

DEVELOPMENT OF THE SNAKE LADDER MATH GAME ON FRACTION MATERIAL IN CLASS IV

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Abstract

The aim of this research is to determine the feasibility of the Snake Ladder Math Game on fraction material in class IV. This research uses the Research and Development (R&D) method with the aim of determining the feasibility of a product that has been made. The steps used in this research are Analysis, Design, Development, and Evaluation. This research has only reached the product development and validation stage with expert validators and has not yet reached the testing stage. This research uses quantitative data to see the feasibility of the product from expert assessments and also uses qualitative data from suggestions, input, criticism from validators through the questionnaire provided. The data collection technique uses a media and material expert validator assessment questionnaire to determine the feasibility of the Snake Ladder Math Game development product. The results of this research show that the validation percentage results from validator material expert 1 was 84.09% and material expert 2 was 81.81%. The percentage results for media expert 1 were 80.76% and media expert 2 was 88.46%. The average assessment of material experts is 82.95% and the average assessment of media experts is 84.61%, indicating that this category is Very Good. This shows that the Snake Ladder Math Game is suitable for use in learning fraction material in class IV.

Keywords: Learning Media, Development, Fractions at

INTRODUCTION

Every human activity is not free from various problems in daily life, these problems can originate from within themselves and the surrounding environment. Every problem must find a solution. Looking at these problems, it is necessary to have problem solving abilities as a basic human action to survive. Problem solving abilities can improve decision making in daily activities. Problem solving abilities can be obtained from the subjects at school. One of them is mathematics subjects. In mathematics lessons, students must be able to master problem-solving skills and be able to make decisions. These problems can be in the form of questions or assignments that can be understood and must also be challenging and capable of taking appropriate steps for students to complete (Harefa & La'ia, 2021).

The teaching and learning process in mathematics subjects in elementary schools must take place optimally so that learning objectives can be achieved. One way to achieve this success is by implementing optimal learning methods, strategies and models. Apart from that, the teacher's skills in planning and implementing learning media are the main essence of the success of the learning process.

However, in reality, there are still many students who think that mathematics is difficult to understand and feel bored while studying. In the 2022 PISA (Program for International Student Assessment) data, Indonesia got a score of 366, lower than Singapore which got a score of 575 (PISA, 2023). Feelings of boredom and fear in understanding the material have an impact

on the lack of problem solving abilities in the form of story questions. In general, the mathematics learning experienced by students only uses existing formulas, only a few questions are in the form of narratives or stories (Septianingtyas & Jusra, 2020). And learning is still conventional or teacher-centered. As the era develops, learning is less interesting for students and teachers also do not make maximum use of technology (Hernawan & Setiawan, 2021; Atmojo, S. E., Rusilowati, A., Dwiningrum, S. I. A., & Skotnicka, M. 2018). The teacher's lack of attention in packaging learning media as a means of supporting the delivery of material causes students to feel bored and makes students not focused on learning.

The right learning media for the character traits of elementary school students is media that can be combined with games. Learning media is able to guide and increase students' attention so that it can foster learning motivation and students can focus more on the material being presented by the teacher. The process of selecting the type of media must be based on the character of students who like to play and are active (Atmoko et al., 2017; Atmojo, S. E. 2018). One media that fits these characteristics is game media. With game media, it is hoped that students will be able to get pleasure from it without any coercion. Apart from that, the game is expected to provide real experience and help students improve their problem-solving abilities in the form of story questions.

Based on the results of observations made at SDN Sindang II and SDN Jatihurip, the teaching and learning process still uses conventional learning or learning is still centered on the teacher as the provider of information. Teachers often provide examples of mathematics problems so that students can better understand the material, but this makes students rely more on the teacher or ask for help in the learning process, especially in mathematics lessons. (Hernawan & Setiawan, 2021). This occurs

due to teachers' lack of attention to media needs in several mathematics learning materials, especially fractions. The impact of these problems causes students to have difficulty relating mathematical knowledge and difficulty in solving mathematical problems in the form of stories.

