

EDUCATIONAL MULTIPLAYER GAME DEVELOPMENT GO GREEN 3D BASED ON ANDROID

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ABSTRACT

The environment is an important part of human life. Human life is also highly dependent on environmental conditions. However, Cimahi society especially people still do not quite understand and care about the environment because they are less effective media campaigns and media outreach to the public on the environment and society Cimahi less interested in media education and media campaigns about the environment provided by the Environment Agency. Educational game app into an alternative environment to be achieved in menumbuhkan public interest and appeal to the environmental education. The existence of environmental educational game app becomes very important when media campaigns and media outreach that has been submitted is less effective and tend to be boring.

Keywords: Educational Games, Multiplayer, board games, Environmental, Google Play Games APIs, the Environment Agency Cimahi

1. INTRODUCTION

1.1 Background

The environment is an important part of human life. Human life is also highly dependent on environmental conditions [7]. However, based on the results of questionnaires given to 150 respondents in Cimahi [1] known that as many as 90 respondents (60%) admit they are accustomed to littering and 43 respondents (28%) admit they sometimes litter. Then as many as 132 respondents (88%) stated that they stay in place community has not yet distinguish garbage by type. And as many as 94 respondents (62%) admit that they have not been accustomed to turning off the lights or other electronic equipment when not in use. It can be concluded that the public Cimahi still do not really understand and care about the environment.

Environment Agency (DLH) Cimahi is one of the local technical institute in Cimahi Government responsible for environmental management in Cimahi [5]. Based on the interview with Mr. Deden who has served as section head of waste management and waste management B3 Environmental Office Cimahi. DLH recognize one factor contributing to society Cimahi still do not really understand and care about the environment is

the environmental education of the public is still lacking.

DLH experienced some problems in terms of environmental education to the public include the public is less interested in media campaigns and media outreach that is given by DLH. Media campaigns and media outreach that already exists in the form of pamphlets, x banner and banner. Then DLH difficulty providing environmental education to the community because of the limited human resources and the cost of which is owned DLH so not all places can receive environmental education materials. As a result of environmental education of the public still lacks so the motivation and desire to protect the environment is also less.

Based on the last issue needed a media outreach and media campaigns that attract new stylish and innovative capable of providing education or education about the environment to the public. Based on the results of the questionnaire by 129 respondents (86%) admit love to play games, as many as 114 respondents (76%) spend 1-2 hours a day to play games and 116 respondents (77%) admit to prefer playing with friends in multiplayer games of the play alone. Then built an educational-style multiplayer game that is expected to provide education or environmental education to the public to be more concerned about the environment. Was appointed to this thesis a title "Educational Multiplayer Game Development Go Green 3D-Based Android".

1.2 Identification of Problems

Based on the description of the background of the problem can be formulated as follows:

1. The public is less interested in media education and media campaigns about the environment provided by DLH.
2. DLH difficulty providing environmental education to the community.
3. Environmental education of the public is still lacking.

1.3 Purpose and Objectives

The purpose of the research conducted, namely, to build educational multiplayer game go green 3D on android platform in the environmental department cimahi city as media outreach and media campaigns that attract new stylish and innovative capable of providing education or education about the environment to the public. The objective is as follows:

1. Provide media education and media campaigns about the environment in the form of attractive and innovative games for the public.
2. Facilitate DLH staff provides environmental education to the community.
3. To help people get an education environment.

2. CONTENTS OF RESEARCH

2.1 Basis Theory

Here are the theories used and associated with the study of games that will be built

2.1.1 Environment

The living environment is the unity with all things space, power, state, and living creatures, including humans and their behavior, which affect the lives and welfare of human beings and other living beings [6].

2.1.2 Game

game is a system that has rules or certain provisions, which the player or the user will be directly involved in an issue or a case so as to produce a measurable outcome that is a win or lose provisions [2]. *game* is a system that is played with a rule or a specific provision that is used for pleasure or entertainment purpose and can also be used as a means of education or learning media [3].

2.1.3 Google Play Games APIs

Google Play Games is a service online game and SDK operated by Google for the operating system Android. It has the ability multi-player games in real-time, cloud saving, social and public scoreboard, achievement, And the anti-piracy features. This service allows developers to include features in their games without having to develop the feature itself. Google Play Games services are introduced in Google I / O 2013 Developer Conference. In the year of 2015, Thousands of games

published through Google Play Store. The service supports [8].

