

Development Of The Educational Game Math Land Using Construct 2

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ABSTRACT

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In the digital era, technological advancements have brought significant changes to the field of education. Conventional learning methods often cause boredom among students, making it necessary to innovate the delivery of learning materials. One solution that can be implemented is the development of educational games, which combine entertainment and education to create an enjoyable learning experience for children. This study aims to develop an educational game that combines learning with play to facilitate a more effective and engaging learning process. The game development is carried out using the Construct 2 game engine, with the implementation of the ADDIE method (Analyze, Design, Development, Implementation, Evaluation) as a systematic framework to ensure the quality and effectiveness of the resulting educational games.

1. INTRODUCTION

To improve the quality of education, innovation that aligns with the progress of the times is needed. This innovation is incorporated into the learning process (Nisa & Susanto, 2022). The rapid advancement of technology today has significantly impacted various sectors, including the gaming industry. Games have become a popular form of entertainment across all age groups, from children to adults, due to their ability to provide enjoyable and interactive experiences. There are various types of games, one of which is educational games, designed to offer learning experiences through digital media. Educational games are considered an effective solution to boost interest in learning, especially among children who tend to prefer playing over conventional learning methods.

Integrating games into the learning process can create a relaxed and enjoyable learning environment. One creative approach is to incorporate adventure elements into educational games. This allows players not only to enjoy the excitement of playing but also to gain educational benefits, such as solving questions to progress to the next level. The challenges presented in each level are designed with gradual difficulty, enabling players to learn while playing in a structured way.

To address these issues, this research proposes the development of an educational game called "Math Land" using Construct 2. The game is designed to provide an engaging math learning experience through adventure elements, such as battling enemies, collecting coins, and answering questions as requirements to advance to the next level. It is hoped that this educational game will enhance players' knowledge by combining the concepts of learning and playing interactively.

2. METHOD AND MODELS

This type of research is categorized as RnD (Research and Development). In RnD research, the researcher develops a product and conducts procedures to test the product's effectiveness (Sugiyono, 2013). To develop the educational game "Math Land," the ADDIE development model is utilized, aiming to produce a game that is optimal and meets user needs. The development model in this study is the ADDIE model, the ADDIE model consists of five interconnected components that are systematically structured, meaning that from the first stage to the last in its application, the process must follow a systematic order and cannot be arranged randomly (Rosmiati, 2019). Which consists of five development stages Analysis, Design, Development, Implementation, and Evaluation.

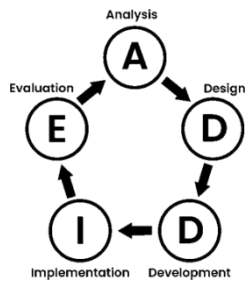


Figure 1. Model ADDIE

2.1 Use Case Diagram

The Use Case Diagram is created to explain which parts of the game can be accessed and used by the user.

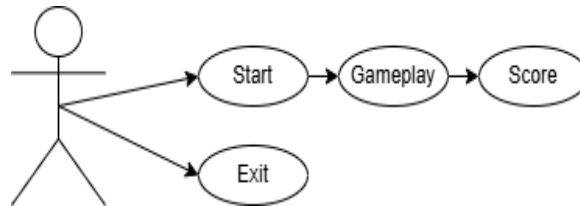


Figure 2. Use Case Diagram

Description:

1. Start, the system initiates the game by providing instructions to the players and setting up the initial conditions for the gameplay session.
2. Gameplay, players engage in the core interactions of the game, such as answering questions, completing tasks, or participating in designed activities.
3. Score, after the gameplay session ends, the system displays the players' final score based on their performance during the game.
4. Exit, this menu option is used to exit the game. When players select this option, the game ends without proceeding to the next stage.

2.2 Flowchart

The flowchart is used to design the overall flow and components of the educational game "Math Land."

