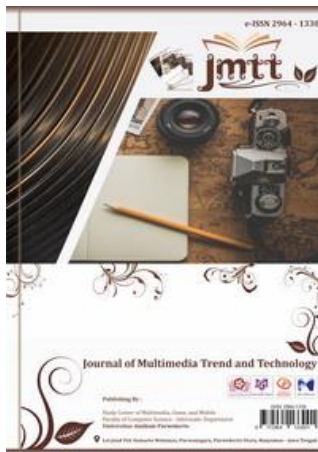


Learning Model for Practicing Counting Through the "Snake and Ladders" Game Method

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ABSTRACT

The discussion of this paper aims to design and build educational games to train children's numeracy skills in the process of addition and subtraction. Problems occur when children have difficulty understanding, especially in numerical logic. In previous research, it was said that learning for special children at pre-primary school age would be better understood if a game was inserted. Learning to count is the basis for children to have numerical abilities. The method used in making this educational game is Classic Waterfall. With several stages, the results include the use of these games are early childhood. The system development stage includes a Concept that shows the steps of the game here the author makes a snake and ladder single-player game with 50 boxes, the dice in the game are rolled randomly, then the design uses a navigation structure design with a hierarchical storyboard design model. Then at this stage, the feasibility test through Alpha Test and the beta test has been distributed. This game can be done on an Android smartphone via Bluetooth for data transfer.

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INTRODUCTION

In everyday life, we often experience the process of counting, from small things to big things we often do calculations. Examples in real life in the sales transaction process. History shows that mathematics is needed by humans. Therefore, the basic concepts of mathematics including counting that are learned in Kindergarten / Early Childhood Education are the basic concepts of learning to count so that in time children will be better prepared to follow learning to count at the next level which is very necessary to get to high school[1].

From an early age, the ability to count is called initial numeracy ability, namely the ability that every child has to develop his abilities, the characteristics of his development start from the environment that is closest to him, in line with the development of children's abilities can increase to the stage of understanding numbers related to addition and subtraction[2].

Counting exercises are given in stages, starting with counting objects or concrete experiences experienced through observing the natural surroundings. Knowledge and skills in arithmetic exercises are given in stages according to the level of difficulty, for example from concrete to abstract, easy to difficult, and from simple to more complex[3]. Counting exercises will be successful if children are given the opportunity to participate and are stimulated to solve their own problems. Counting exercises require a pleasant atmosphere and a sense of security and freedom for children[4]. For this reason, props/media are needed that are in accordance with the actual object (imitation), interesting and varied, easy to use, and not dangerous, such as using games, one of which is snakes and ladders game[5].

Today's games are much loved by children, but unfortunately, most of the games that are circulating and are well-known today only highlight their benefits and purposes as a medium for entertainment. Like online games, which currently have many users, from children to adults[6]. Online games are games where the way to play is connected directly to the internet network. These online games are very broad, in fact, what makes it fun to be able to play with friends in the world[3]. However, if you play it excessively, it can have a negative impact, which will reduce socialization with others[7]. Online games can be addictive to those who want to keep playing them, so they will spend a lot of time just playing games. The result is that there is no sense of playing with other children, and they feel they don't care about those around them because they are already focused on the game[8][9].

Until now, the use of games has begun to develop, many of which use games as learning media (educational games). Previously, it will be explained about educational games[7]. In the previous theory, it has been argued in translation that actually, without realizing it, games can teach many skills and games can be used as an educational alternative[10]. The use of educational games as an alternative to the learning process is of course very good because it is considered good and positive, in accordance with the research conducted with this educational game, children are more enthusiastic and motivated to learn because children are invited to learn by playing so it does not cause boredom in children. The functions of educational games are as follows[11]:

1. Providing knowledge to children through the learning process of playing while learning;
2. Stimulate the development of intellect, and creativity and language in order to foster a good attitude, mentality, and morals;
3. Creating an attractive playing environment, providing a sense of security and fun;
4. Improving the quality of children's learning.

The purpose of this game of snakes and ladders is to provide learning motivation for students to always learn or repeat material that has been previously studied which will later be tested through games, so that early childhood feels fun[12]. Based on observations that researchers found in the field, precisely in the process of learning to count, it can be seen that children do not understand simple concepts in everyday life, especially in counting, children are less able to connect between the concept of numbers and symbols of numbers, sort and pair the number of objects with numbers, so that the expected indicators not yet reached. This is because the teacher (often) requires children to count rote, but ignores the child's ability to recognize symbols and the concept of numbers, the media used is still simple, there is no development, the methods used are also not varied[13], so that children's numeracy skills do not develop. By using a game engine, with this software we can make games that are fun. Because this game developer is very easy to use, with a GUI that makes it easy for us to edit and create scripts to create a game[14].

