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Development of the Story of Life: A Narrative and Educational Game Using the Godot Engine for Android

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Abstract *– Godot Engine, as an open-source platform, offers flexibility and ease of use for developing both entertaining and educational games. This research showcases the creation of Story of Life, an educational game aimed at engaging players in learning through interactive storytelling and character-driven quests. The game features a character named Ucup, who explores various environments, clearing questions, and interacts with NPCs to gain knowledge and complete learning-based challenges. The development process followed the Agile Software Development Life Cycle (SDLC), with rigorous testing conducted through black-box and white-box methodologies. Testing results indicate a 97% success rate in functionality and performance on low-spec devices, confirming the game's compatibility and responsiveness. The findings demonstrate that Story of Life successfully combines narrative with educational content, providing a meaningful and accessible learning experience.*

Keywords – Game; Story; Education; Game Development; Godot Engine; Story of Life

I. INTRODUCTION

The rapid progress of technology has transformed how people, particularly students, use smartphones. Nowadays, phones serve not only as communication tools but also as platforms for gaming, often capturing children's attention for extended periods. In Indonesia, this trend has contributed to a decline in academic performance among students, as they spend more time on entertainment-focused games that offer little educational value. Observing children in the community, it is clear that excessive time spent on such games has impacted their school grades and overall literacy. This concern underscores the need for a game that provides an engaging yet educational experience, redirecting students' gaming habits towards learning and knowledge-building. In response, the researcher aims to develop *Story of Life*, a narrative-driven game that improves literacy, knowledge, and critical thinking. By embedding educational content within an immersive storyline, the game is designed to stimulate curiosity and provide learning experiences on topics beyond the conventional school curriculum, meeting an essential need for more constructive game-based learning tools.

This journal focuses on the development of *Story of Life*, a narrative-driven educational game created using the Godot Engine for Android. The research covers the design, development, and implementation of the game's core features, including the integration of educational content aimed at improving literacy, critical thinking, and knowledge across various subjects. The study evaluates the game's performance on low-spec Android devices, its usability, and the effectiveness of its interactive storytelling approach in engaging students. The scope of the journal does not include the development of similar games for other platforms, nor does it address other aspects of game development outside the educational content and user experience.

Practically, games can have a positive impact on children's development if used properly and following the rules that have been set by parents regarding the time of use and the content of games that children can access using technology. [1]

Based on the background described above, several issues can be identified: Students tend to spend a significant amount of time playing games, and the games lack educational content; They often experience boredom with conventional learning methods, which leads to a decrease in their interest in learning and a preference to play games; Many students and smartphone users are using the Android operating system, and the specification is low.

Indonesia is one of the largest countries in the world for active smartphone users. However, the increasing time spent on the internet is often misused by society. Despite the government's efforts to provide various conveniences to achieve the nation's goals, as outlined in the Preamble of the 1945 Constitution, particularly in educating the nation's life, the presence of the internet has led the younger generation astray. They have begun to neglect books and the habit of reading, resulting in a decrease in their knowledge acquisition. Additionally, their engagement in the teaching and learning process has also diminished. [2]

Teaching children about morals and ethics, particularly in relation to their parents, has not yet been effectively implemented. One of the main challenges in this learning process is the lack of engaging delivery methods. As educators, it is essential to prioritize a play-based learning approach in the teaching process, especially for young children. This is because primary school-aged children are naturally inclined toward play. [3]

According to Damien Djaouti et al., a video game is a form of electronic game that involves text or images, where

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interaction occurs between the game software and the player, facilitated by the hardware that processes the game. The game software provides output in the form of images or text, which is displayed through a medium (such as a television, computer, or mobile phone). The player then inputs commands via the hardware, which are subsequently reflected on the medium. [4]

The result of this research is a game prototype that can serve as a foundation for further development. In the long term, if this game can be implemented and used by the public in Indonesia, it will become a creative solution that supports the government's efforts to preserve and promote national culture. [5]

Education is crucial from an early age to ensure that children are not delayed in becoming familiar with the world of learning. Educational games are applications that can be used to teach and increase users' knowledge through engaging media. The author has designed a mobile-based educational English game for early childhood education students that is both engaging and educational, with the goal of motivating them in their learning activities. [6]