This problem is in line with Adita and Irfan's opinion that students have difficulty relating the mathematical knowledge they learn to everyday situations and also lack practical experience in solving real problems or problem contexts that are not directly related to their daily lives (Safirah & Abdillah, 2011). Other research conducted by Amalia, et al. (2019) said that in learning mathematics, students have difficulty solving math problems in the form of stories and are still weak in determining what is known and asked in the questions. Story questions that are considered difficult can make students feel anxious. This difficulty is based on a lack of practice in solving story problems. Because of this, students become inactive when answering fraction material. Even though teachers are very important and are the spearhead in making mathematics learning interesting and fun through learning media.

One of the teacher's roles during learning is to stimulate students' thinking activities, by providing a problem that allows students to discuss and solve problems (Winaryati, 2018). The importance of problem solving skills is so that students are able to make quick decisions by taking the right steps. Problem solving can be said to be the heart of mathematics (Septianingtyas & Jusra, 2020). Mathematical problem solving abilities are very important for students not only to make it easier for students to learn mathematics, but in other learning and in everyday life (Novianti et al., 2020).

In line with research conducted by (Akhidah et al., 2023) that the snakes and ladders learning media can improve student learning outcomes because it can grow students' thinking abilities through practice

questions regarding the material contained. Snakes and ladders media can also increase student activity. Students become more active in the learning process, because students are required to be involved in the learning process (Islamy, 2023). According to Hastiwi, the snakes and ladders game media is a learning media that is student-centered, with students learning in small groups, helping each other, and discussing (Dynawantika et al., 2023).

Looking at this problem, a suitable solution is to develop learning media that is interesting and prevents students from getting bored in mathematics subjects, especially fractions. The media that will be developed by researchers is new compared to previous research. The media is called Snake Ladder Math Game. This media was created using two applications, namely figma and protopie. The Snake Ladder Math game contains story questions about fractions. Examples of fractional numbers include ordering fractional numbers, comparing fractional numbers, decimal fractions and percent fractions. The playing group spins to determine the outcome of the game's progress. The playing group must answer the questions correctly to be able to move forward. If another group is in the same place or is in a place where the question has already been answered, then that player spins again. This game also provides interesting animations that are liked by elementary school students and in this media there is also material about fractions.

By using the Snake Ladder Math Game media, students will not feel bored with mathematics subjects, especially fractional number material. This is caused by the active involvement of students in learning through the use of media, which aims to improve their thinking abilities in solving problems. Therefore, the use of learning media becomes very relevant for students during the learning process, because apart from providing benefits for students, it also makes it easier for teachers

and students in carrying out teaching and learning activities.

RESEARCH METHODOLOGY

This research uses research and development (R&D). The model used is the ADDIE model. According to Hasyim, the ADDIE development model is a simple and easy procedural model for creating a product that can be used in research in the short and ongoing term (Beta Rapita Silalahi, 2021). ADDIE is a development model that involves model development stages with five development steps/phases including: Analysis, Design, Development, Implementation, and Evaluation. However, this research is limited to product development design and validation with expert validators and has not yet reached the product trial stage with students. The following steps are used in this development, namely: 1) Problem Analysis, 2) Product Design, 3) Product Development, 4) Product Validation, 5) Product Revision (Lestari & Suciptaningsih, 2024).

The data used in this research is descriptive qualitative and quantitative data based on the results of expert validation through the questionnaire provided. The data collection technique used is using an expert validator assessment questionnaire to determine the feasibility of the product being developed. Data analysis through a questionnaire instrument by validators analyzed qualitative descriptions to revise the Snake Ladder Math Game product. Qualitative data was obtained from questionnaires, input, suggestions and criticism of the products being developed.

Quantitative data is obtained from the results of calculations from material expert and media expert assessments. The collected data will be processed by calculating the respondents' answers, then presented using the formula:

$$NP = \frac{R}{SM} \times 100$$

Information :

NP: Expected Percentage Value

R: Score obtained

SM : Maximum Score

To determine whether the product we make is suitable or still needs

improvement, it can be processed through qualification

Table. 1. Product Eligibility Criteria

Percentage	Qualification	Information
81-100%	Very good	No need for product revisions
61-80%	Good	No need for product revisions
41-60%	Enough	Revision
21-40%	Not good	Revision
0-20%	Very Not Good	Revision

(Source:Saverus, 2019)

RESEARCH RESULTS AND DISCUSSION

This development resulted in a product in the form of the Snake Ladder Math Game. The development stages of this SLM Game consist of four stages, namely Analysis, Design, Development and Evaluation.