METHOD

In this model development method, the author uses the classic waterfall method. This method is considered easy to manage game projects[15]. The following steps will be carried out:

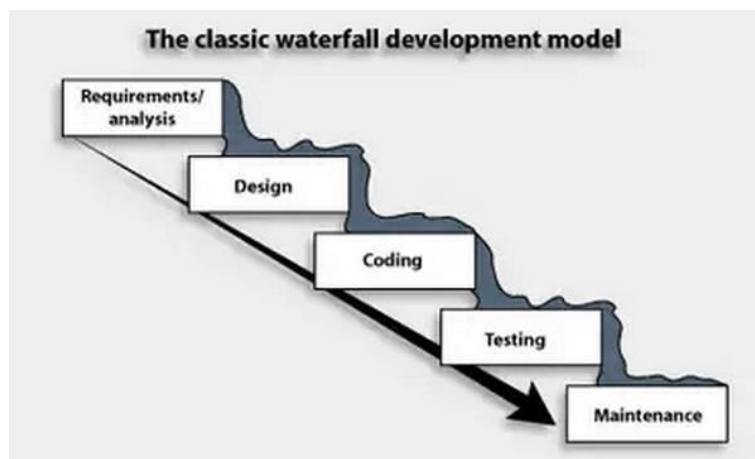


Figure 1, Waterfall Classic Method.

1. Needs analysis is the stage to find out how much is needed for the development of this model. The end program's goals and users influence game play. Application development also needs to be considered because it can affect the making of the design. The theme, and purpose of making educational games as a counting exercise.
2. Design is the stage of making specifications regarding program architecture, style, appearance, and material or material requirements for the program. The specifications are made as detailed as possible so that in the next stage, namely collecting and assembling materials, new decision-making is no longer needed, it is enough to use the decisions that have been determined at this stage. Even so, in practice, project work in the early stages will often experience adding materials or reducing application parts, or there may also be other changes.
3. In this stage, the design of the appearance of the educational game as a learning media for numeracy is carried out which includes storyboard design and navigation structure design. To describe the design of each scene, storyboard design, and layout design must be made, as well as user requirements specifications.

4. Coding is the stage after collecting materials according to the needs being worked on. These materials include design drawings, audio, and others which can be obtained free of charge or by ordering from other parties according to the design. This stage can be done in parallel with the assembly stage. However, in some cases the material collecting stage and the assembly stage will be carried out in a linear and not parallel manner. In this stage, material is collected for the manufacture of educational games as learning media for starting counting exercises.
5. The testing phase is after completing the assembly stage by running the application/program and being able to see whether there are errors or not. The first stage at this stage is called the alpha testing stage (alpha test) where the test is carried out by the manufacturer or the manufacturing environment itself. After passing the alpha test, beta testing involving end users will be carried out using a questionnaire.
6. At this stage the application will be stored in a storage medium. If the storage media is not enough to accommodate the application, compression of the application will be carried out. This stage can also be called the evaluation stage for product development which has also gotten better. In addition, you can use the .APK platform as a data transfer medium through PC (Personal Computer) devices and Mobile Apps.

RESULT

Snakes and Ladders educational game is a board game for children played by two or more people. The rule is that players will try to be the first to reach the last box, here the author makes a single-player snake and ladder game with 50 boxes, if the player can answer the questions provided on the game board and make it to the finish then he will be the winner. How many square moves the player gets is determined by the result of the dice. In certain boxes, there will be snakes and ladders. If the player stops at the box with the ladder, then the player will go up to the box at the end of the ladder. Conversely, if the player stops at the box with the snake's head, the player will go down to the box where the snake's tail is.

The dice in the game are shuffled randomly. The player is declared successful in completing the game if the dice numbers match the number of boxes remaining in the game. For example, if the player is in box 46, and finishes in box 50, the number of dice that must come out to finish the game is 4. The condition for winning the game is that the player must be able to finish the game to the finish. While the second game is addition and subtraction from 1-50, where this player is to train children's numeracy skills, especially the ability to count and interact. Besides having to think quickly through counting addition and subtraction, this game is also very good for training children's motoric systems to be able to think quickly, precisely, and responsively.

Layout is the design or scene that will be displayed later on the smartphone. The results of the layout design will become a reference in making the display at a later stage as shown in Table 1: Summary Layout as follows.

Table 1, Layout Concept

#	Layout	Description
1	Main course	Is a layout that contains 6 buttons from the virtual reality solar system application, namely the sun, solar system, planets, other celestial bodies, about and out
2	Play	This is the menu display for playing Snakes and Ladders which has a dice button and a back button.
3	Question	Is a layout that contains question and answer questions that must be filled in by players.

4	Succeed	Is the layout when the player is declared successful through the challenges given.
5	Try again	Is a layout when the player fails and is given the opportunity to repeat the challenge given.
6	Help	It is a helpdesk display layout to help players by giving game instructions to instructions for solving the problem challenges.
7	About	Is a menu for the description of the designed game manager.
8	Logout	Is a button to exit the application.

Then proceed with the concept of game navigation. The navigation structure serves to clearly describe the relationships and work chains of all elements that will be used in the application. With the description of the navigation structure, making an application can be systematic and easy. The design of the navigation structure in Snake Game using Unity, includes:

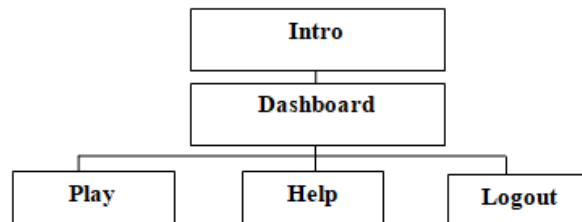


Figure 2, Game Navigation Structure

The Coding stage is the stage where all multimedia objects or materials are made. Game creation is based on the design stage. This stage is the stage of making all multimedia objects based on the designs that have been made before. The software used for this stage is Unity and the program scripts used are Javascript and C#.