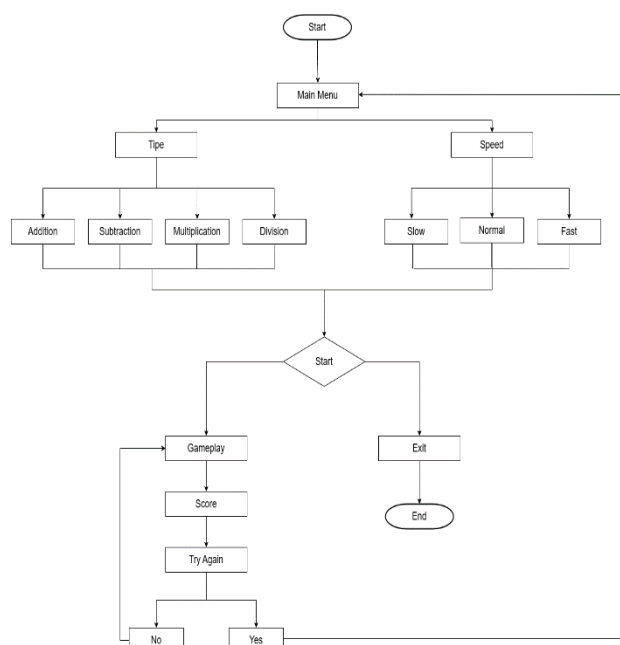


Figure 3. Flowchart

2.3 Activity Diagram

The activity diagram is created to design the flow of the educational game "Math Land." It also illustrates the interaction flow between the user and the system within the game.

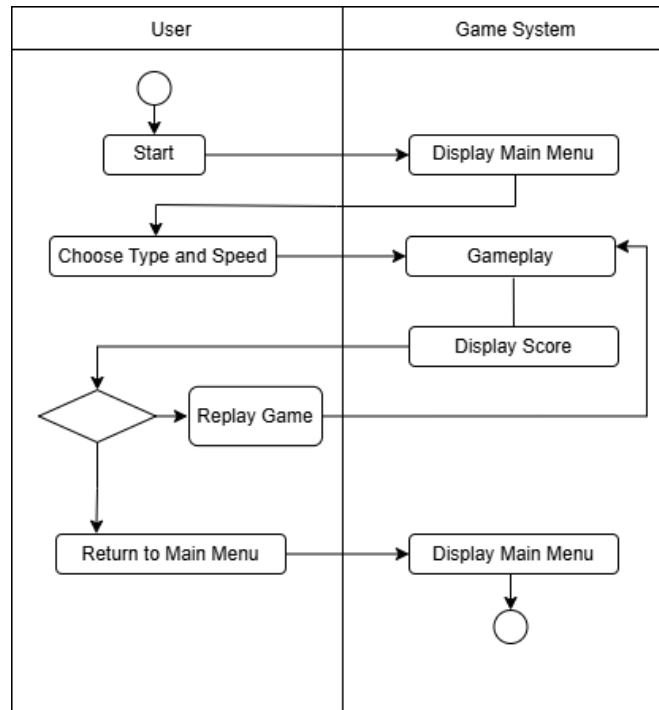


Figure 4. Activity Diagram

3. RESULT AND DISCUSSION

3.1 Analysis

The analysis results show that students need interactive learning media to help with understanding math problems. Additionally, it was found that students are more motivated by the use of game-based media.

3.2 Design

This stage aims to facilitate the game design process. The design process consists of three main steps:

1. Preparation of questions and materials, this is based on a thorough study of the core competencies in mathematics learning, focusing on questions that align with the curriculum.
2. Learning media design, this includes the main page with several menus, such as "Game Instructions" for usage guidance, "Play" to start the game, "Info" for additional information, and "Exit" to close the application.
3. Design of assessment instruments, the assessment instruments are designed to evaluate the effectiveness of the game in enhancing students' understanding of the material.