2.1.4 Google Play Games Realtime Multiplayer

Google Play Games Realtime Multiplayer is the real-time multiplayer API in the Google Play game services to connect multiple players together in one game session and transfer data messages between players that are connected [9].

Google play games already provides several features that can be directly used as: [10]

- a. Create a Quick Game
The system will be set up and insert the player into the room with random opponents.
- b. Create With Invitation Screen
Google play the game will display a standard invitation to users, where they can choose which friends they want to invite to play.
- c. Accept From Inbox
Google Play game will feature an invitation to the user inbox, which is the standard Google Play game screen that contains all of the pending invitation has been received users.
- d. Accept Invitation
Accept the invitation of his particular ID you know. This is usually done in response to receiving an invitation to into a room.

2.2 Problem Analysis

Problem analysis obtained for the development of this application is as follows.

1. The public is less interested in media education and media campaigns about the environment provided by DLH.
2. DLH difficulty providing environmental education to the community.
3. Environmental education of the public is still lacking.

2.3 Analysis of Games that will be built

Gaming applications that will be built is an educational game Go Green Go Game. This game-type board game or games that use a board game to play. Board games have been selected for the results of discussions with staff from the Environment Agency Cimahi game types boardgame considered suitable to be played by women and men. Then boardgame match played by the various vulnerable age, because of the way this type of game play easy and simple rules but still fun to play. Also based on the results of the questionnaire, as many as 124 (78%) of respondents said like the game kind of board game.

Game systems on educational game Go Green Go Game is multiplayer or can be played more than one person (up to 3) and the game is online. Based on the results of the questionnaire were 116

respondents (77%) admit to prefer to play games with friends online than in the play itself. So that element of challenge in the game is more pronounced.

2.3.1 Gameplay

gameplay game Game Go Go Green education is as follows.

1. Board game (boardgame) is divided into four themes. Here are four theme.
 - a. Scene 1
This theme is in the form of a green island with several pine trees. Then there are some robots were camping. Near the campsite there is a place to shake dice.
 - b. theme 2
This theme is in the form of an island deforested. Then there are the middle islands of flooding due to its barren forest.
 - c. theme 3
This theme is in the form of an island with a hill - a hill made of stone. Knoll there are some fungi that can light up when night falls.
 - d. theme 4
This theme is in the form of an island that is dirty and there are a lot of garbage. Amid this island there is a river where the water is very turbid.
2. The first player to reach the last box plots or by moving from one plot to another plot until it reaches the last plot (finish) to be the winner.
3. Players alternately throwing the dice to make a pawn or a pawn move. Starting from the first player to the last player.
4. In the board game (boardgame) there were 65 plots. In each plot traversed by a pawn of the player there are challenges to be dilewani sebuat by the player. If the player successfully malalui these challenges the pawn will advance several pieces depending on the challenge. If a player can not get through the challenges of the piece will resign several plots depending on the challenge. Challenges depending on the type of plot that is passed by the player.

Type plots or box in this game there are 3 kinds:

- a. Plots types of questions (blue)
On the plot kind of question players will be given a question in the form of multiple choice questions relating to the environment.
- b. Plots type of action (red)
On the plot kind of action the player will be asked menyelesaikan minigame. There are several types of minigames that must didelsaikan by the player. Minigame given terhapat the player depending on the theme on the game board that is passed by the player. This type of plot is so special players can invite friends to play a

minigame together. If defeated friend who invited this then the friend will retreat some plots and the winning player will advance. But otherwise if you can not beat it then that friend's friend who will forward some plots and losers will retreat some plots. This will further enhance the element of challenge in the game.

Here are a few minigames that exist in the plots kind of action.

- i. *minigame* waste sorting
 - ii. *minigame* fallen fruit shake smartphone players.
 - iii. *minigame* plant Trees
- c. Plots empty types (white)
On the plot of this type there is no challenge whatsoever. Players will only pass swath without any challenge.
5. Every player has a rank respectively. If the player manages to win the game then the players rank will go up. But on the contrary if the player loses the rank of the player will be dropped.

2.4 Multiplayer System Analysis

Analysis multiplayer system aims to identify multiplayer system built into the game. In this study multiplayer game system using technology from google play games. The following is a general process flow in the game of go game go green.