Figure 3, Dashboard Layout.



Figure 4, Main menu on Game Apps.



Figure 5, Page of challenge.

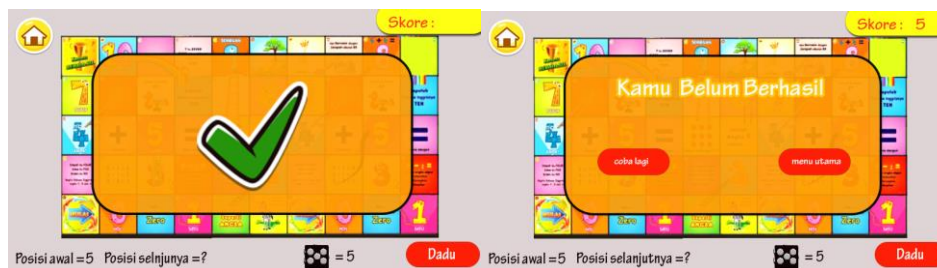


Figure 6, Mission Result.

Testing is the stage of testing the finished program. Testing needs to be done to find out deficiencies or errors that may occur. If there is an error, the game will be corrected, and if it is running well, the process will enter the next stage, namely distribution. The goal of the first test on the Alpha test is to identify and eliminate as many problems as possible before finally reaching the user, carried out after the game has been made. In this test, the quality of educational games is seen. If there are still deficiencies and errors, then immediately correct the part that is still considered inappropriate. From the design that was made 90% were not constrained by errors.

Tests carried out with the questionnaire method. Testing is done by the users. In this test, it is seen that the quality of the game is in accordance with what is expected by the user or not. This test was also carried out to get feedback from users about the ease of operating the program and its appearance and how beneficial this game will be for them. There are 7 aspects proposed to respondents and will be calculated using a Likert scale with the following conditions:

Table 2, Testing Aspect

Scale	Score	Description
Strongly agree	4	<i>Game has more performance than expected</i>
Agree	3	<i>The game has performance as expected</i>
Disagree	2	<i>The game has performance that is not as expected</i>
Strongly Disagree	1	<i>The game has very poor performance as expected</i>

Table 3, Result testing by responden.

Respondent Number	Aspect						
	1	2	3	4	5	6	7
Player 1	3	4	4	3	4	4	3
Player 2	3	3	4	4	3	4	3
Player 3	3	3	3	4	4	4	3
Player 4	3	4	4	4	3	4	3
Player 5	3	3	4	4	3	4	3
Player 6	3	3	3	3	3	4	3
Player 7	3	4	3	4	3	4	3
Player 8	3	4	3	3	3	4	3
Player 9	3	3	4	4	4	4	3
Player 10	3	3	4	4	4	4	3
Player 11	3	3	3	3	3	4	3
Player 12	3	3	3	3	3	3	3
Player 13	3	3	4	4	3	4	3
Player 14	3	3	3	3	3	3	3
Player 15	3	3	4	4	4	4	3

Table 4, Final assessment results.

Aspect	Index	Category
1	75 %	Strongly agree
2	86,6 %	Strongly agree
3	88,3 %	Strongly agree
4	90 %	Strongly agree
5	83,3 %	Strongly agree
6	96,6 %	Strongly agree
7	75 %	Strongly agree

From the results of Tables 3 and 4 it shows that the final results of testing the Snakes and Ladders Game can be taken on average by the Index formula as follows:

$$(75 \% + 86.6 \% + 88.3 \% + 90 \% + 83.3 \% + 96.6 \% + 75 \%) / 7 = 84.97 \%$$

So the average Index formula of the respondents is 84.97%, so it is in the very agree category.

Furthermore, after the snake and ladder game has been tested, the next stage is application distribution. The results of this evaluation can be used as input for the

concept stage of the next product. This stage can also be called the evaluation stage for product development which has also gotten better. In addition, you can use the Playstore media or APK application as a data transfer medium via PC and mobile devices.

CONCLUTIONS

From the problems and discussion in the previous chapter, the conclusions obtained are as follows, (1) An educational game has been successfully made as a medium for learning to count in early childhood. (2) The results of the feasibility test through the Alpha Test show that the course of the educational game is as expected. Then the results of the feasibility test using the questionnaire method on average the index formula reached 84.97% strongly agreed, so most stated that this game was feasible to use as a learning medium.

Educational games to train children's numeracy skills are still not perfect. Therefore, it is necessary to do a lot of further refinement and there is still much that needs to be added to this game, including namely, the material presented does not only focus on addition and subtraction, but also other material regarding practicing counting, then for further research it is hoped that there will be an increase from in terms of making games with the latest software and techniques to make it more interesting.

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