Engaging learning media can make the learning environment more interesting, reduce boredom, and enhance learning outcomes. The development of the learning media, specifically the board game "Labyrinth in the Forest," is aimed at junior high school students and focuses on the topic of numbers, which is the objective of this research. This developmental research uses the ADDIE development model. [7]

This limited use of technology results in students becoming easily bored, and the teacher has not yet fully utilized the potential of technology in the classroom. [8] This research aims to develop an animated game designed to enhance early childhood readiness for learning science. Research Related, the game helps children learn science through a fun, play-based approach that aligns with the characteristics and developmental stages of early childhood. [9] Further enhancements in development can include performance optimization, the addition of new features, and the exploration of game elements that can increase the game's appeal. [10]

The Software Development Life Cycle (SDLC) models provide a structured approach to software engineering, ensuring a systematic path to delivering high-quality products. Among the various SDLC models, the Agile methodology was selected for this project due to its iterative nature, which supports continuous improvement and adaptation, a key requirement for game development. Unlike traditional models, Agile emphasizes flexibility, allowing for frequent updates and enhancements based on user feedback and testing outcomes. This approach aligns with the researcher's plan to release monthly updates to *Story of Life*, ensuring that the game evolves in response to player needs and educational goals. Agile's focus on maintenance and continuous delivery makes it particularly suitable for developing a game that requires ongoing adjustments and improvements, setting it apart from more rigid, sequential models. [11]

The purpose of this research is to educate students and smartphone users, to develop a game that can operate on low-spec Android devices, and to demonstrate that a game or piece of software can be created using low-spec laptops or computers.

II. RESEARCH METHODOLOGY

2.1 Research Stages

A research method in a study is a set of steps that must be followed. The intention is for the author to properly design the research according to the topic. Furthermore, this research is prepared systematically so that it can be easily understood and become a guide to solving problems in the future. In this research, the author used the System Development Life Cycle (SDLC) method depicted in Figure 1. This method was chosen because it has clear and systematic stages in designing and developing software.

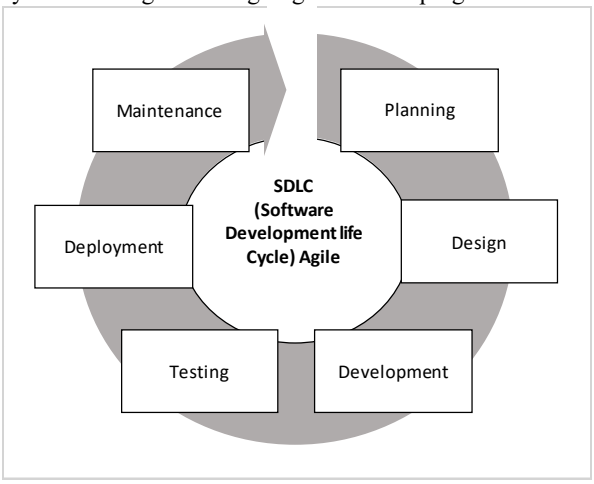

Figure 1. Software Development Life Cycle(SDLC)

1. Planning
   In this phase, the researcher plans the game development and performs the **system analysis** to define game requirements, core features, and functional specifications. This phase also involves analyzing the system architecture, user needs, and game flow. Diagrams such as the use case, class, and sequence diagrams are created to establish how the system should function. Based on this analysis, the development team can clearly understand the objectives and requirements for the next phase.
2. Design
   In this stage, the overall system design is conducted based on architectural planning, user interface design, database design, and module design.
3. Development
   In this stage, the researcher develops the game according to the established design and uses the planned programming languages to implement the software's logic and functions.
4. Testing
   The game is tested by involving several respondents to evaluate the effectiveness of the teaching, the storyline conveyed in the game, and user engagement during gameplay.
5. Deployment
   After the application is considered ready and tested, the

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game will be gradually published, starting from small markets to larger markets.

6. Maintenance
   This involves maintenance, updates, addressing bugs reported by players, adding features if necessary, and responding to feedback.