Here are some design views of the "Math Land" educational game:

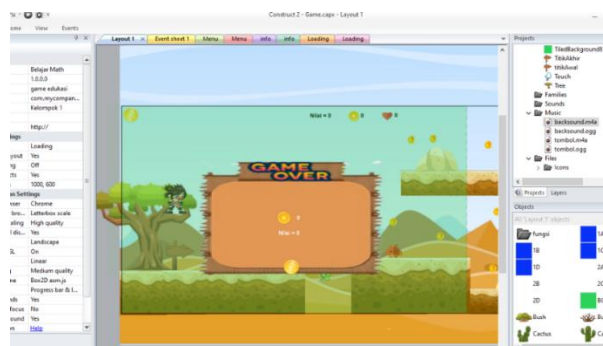


Figure 5. Layout 1

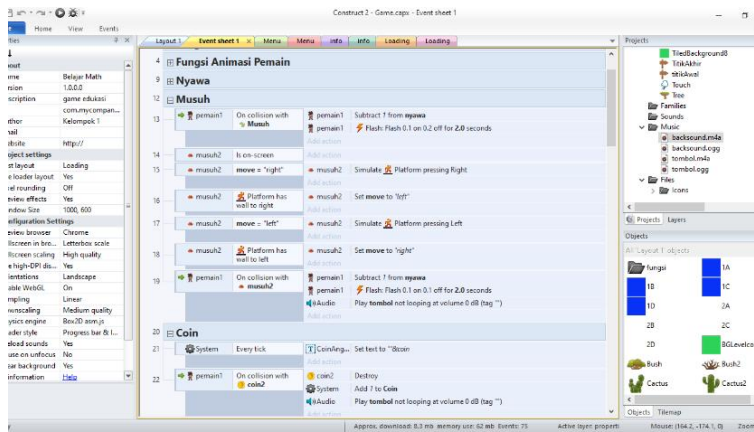


Figure 6. Event Sheet 1

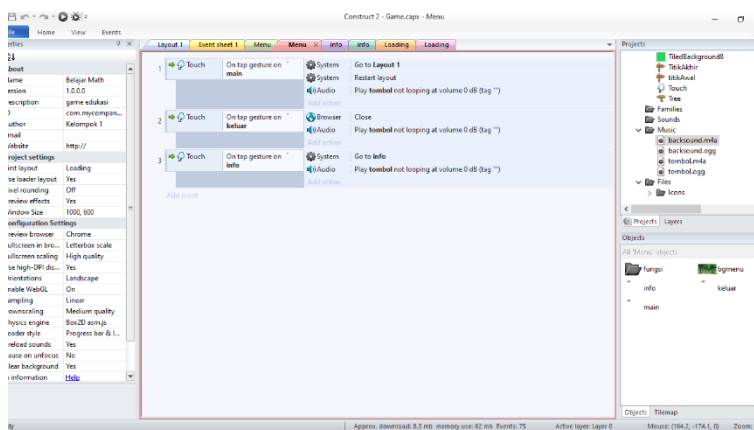


Figure 7. Event Sheet Menu

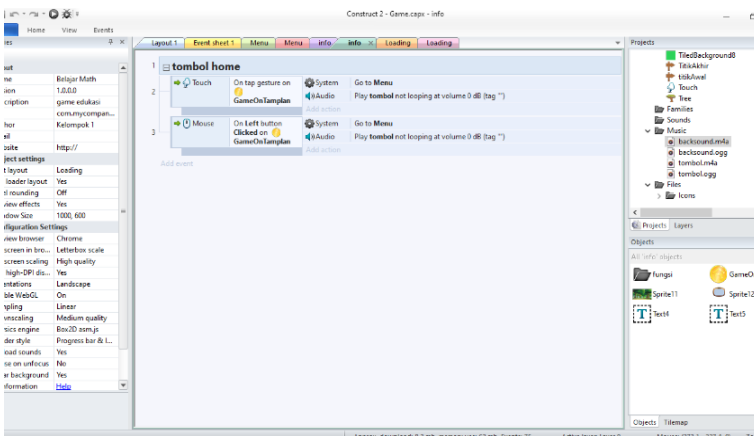


Figure 8. Event Sheet Info

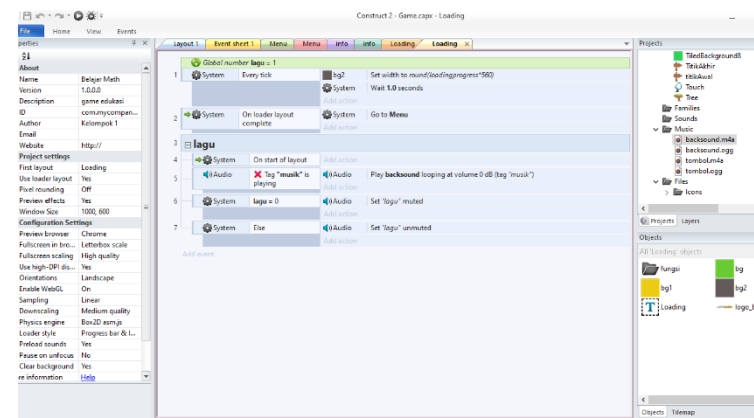


Figure 9. Event Sheet Loading

3.3 Development

The Development stage is where the game starts to be created based on the flow design that was prepared in the Design stage. The process of creating the Math Land educational game includes

- **Main Page**