1. Analysis

At this stage, an analysis of the need for developing learning media and also the feasibility of the learning media is carried out. The analysis stage is the initial stage in the development of the Snake Ladder Math Game. This stage identifies what aspects and elements are presented in the Snake Ladder Math Game. Components identified in the SLM game include guide features, game name, animation, game board, game characters, spinner, and questions according to the material. The snakes and ladders interactive game display presents each material in accordance with the learning objectives achieved. This stage identifies the facilities and infrastructure used in the manufacturing process, such as laptops and the software used, namely figma and protopie.

This stage is also carried out in analyzing what material is presented in this SLM game. The material presented in this SLM game is in accordance with the independent curriculum learning about fractions, decimals and percent.

2. Design

At the design stage, the product is designed. This product design stage starts from mapping out the design, such as creating a wireframe and the contents of the SLM game which is developed in accordance with the needs analysis that was carried out at the initial stage. Products are developed in accordance with the material and needs of students as users of this product. The target users of this product are teachers and students who are studying fractions, decimals and percentages or in grade IV elementary school.

3. Development

This stage contains the product creation process using the figma and protopie applications. The wireframe or design that has been made previously is delivered into a product in the form of the Snake Ladder Math Game. Products that have been developed are then tested by experts and users.

4. Evaluation

The evaluation stage in this research was carried out to provide feedback to product users, so that the product results that would be achieved could be seen to determine improvements and feasibility of the Snake Ladder Math Game product. Evaluation is carried out to measure the achievement of development goals. The evaluation stage is the final stage of developing the Snake Ladder Math Game product. At this stage you can also see the

weaknesses of the product being made. The evaluation stage is carried out based on suggestions from media experts and material experts, so as to find out whether the SLM game product is categorized as suitable for use in learning fraction material.

The result of developing the Snake Ladder Math Game is a digital game in the form of a traditional game, namely snakes and ladders. This game can be accessed via laptop, computer, Android or iOS smartphone and consists of 5 pages. The appearance of the Snake Ladder Math Game is as follows:

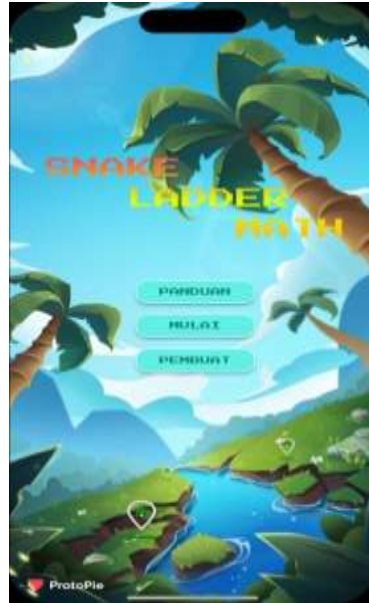


Figure 1. First page

Figure 1, shows the first page of the Snake Ladder Math Game product. There is an interesting background, like exploring the forest where snakes live. Blue represents intelligence. The start page

contains the game title, button features such as a guide button, a start button to start the game and move to the next page, and a builder button.



Figure 2. How to play

Figure 2, shows a guide on how to play. When you click the guide button on the first page, a guide on how to play or

steps to play will appear. This game is played by a minimum of 4 players.



Figure 3. Manufacturer information

Figure 3, displays product manufacturer information. When you click the maker button on the first page, the

maker's information will appear. This information includes the name of the maker and the name of the maker's college.



Figure 4. Second page

Figure 4, shows the second page of the Snake Ladder Math Game product. There are several interesting and self-moving animations. On this page there is

also material on fractions, decimals, and percent as well as a back button to return to the previous page



Figure 5. Fraction material page

Figure 5, shows the fraction material page. When you click the fraction button on the second page, you will switch to the fraction material game page. This page has several interesting animations that can

move on their own. This page contains a snakes and ladders game board, characters in the game, and also a spinner to determine the steps forward in the game, as well as other button features.



Figure 6. Example of a fraction problem

Figure 6, shows an example of a fraction problem. The display is still on the same page, if the player has got the spinner results, then the player must answer the question correctly. If a player cannot answer a question correctly, then the player

cannot move forward and the question can be answered by another group. The game is played until one player reaches the finish line first. All the appearances and features of each material, such as the shape and how to play, are the same.