2.2 Research Supporting Theories

There are several theories that will support this research process that are useful for the basis of research related to existing theories. The theories is as follows:

1. Godot Engine
   Godot Engine is a piece of open-source software that lets people from all experiences levels and walk of life create games. The project was started in 2027 by Juan Linietsky and Ariel Manzur as an in-house engine for several Argentinian game studios. In late 2014, the engine got open-sourced, giving everyone free access to the code. Since then, it has gained lots of traction and is currently one of the most used game engines on the market. [12]
2. Game Engine
   Game Development is complex and involves a wide variety of knowledge and skill. To build a modern game, you need a great deal of underlying technology before you can make the actual game itself. imagine that you had to build your computer and write your own operating system before you could even start programming. Game development would be a lot like that if you truly had to start from scratch and make everything that you need. Godot script syntax is very closely modeled on the python language. If you are familiar with Python already, you will find Godot script very familiar. If you are comfortable with another dynamic language, such as JavaScript, you should find it relatively easy to learn. Python is very often recommended as good beginner language, and Godot script shares that user-friendliness. [13]

III. RESULTS AND DISCUSSION

3.1 Analysis System

The **Analysis System** phase is crucial for laying the foundation of the game *Story of Life*, as it defines the system's requirements, features, and interactions. This phase ensures that the game's development aligns with educational goals and provides an effective, engaging experience for students.

1. Recommendation System

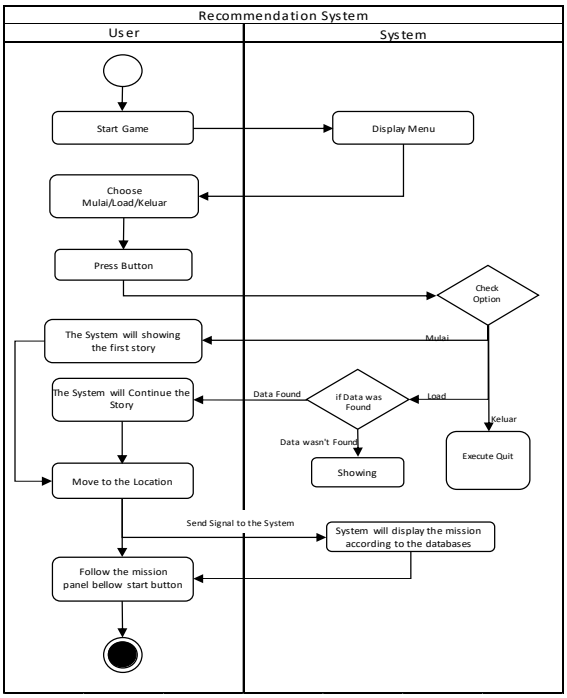

Figure 2. Recomendation System

Below is an explanation of the recommendation system:

1. The user starts the game, and the system will display a menu that the user can select from.
2. When the user selects "Start," the system will immediately transition the user to the opening story scene.
3. When the user selects "Load," the system will check the storage memory on the user's smartphone. If a saved game is found, the user will be directed to continue the story from that save; if not, an alert will appear.
4. Once the character is in a location or map where they can be controlled, the system will automatically receive a signal to provide the user's next objective, which will be displayed on the mission panel.

2. Use Case System

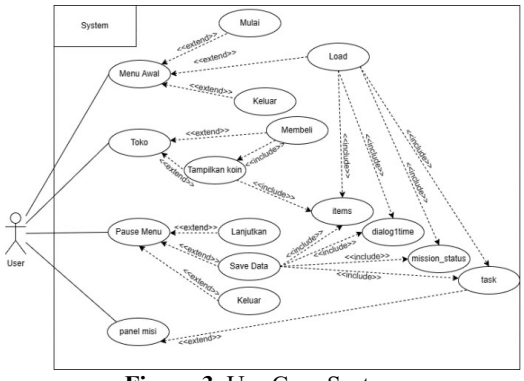

Figure 3. Use Case System

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Use Case Descriptions:

a. Use Case: Enter Menu
   Actor: User
   Description: The user selects either "Start" or "Load." If the user selects "Load" and no saved data is found on the smartphone, an alert will be displayed.
b. Use Case: Shop
   Actor: User
   Description: The user goes to the park and interacts with the kiosk to access or open the shop.
c. Use Case: Save Game
   Actor: User
   Description: The user presses the pause button, and a "Save Game" option appears. If the user selects it, the game will save data such as coins, keys, etc.
d. Use Case: Mission Panel
   Actor: User
   Description: The user is given instructions from the mission panel to continue the predetermined storyline.

