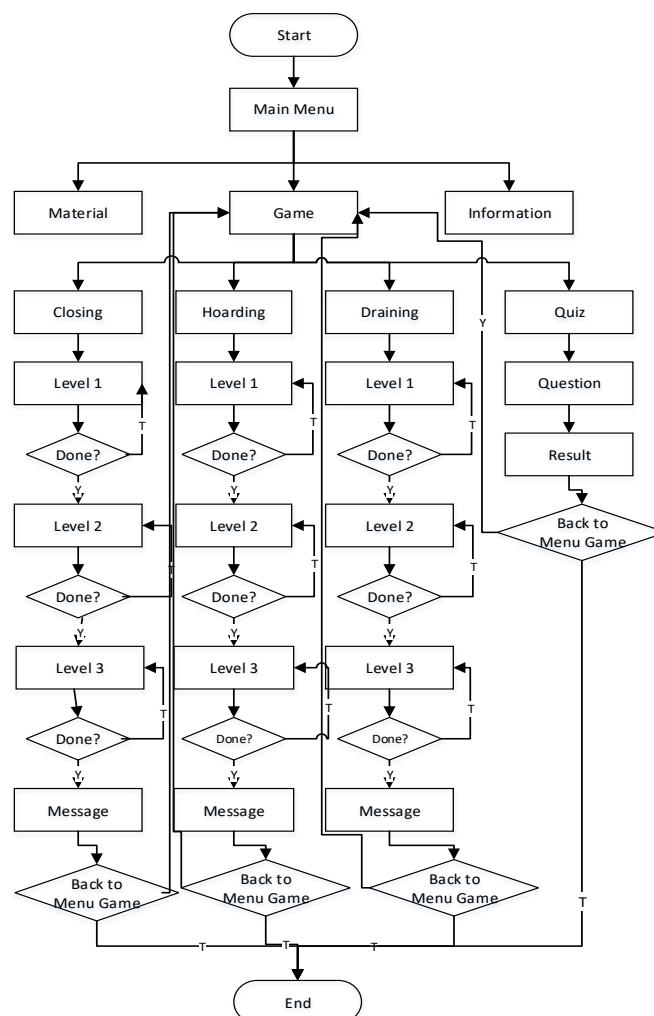
Scoring in this game is based on win and lose conditions. The win condition is achieved if the player succeeds in completing all command given at each level. Lose condition is achieved if a player cannot complete the instruction. They can repeat the game or quit it. In this game, the main control is using fingers to interact with the smartphone screen.

The interface is made familiar to the users which consist of the main menu of the game, in-game menu, head up display (HUD), containing the achievements when playing the game. The main menu comprises two buttons: play and materials.



**Figure 2.** Layout design.

The design of this level divides each level into a scene. Based on this then the game is divided into several scenes including: scene material, game menu, about the application, silent. The material scene contains the material of dengue fever and how to prevent it.



**Figure 3.** Level details.

Game Menu is used as a navigation tool to access the scene in the game. The menus of the game are closing, hoarding, draining, and quiz. Closing is one of the gameplay where the user must close all water shelters by the lid that has been provided, where there are three levels that must be completed by the user. Also, hoarding and draining also have the same rules with higher levels of difficulty. In the quiz section the user is required to answer the question of multiple choice, which at the end of the quiz will be shown the score obtained. These game contents are in the Indonesian language; thus, there is no need of translation.

### 3.3. Development

The process of development is done in the game engine collecting the existing art files. The art files used are pictures and audio (music). Source code game is and IDE MonoDevelop using C# programming language. Script made is implemented into the game object in the forms of asset files. To develop the prototype (development phase), the types of game technology need to be determined. The history character can be modeled via modeling software such as 3D Studio Max or Maya [19].

## 4. Conclusion

The prototype of Edugame for prevention dengue fever disease has been redesigned using DGBL-ID method. This prototype game is a combination of materials about the disease and fun entertainment. The concept of combination between materials and game is also interactive. Having several features, the games appear to be interesting to use.

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