The main page contains the game name, information about the game, game instructions, fraction material, and a play menu to start the game.

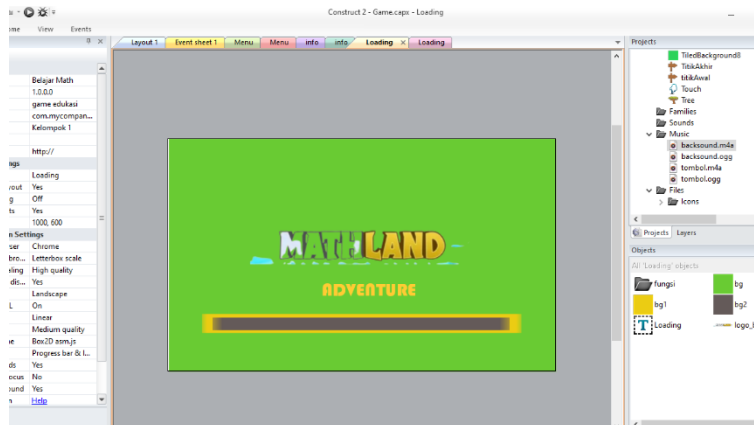


Figure 10. Main Page

- **Menu Display**

In the initial menu of the Math Land game, there are three main buttons: Main, Info, and Exit, designed with an attractive forest background, creating an adventurous atmosphere that invites users to start their math learning journey.

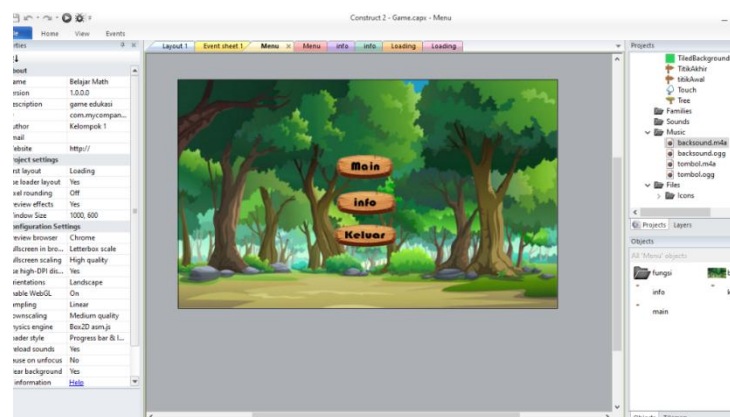


Figure 11. Menu

- **Info Display**

The Info page in the Math Land game displays information about the game's objective, which is to collect as many gold coins as possible.