3. Class Diagram

Class Diagram class diagram that the author used in this research:

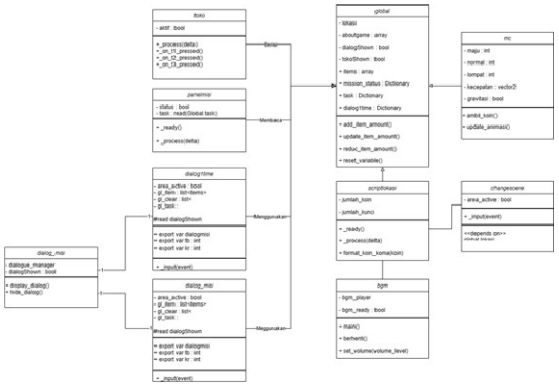

Figure 4. Class Diagram

4. Sequence Diagram
   a. Sequence Diagram First Menu

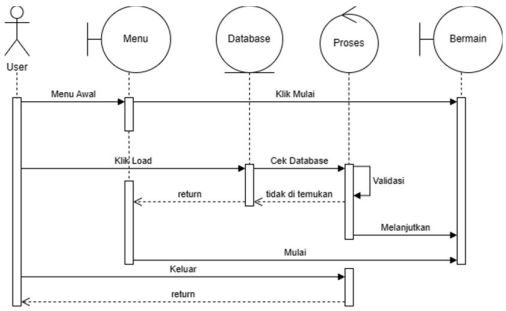

Figure 5. Sequence Diagram First Menu

class diagram that the author used in this research and The sequence diagram above explains the flow of the initial menu when the game is first started. There are three buttons: "Start," "Load," and "Exit." When the "Start" button is pressed, the system will display the opening story. If the "Load" button is pressed, the system will check a database and memory; if a saved game is found, the system will direct the player to continue the storyline. However, if no saved game is found, the system will display an alert. When the "Exit" button is pressed, the system will execute the command to exit the user from the game.

b. Sequence Diagram Pause Menu

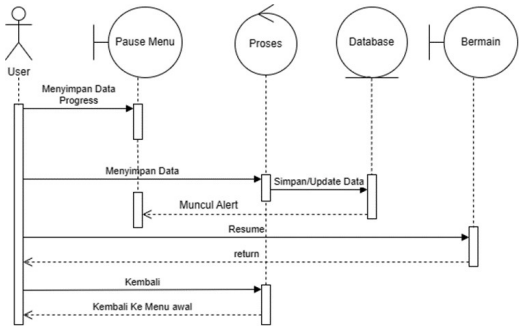

Figure 6. Sequence Diagram Pause Menu

The sequence diagram above explains the flow of the pause menu, which contains three buttons: "Resume," "Save Game," and "Exit." When the "Resume" button is pressed, the system will close the pause menu and continue the game. If the "Save Game" button is pressed, the system will save the game, and if successful, an alert will be displayed. When the "Exit" button is pressed, the system will redirect the user to the main menu.

c. Sequence Diagram Store System

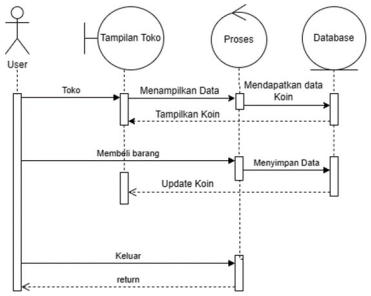

Figure 7. Sequence Diagram Store System

The sequence diagram above explains the flow of the shop system, where the user can open the shop panel at the shop's location. When interacted with, the shop will display several items available for purchase. The shop system works as follows: if an item button is pressed, the system will first check the user's coin balance. If the coins are sufficient, the item will be added, and a "purchase successful" alert will appear. However, if the coins are insufficient, a "not enough coins" alert will be displayed.

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d. Sequence Diagram Mission Panel

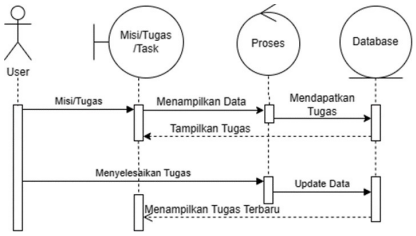

Figure 8. Sequence Diagram Mission Panel

The sequence diagram above illustrates the workflow of the mission panel. When the user completes a mission or enters a location, the system will perform a real-time check of the database and memory. If the user completes a mission listed on the mission panel, the system will assign a new mission.