Figure 7. Answers to questions
 Figure 7, shows an example of an answer. The display is still on the same page, if you click on the letters a, b, c, and Table 2. Results by media expert validators

d in the question popup, the answer to the question will appear. All the appearances and features of each material, such as the shape and how to play, are the same.

Before	After	Suggestion
		<ol style="list-style-type: none"> 1. It would be best to position the instructions for use above "Start", to avoid the user immediately clicking start, because without reading the instructions first the user will experience difficulties in playing. 2. A "bug" occurs when the wheel is rotated many times, so that when you click stop, the wheel does not stop properly.



3. 3. It's good enough, just add animation

After making minor revisions to the Snake Ladder Math Game, the results obtained from expert validators can be presented in the following table:

Table 3. Results of material expert and media expert validators

	Evaluation	Average	Category	Information	
Material Validator	1	84,09%	82,95%	Very good	No need for product revisions
	2	81,81%			
Media Validator	1	80,76%	84,61	Very good	No need for product revisions
	2	88,46%			

Based on the table above, the material expert validator assessment results from validator 1 were 84.09% and validator 2 was 81.81%, then the average of the two validators was 82.95% in the "Very Good" category, meaning there were no revisions to the Game. Snake Ladder Math. The research results from media expert 1 were 80.76% and validator 2 was 88.46%, then the average of the two validators was 88.46% in the "Very Good" category, meaning there were no revisions to the Snake Ladder Math Game.

The development of the Snake Ladder Math Game is ready to be implemented in learning fractions at school because the product has been tested for feasibility by experts in the Very Good category. The Snake Ladder Math game has advantages such as having an attractive appearance, can be used on various types of digital devices, the material is in accordance with learning outcomes in the independent curriculum, and story questions can develop students' problem solving abilities.

Sourced from previous research regarding the development of the snakes and ladders game carried out by Dian, et al. (2022) development of snakes and ladders media on fractional material obtained an average percentage of 92% after validation by material experts, after validation by media experts obtained an average score of 90%, and obtained an average score of 89.14% after implementation validation by practitioners (teachers) based on this average, the media is included in the very high category. This research discusses operations for calculating fractions, while this research discusses fractions with the same denominator, fractions with different denominators, fraction comparison, order of fractions, decimals, and percent. Research conducted by Ismi Anggraini, et al. (2023) Snakes and Ladders media on fractional material with small group trials showed that the media obtained an average percentage of 96.42% and large group trials showed an average percentage of 93.19%, based on the percentage the media was in the very feasible category. In this research,

the product was made using several materials such as thick cardboard/bufalow and A4 size HVS paper, and 2x2 meter banner material, while in this research the product was made using applications called Figma and Prototipe. Other research conducted by Candra & Rahayu (2021), at the material expert test stage a score of 75% was produced in the good category, while the media expert test resulted in a percentage of 77% in the very good category. This research discusses material on whole number calculation operations and the target user is grade 2 of elementary school, while this research discusses material on fractions, decimals, and percent and the target user there is grade 4 of elementary school.

CONCLUSION

Based on the results of the development and research that has been carried out, it can be concluded that the results of the Snake Ladder Math Game development product are very suitable for use in learning class IV fraction material with learning outcomes in accordance with the independent curriculum. This product contains material about fractions, namely fractions with the same denominator, fractions with different denominators, fraction comparisons, order of fractions, decimals, and also percent. Product feasibility was obtained through a development process that involved assessments from validator lecturers as media experts and class IV teachers at SD Negeri Jatihurip and Sindang II as learning material experts.

The results of this research show that the validation percentage results from material expert 1 validator were 84.09% and material expert 2 were 81.81%. The percentage results from media expert 1 were 80.76% and media expert 2 were 88.46%. The average assessment of material experts is 82.95% and the average assessment of media experts is 84.61%, indicating that this category is Very Good.

Future research is expected to conduct field trials to see the level of

effectiveness of the Snake Ladder Math Game. Material in the Snake Ladder Math Game needs to be added, for example subtraction, addition, multiplication and division material in fractions, decimals and percent. Then add a score to the product if students can answer the questions correctly.

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