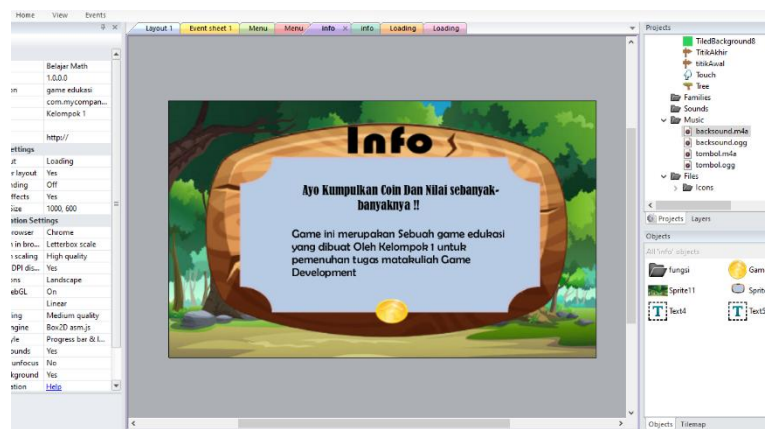


Figure 12. Info

- **Game Display**

The main gameplay screen of Math Land features a player character that can move, accompanied by game elements such as collectible coins, a health indicator, a score display, as well as platforms and obstacles that the player must navigate to complete the level.

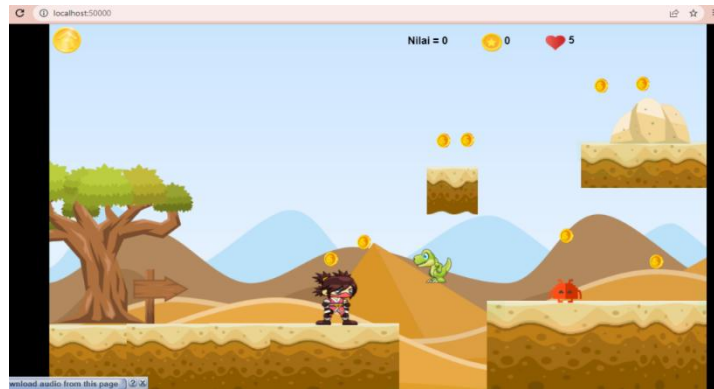


Figure 13. Game Display

- **Display for Correct Answer**

When the player successfully answers a math question correctly, the system will display a large green checkmark with a score of 100 as an indicator that the chosen answer is correct.



Figure 14. Correct Answer

- **Display for Incorrect Answer**

When the player provides an incorrect answer to a math question, the system will display a large red X as an indicator that the answer is incorrect.

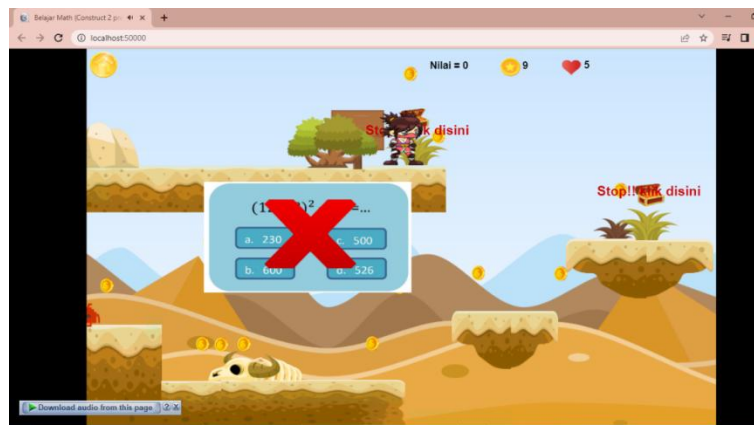


Figure 15. Incorrect Answer

- **Level Complete Display**
After the player successfully completes a level, the game displays a "Level Complete!" screen showing a recap of the player's achievements, including the final score and the total number of coins collected.