5. Design User Interface
In this below are the user interface design for this game:
a. First Scene Load the Game
The UI design upon opening the game will display the following elements.

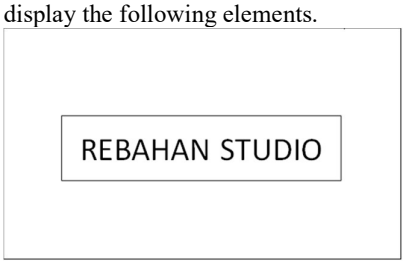

Figure 9. First Scene Load the Game

b. First Menu
The UI design upon entering the menu will display as shown below.

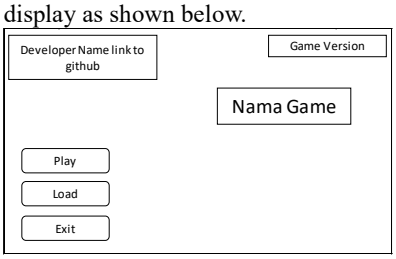

Figure 10. First Menu

c. Opening
When the start button is pressed, an opening story dialog will appear.

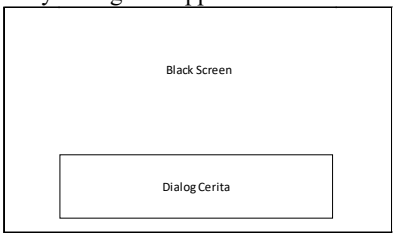

Figure 11. Opening Start Button

d. Paused Menu
The UI design for the pause menu is shown below, featuring three buttons: Continue, Save Game, and Quit.

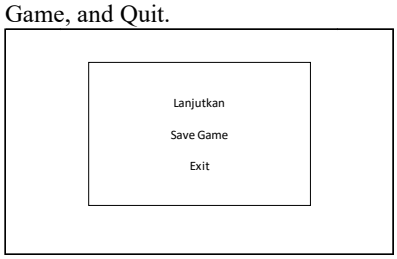

Figure 12. Pause Menu

e. Main Character
The design below shows the text that appears when the main character is in the active item area.

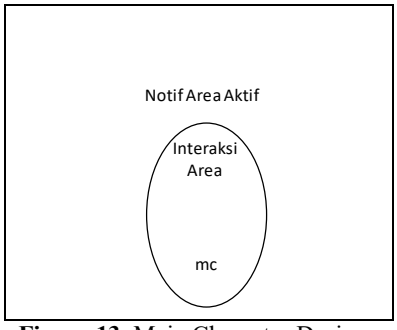

Figure 13. Main Character Design

f. Controller
The in-game controller design for controlling the character is shown below.

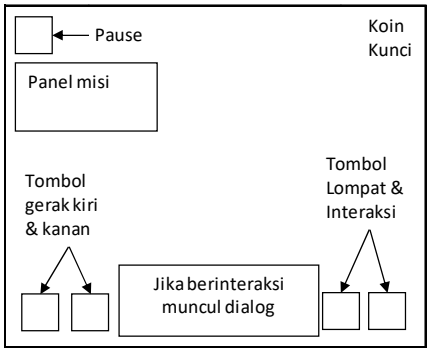

Figure 14. Controller

g. Shop
The shop design that appears upon interaction is shown below.

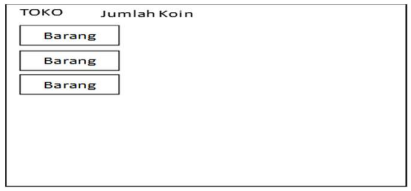

Figure 15. Shop User Interface

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h. Minigames before start
The mini-game design that appears before the start button is pressed is shown below.

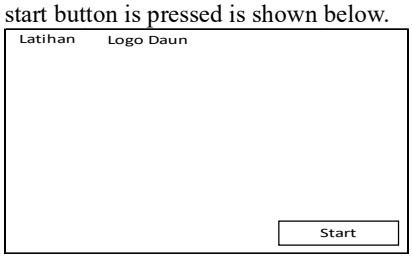

Figure 16. Minigames UI before start

i. Minigames after start
The mini-game design that appears after the start button is pressed will display a question in the center.