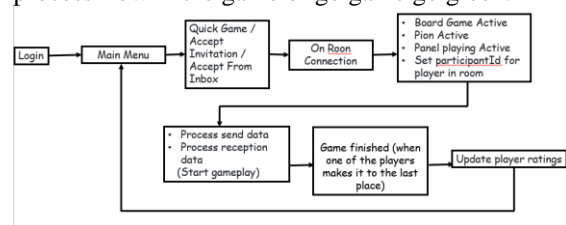


Figure 1. Process Flow General Games Go Game Go Green

2.4.1 Data Delivery Process

In the game of go game to go green will be built the data transmission process is divided into two phases:

1. Making the data packets (messages)
Data to be transmitted is inserted into a packet of data to be easily identified when the process of receiving the data. The data packets to be sent in the form of bytes. Here is a packet data exist in the game of go game to go green will be built:
 - a. byte [] mPosPacket1 = new byte [1];
 - b. byte [] mPosPacket2 = new byte [2];
 - c. byte [] mPosPacket3 = new byte [3];

The data packets are separated based on the amount of data to be sent in order to minimize the data sent in vain.

2. Grouping the data transmission process
Grouping the data transmission process aims to ease when the process of making games and to analyze the type of data transmission.

Here is a table containing the data delivery process that is in the game of go game go green

Table 1. Data Delivery Process

No.	Name of the data transmission process	The contents of the data	The delivery type of data (messages)	Information
1	BroadCastResultDice	Message code (char) Results whisk dice (Integer)	Reliable messages &Send to all	Whisk send the dice
2	BroadCastPosition	Message code (char) Position players (Integer) Types of rules (char)	Reliable messages &Send to all	Sending a player position
3	BroadCastChoiceSelect	Message code (char) Answers players (char)	unreliable messages &Send to all	Sending players to plot answer questions
4	BroadCastResultQuestion	Message code (char) Results of the answers (char)	Reliable messages &Send to all	Send the plot question.
5	BroadCastPlayerPlayWith	Message code (char) Players selected (char)	Reliable messages &Send to all	Sending which players are selected to play together in the plots action
6	BroadCastMiniGamePoint	Message code (char) Minigame code (char)	Reliable messages &Send to all	Sending point players in minigames (plot action)
7	BroadCastMiniGameMove	Message code (char) Minigame code (char) Position players in minigames	Reliable messages &Send to all	Sending position players in minigames (plot action)
8	BroadCastFinishGame	Message code (char) participantId player who wins (string)	Reliable messages &Send to all	Sending participantId players who managed to win the game.

2.4.2 Data Reception Process

In the game of go game to go green will be built a data reception process is divided into two phases:

1. Identification of data (messages)
Identification of data aims to identify the data that has been received through coded messages. For example, if the code message is 'D' then the received message contains the results of shaking dice. Or if if the code message is 'T' then

the received message contains the position of the player.

2. Identification of the type of minigame
Once the data have been identified and if the data is the data minigame will be made to identify the type of minigame. Identification of the type of minigame aims to identify the type of minigame minigame through the code.
3. Running the process according to the data content
After the data has been identified, the system will run the process sesuai with the contents of the received data.

2.5 Analysis of Media Storage

The analysis aims to identify the storage medium storage media built into the game. In this study the storage media on the game using the cloud system of technology google play games. There are two kinds of data are stored as follows:

1. Data Rank enum type player
2. Star Data integers player

2.6 Use Case Diagram

Use case diagrams describe the process of each procedure runs contained in the application educational game of go game go green.