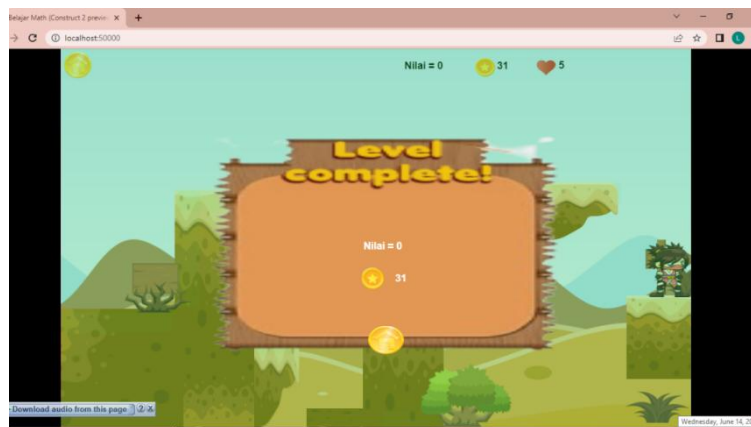


Figure 16. Complete Display

- **Game Over Display**
When the player runs out of lives (health points reach 0), the system will display a Game Over screen showing the total coins collected and the player's final score.

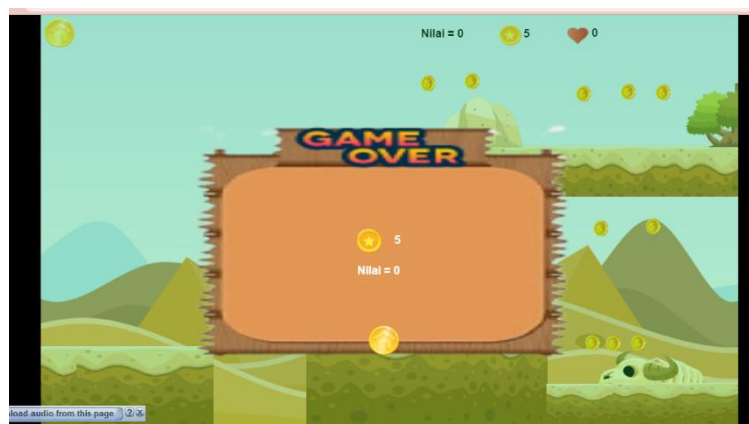


Figure 17. Game Over Display

3.4 Implementation

In the implementation stage, the developed game will be tested with users to measure the achievement of learning objectives and evaluate the benefits perceived by the users. The Math Land educational game is expected to become a solution in providing an interactive and user-friendly math learning medium.

3.5 Evaluation

In the evaluation stage, the researcher conducts black box testing to ensure the game's functionality operates as designed. Based on the evaluation results, revisions are made to the media, referring to user feedback, including the addition of question variations and improvements to the title design to make it more intuitive and less confusing for users.

4. CONCLUSION

Based on the research and development results of the Math Land Educational Game, several conclusions can be drawn as follows.

1. The Math Land Educational Game was successfully developed using the ADDIE method (Analysis, Design, Development, Implementation, and Evaluation), resulting in a product that meets the needs of math learning.
2. The implementation of this educational game offers an alternative learning approach that is both educational and entertaining, allowing children to learn math without feeling burdened, while also providing added value for parents in supporting their child's learning process.

3. The use of multimedia elements such as animation and sound effects in the game has proven to be effective in increasing children's/students' interest in learning, creating a more interactive and enjoyable learning experience.
4. The Math Land Educational Game has successfully become an alternative, flexible, and enjoyable learning media solution, supporting the improvement of math learning quality in line with the development goals.

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