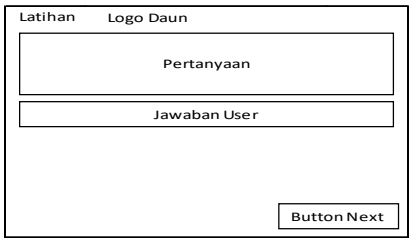

Figure 17. Minigames after start

j. House1-2
The design for the locations house1-2 is shown below.

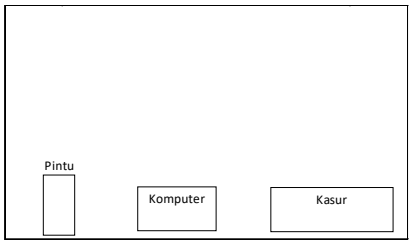

Figure 18. House1-2 Design

k. House1-1
The design for the locations house1-1 is shown below.

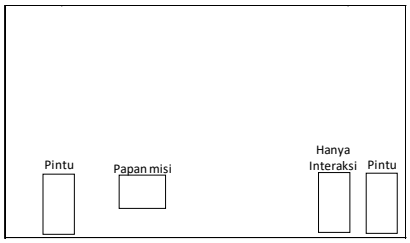

Figure 19. House1-1 Design

l. River
The design for the river location is shown below.

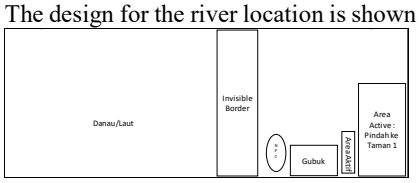

Figure 20. River Design

m. Garden1
The design for the garden1 location is shown below.

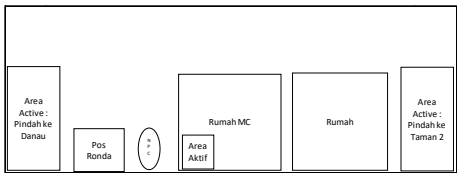

Figure 21. Garden1 Design

n. Garden2
The design for the river location is shown below.

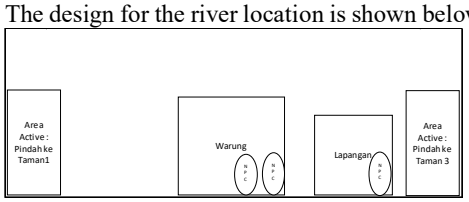

Figure 22. Garden2 Design

o. Garden3
The design for the garden3 location is shown below.

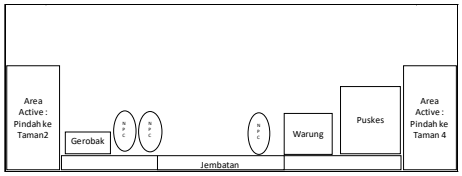

Figure 23. Garden3 Design

p. Garden4
The design for the garden4 location is shown below.

Figure 24. Garden4 Design

3.2 Software and Hardware Requirement

This section outlines the necessary software and hardware specifications required to run the game *Story of Life* effectively. The software requirements include the game engine, operating system, and any additional libraries or tools used for development.

1. Software Requrement
In this below the table of software requirement for this research.

Table 1. Software Requirement Table

NO	Perangkat Lunak	Keterangan
1	Sistem Operasi	Linux Ubuntu 20.04(Focal Fossa)
2	Bahasa Pemrograman	Godot Script
3	Code Editor	Godot Engine
4	Sprites/UI Editor	Pixelorama
5	UML Modelling Tool	Draw.io

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2. Hardware Requirement

In this below the table of hardware requirement for this research.

Table 2. Hardware Requirement Table

NO	Perangkat Keras	Keterangan
1	Device 1	Laptop Lenovo G400 Intel(R) Celeron 1005M, Ram 2GB
2	Device 2	Samsung A10, Rom 32gb,Ram 2gb
3	Device 3	Oppo A37,Rom 16gb,Ram 2gb

3.3 Implementation User Interface

The implementation of the User Interface (UI) focuses on translating the design concepts into a fully functional interface that enhances user interaction within the game. This phase involves coding and integrating various UI elements such as buttons, menus, text boxes, and interactive dialogues, ensuring they respond smoothly to user input. The UI is built to be both user-friendly and visually appealing, prioritizing accessibility and ease of navigation to provide players with a seamless and engaging experience throughout the game.