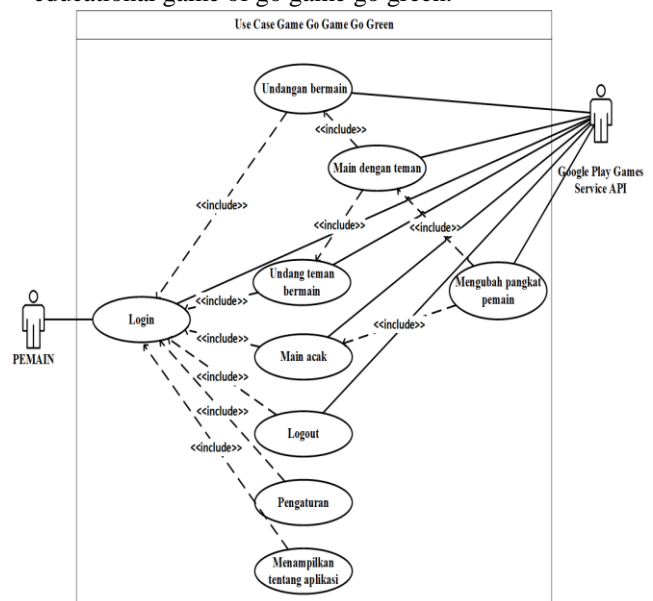


Figure 2. Use Case Diagram

2.7 Class Diagram

Here is the class diagram of the educational game apps Go Game Go Green

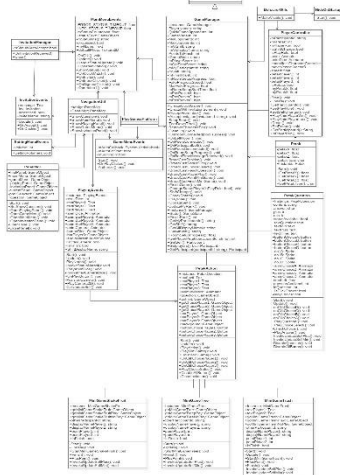


Figure 3. Class Diagram

2.8 Interface Implementation

The following are the results of implementation of the interface at educational game apps Go Game Go Green

2.8.1 Implementation Interface Login



Figure 4. Implementation Interface Login

2.8.2 Implementation Interface Main Menu

Figure 5. Implementation Interface Main Menu

Invite friends 2.8.3 Interface Implementation

Figure 6. Interface Implementation Invite a Friend

2.8.4 Interface Implementation Invite bermain

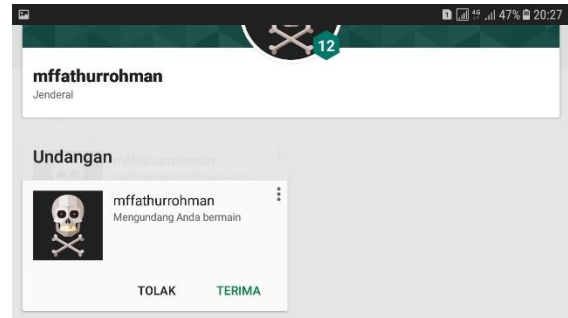


Figure 7. Interface Implementation Invitation to Play

2.8.5 Implementation Interface Main Game

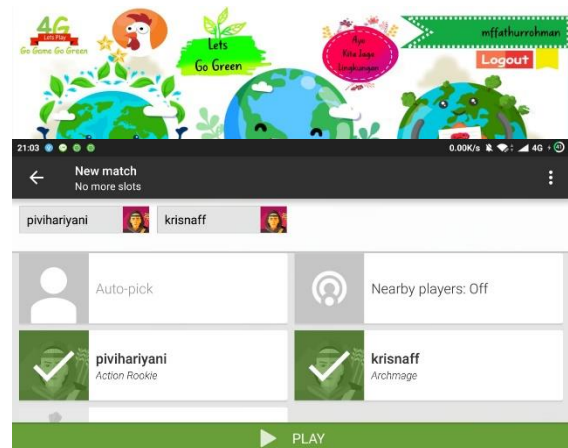


Figure 8. Main Game Interface Implementation

2.8.6 Grid Interface Implementation Questions



Figure 9. Grid Interface Implementation



Questions

2.8.7 Interface Implementation minigame Sorting Trash



Figure 10. Garbage Sorting minigame Interface Implementation

2.8.8 Interface Implementation minigame Shake Fruit Fall

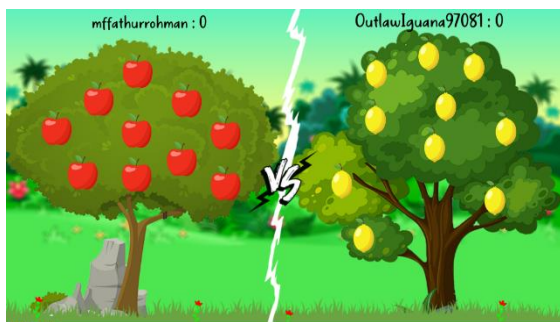


Figure 11. Interface Implementation minigame Shake Fruit Fall

2.8.9 Interface Implementation minigame Planting Trees



Figure 12. Interface Implementation minigame Planting Trees

2.9 testing Systems

In this study the tests performed on the educational game apps Go Game Go Green namely functional testing (blackbox) and beta.

2.9.1 Black Box Testing

Black box testing is done in order to determine whether all functions of the game is going according to functional requirements.