1. First Scene Load the Game

The initial screen that appears when the game starts will display an introduction, as shown below.

Figure 25. First Scene Load the Game

2. First Menu

To start the game, players can select the "Play" menu. If they want to use previously saved data, they can choose the "Load" menu.

Figure 26. First Menu

3. Opening

After selecting "Play," the game will display the introductory story, revealing the beginning of the game's narrative.

Figure 27. Opening

4. Controller

The interface includes the controller display, mission panel, currency, and pause button, all of which can be used by the player.

Figure 28. Controller

5. Shop

The shop interface features three items available for purchase. However, only one item will be visible until the main mission is completed.

Figure 29. Shop

6. Minigames

The minigame interface, as shown below, includes a science practice section. This section will present 10 questions for the user to answer, and the final score will be displayed once all questions have been answered.

Figure 30. Minigames

7. House1-2

After the introductory story is completed, the user will start from either Location House1-2 or the room.

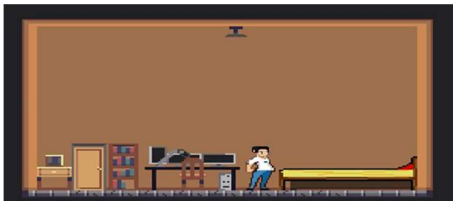

Figure 31. House1-2

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8. House1-1
The interface for Location House1-1 or the living room is displayed as shown.

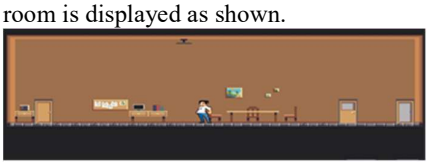

Figure 32. House1-1

9. River
The interface for the "Lake Shore" location features one NPC that can be interacted with for conversation.

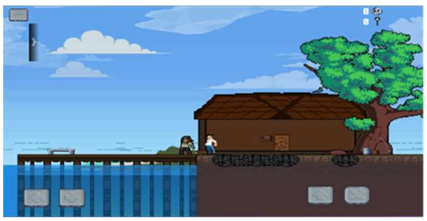

Figure 33. River

10. Garden1
The interface for "Garden 1: Left Side" features two sections in each outdoor location due to the large size of the area. On the right side, there is a directional indicator that can be interacted with to learn about the location.

Figure 34. Garden1 left side

Figure 35. Garden1 right side

11. Garden2
The interface for "Garden 2: Left Side" includes a shop that can be interacted with. When interacted with, the shop will be displayed. On the right side, additionally, there are two people in the area who can be interacted with.

Figure 36. Garden2 left side

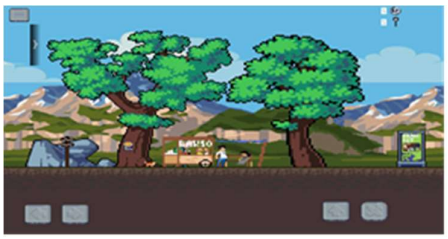

Figure 37. Garden2 right side

12. Garden3
The interface for "Garden 3: Left Side" is displayed as shown. On the right side of "Garden 3," the interface will include an "Uduk Rice Vendor" and a "Health Clinic" that can be interacted with in future versions.

Figure 38. Garden3 left side

Figure 39. Garden3 right side

13. Garden4
The interface for "Garden 4: Left Side" features several NPCs and a billboard. On "Garden 4—Right Side," the interface includes three interactive elements that allow users to start minigames or practice activities.

Figure 40. Garden4 left side

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Figure 41. Garden4 right side

3.4 Implementation System

At this stage, researchers will carry out three testing processes: blackbox testing, whitebox testing, and beta testing.

1. Blackbox Testing

Blackbox testing is defined as a testing technique in which functionality of the Application Under Test(AUT) is tested without looking at the internal code, structure, implementation details and knowledge of internal path of the software. [14] In this research, the researcher conducted tests on the appearance and functionality of each scene.

a. First Menu

Table 3. Blackbox Test on the menu

Correct Test Data Case			
Input	**Expectation**	**Observation**	**Result**
Pressing the Start Button	System redirects the user to the initial story	Displays the initial story	Success
Pressing the Load Button	System checks memory to find saved data	Enters the game, continues the story, and retrieves inventory data	Success
Pressing the Exit Button	System immediately executes syntax to exit the game	User exits the game	Succes
Incorrect Test Data Case			
Input	**Expectation**	**Observation**	**Result**
Pressing the Load Button	System checks memory to find saved data	Displays alert "Failed to load data, data not found."	Success

b. Controller

Table 4. Blackbox Test on the controller

Input	Expectation	Observation	Result
Pressing the Pause Button	System displays the Pause Menu	Pause Menu appears	Success
Pressing the Jump Button, Moving Left or Right	System immediately executes syntax to move the character	Character moves according to the pressed button	Success
Pressing the Interaction Button	System immediately executes syntax for interaction	Dialog appears, viewing store, performing exercises	Success

c. Panel Mission

Table 5. Blackbox Test on the panelmission

Pressing the direction { on the mission panel	System immediately executes syntax to close the mission panel and display the button to open the mission panel	Mission panel is closed, and the button } to open the mission panel appears	Success
Pressing the button } on the mission panel	System immediately executes syntax to close the mission panel	Mission panel opens and the button to close the mission panel appears	Success

d. Shop

Table 6. Blackbox Test on the store

Correct Test Data Case			
Input	**Expectation**	**Observation**	**Result**
Pressing the Button labeled "salt" with 5000 coins	System checks the character's inventory; if coins are > 2999, it deducts 3000 coins and adds salt to the inventory	Coins are deducted, and salt is added to the inventory	Success
Completing the mission of giving salt to the mother	System checks the save data; if mission 1.2 is TRUE, the store displays new items besides salt	New items appear, namely a book and a pencil	Succe
Incorrect Test Data Case			
Input	**Expectation**	**Observation**	**Result**
Pressing the Button labeled "salt" with 0 coins	System checks the character's inventory; if coins are < 2999, it displays the alert "Not enough coins"	Alert appears: "Not enough coins"	Success

2. Whitebox Testing

Whitebox testing is a way of testing the external functionality of the code by examining and testing the program code that realizes the external functionality. [15] In this research, the researcher tested the shop functionality with Godot Unit Test(GUI) to ensure that purchased items are properly detected and that the coin count decreases accordingly.

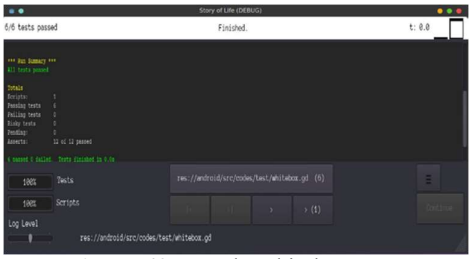

Figure 42. Result Whitebox

3. Beta Testing

A questionnaire is an objective testing method where the system is directly tested and the application can be downloaded. By creating a questionnaire about the usefulness of the developed system, the goal is to determine whether the application meets user expectations. Testing is conducted by distributing the questionnaire to 15 individuals. The questionnaire consists of 8 questions with responses rated on a scale from 1 to 5.

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NO	Pertanyaan	Nilai				
		1	2	3	4	5
1	Is the appearance of the "Story of Life" application/game attractive?	0	0	0	10	5
2	Is the storyline in the "Story of Life" application/game interesting?	0	0	2	5	8
3	Does the system of this application/game work well?	0	0	2	9	4
4	Is the navigation within this application/game easy to understand?	0	0	2	7	6
5	Are the controls of this application/game easy to use?	0	0	1	8	6
6	Are the designs of each character in this application/game attractive?	0	0	5	6	4
7	In the "Garden 4" location in the game, there is a mini-game containing several questions about Science, Mathematics, and English. Does the mini-game in this game enhance knowledge?	1	0	1	6	7
8	Is this game worth playing?	0	0	0	7	8
TOTAL		1	0	13	58	48

Figure 43. Beta Testing

IV. CONCLUSION

Based on the research and testing conducted as follows, the "Story of Life" game serves as an educational solution for parents and students who are less interested in traditional learning. "Story of Life" holds significant potential as an effective educational and entertainment tool. By continuously improving and developing the application based on feedback from beta testing, it can become a popular and beneficial learning resource for children and students in Indonesia. The choice of the Android platform for this game's development is highly appropriate, given the large number of Android users in Indonesia. Additionally, the game is designed to be lightweight, ensuring it runs smoothly on low-spec Android devices, thereby increasing accessibility for users from various backgrounds.

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