Table 2. Testing Black Box Invite Friends to Play

No.	Test item	Test scenario	Expected results	Test result
1		Pressing the menu invite a friend	Displays a list of friends	<input type="checkbox"/> In accordance <input type="checkbox"/> It is not in accordance with
2	Invite friends to play	choose a friend	Friends who have been entered column into legislation and tercekis	<input checked="" type="checkbox"/> In accordance <input type="checkbox"/> It is not in accordance with
3		Pressing the play button	Invite up to friends who have been invited	<input checked="" type="checkbox"/> In accordance <input type="checkbox"/> It is not in accordance with

2.9.2 Black Box Testing Results

Based on black box testing has been conducted on educational gaming applications go game go green all the functional game is in conformity with the expected results. It can be concluded that the black box testing has been meeting the needs of the system according to the needs of software designed.

2.9.3 Beta Testing

Beta testing is done by interviewing the staff of the Department of Environment Cimahi and questionnaire about user response to the game has been built.

Testing 2.9.3.1 Interview

Table 3. Results of Testing Interview

NO	Aim	Question	answer
1	Provide media education and media campaigns about the environment in the form of attractive and innovative games for the public	Is this game can be used as media outreach and media campaigns about the environment?	Yes of course, this game will be a media outreach and media campaigns about the environment for new and innovative. And I will be much in demand by the public
		Is this game is an interesting view?	According to my appearance was very attractive and cock with environmental themes
		Is interesting to play this game?	It has been very interesting because there are a few minigames and animations are varied.

NO	Aim	Question	answer
		Whether playing solo or multiplayer gaming systems have become more interesting and fun to play?	Yes of course, by playing with friends this game very interesting and really crowded to play. And the player can interact with other players that make this game more fun to play and not make bored quickly.
2	Facilitate DLH provide environmental education to the community.	Is this game is easier for DLH to provide environmental education to the community?	It has been very helpful with their game, communication of or provision of material to the public becomes easier not need to bother anymore to extension and can reach a variety of places. Then more cost-effective
		Is the delivery of content in this game is easy to understand?	Overall delivery of content in this game is easy to understand because the material is not in the form of text, but in the form of an audio or voice and there are some animation.

Testing 2.9.3.2 Questionnaire

Tests done by giving questionnaires to the public to try the game of go game go green and find out if the game has fulfilled its purpose. Adapaun target or targets user who made the public Cimahi respondents are 12-30 years old. In this test the questionnaire given to 35 respondents. The percentage of each question given to respondents have 5 scale using Likert scale. With the score criteria described inTable 4. Criteria Score Likert following:

Table 4. Criteria Score Likert

scale Answers	Statement options	Score	Percentage
SS	Strongly agree	5	100% - 80%
S	Agree	4	79% - 60%
C	Doubtful	3	59% - 40%
TS	Disagree	2	39% - 20%
STS	Strongly Disagree	1	19% - 0%

Here are the results the percentage of answers obtained from the questionnaires were then calculated using the formula above.

1. Do you agree this game is used as medium of education and media campaigns about the environment?

No Agric nyaan	Information	Score	Frequency	S
1	SS	5	17	85
	S	4	16	64
	C	3	2	6
	TS	2	0	0
	STS	1	0	0
amount			35	154

$$\frac{155}{175} \times 100\% = 88\%$$

Based on the percentage of the value of the above, it can be concluded that the assessment of the question of kin respondents if the game is used as medium of education and media campaigns about the environment was 88% of 100% is expected, it can be categorized as strongly agree.

2.9.4. Conclusion Beta Testing

Based on the beta testing has been carried out through interviews and questionnaires was concluded as follows:

1. Educational game app game go go green can be used as media outreach and media campaigns about the environment interesting and innovative for the community.
2. With the application of educational games go games go green can facilitate DLH provide environmental education to the community.
3. With the application of educational games go games go green can help the community get environmental education.

3. CLOSING

3.1 Conclusion

After the analysis, design and testing, it can be concluded as follows:

1. Educational game app game go go green can be used as media outreach and media campaigns about the environment interesting and innovative for the community.
2. With the application of educational games go games go green can facilitate DLH provide environmental education to the community.
3. With the application of educational games go games go green can help the community get environmental education.

3.2 advice

Suggestions for application development educational game game go go green for a better future are as follows:

1. Board games in the game is made more interesting and not just a board game.
2. A pawn in the game is made more diverse, and the player can choose pawns that they will use.
3. *minigame* The game is made more and made more attractive.
4. For the future, environmental education elements in the game are added and animation made more attractive again.

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