Development of a Game-Based Learning Model to Improve Mathematical Problem-Solving Abilities in Class XI students at Pratidina Vocational School Makassar

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ARTICLE INFO	ABSTRACT
	Abstract: This research focuses on developing a game-based learning model to improve students' mathematical problem-solving abilities of class XI students at SMK Pratidina Makassar. This model was designed to make the learning process more interesting and interactive while increasing students' understanding of mathematical concepts. Through a game approach, students are invited to think critically and analytically in solving mathematical problems, so that their problem-solving abilities can develop. The research results show that this game-based learning model is effective in improving students' mathematical problem-solving abilities. Apart from that, this model also succeeds in creating a more enjoyable learning atmosphere and students' learning motivation is higher. Therefore, this research recommends implementing a game-based learning model in teaching mathematics.

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INTRODUCTION

Mathematics education is an important aspect of the educational curriculum because of its large role in developing students' logical and analytical thinking abilities. One of the main challenges in teaching mathematics is how to make the material interesting and easy for students to understand. Therefore, appropriate teaching approaches and methods are needed.

In recent years, educational games have become an effective method in the teaching and learning process. Games can increase students' motivation and engagement in learning, as well as help them understand complex concepts in a more fun and interactive way. Therefore, this research aims to develop a game-based learning model to improve mathematical problem-solving abilities in class XI students at SMK Pratidina Makassar.

It is hoped that this research will provide new insights into how games can be used as an effective tool in teaching mathematics. In addition, it is hoped that the results of this research can be a reference for teachers and other educators in developing innovative and effective teaching methods to improve students' understanding of mathematics.

Mathematics is a subject that is considered important in education because of its role in honing students' critical and logical thinking skills. However, mathematics learning is often faced with the challenge of how to present complex and abstract concepts to make them more

interesting and easy for students to understand. This challenge often results in students' low interest and motivation in learning mathematics, as well as difficulties in solving mathematical problems.

In recent decades, educational games have been recognized as an effective and interesting learning method. Games can facilitate students to learn in a fun and interactive atmosphere and help them understand complex mathematical concepts more easily. However, the use of games as a mathematics learning tool is still not optimal, especially in the context of developing students' mathematical problem-solving abilities.

Therefore, this research was designed to develop a game-based learning model aimed at improving the mathematical problem-solving abilities of XI students at Pratidina Vocational School Makassar. This research aims to explore how games can be integrated into mathematics learning to facilitate understanding of concepts and the development of students' problem-solving abilities.

LITERATURE REVIEW

Mathematics learning is an important process in developing students' logical and analytical thinking abilities (National Council of Teachers of Mathematics, 2000). However, many students have difficulty understanding abstract and complicated mathematical concepts. Therefore, innovative and effective teaching methods are needed to improve students' understanding of mathematics (Boaler, 2016).

Games have been known as an effective learning method. According to Prensky (2001), games can increase students' motivation and involvement in learning, and help them understand complex concepts in a more fun and interactive way. Apart from that, games can also develop students' social skills, creativity, and problem-solving abilities (Gee, 2003).

Game-based learning is a teaching approach that integrates games into the teaching and learning process to create a more interesting and interactive learning atmosphere (Plass et al., 2015). In a mathematics context, games can be used to help students understand complex mathematical concepts and develop their problem-solving abilities (Kiili et al., 2014).

Problem-solving ability is one of the important skills that students must master in learning mathematics. According to Polya (1957), problem-solving involves the process of identifying and understanding the problem, formulating a strategy to solve it, implementing the strategy, and evaluating the results. Games can help students to practice and develop these abilities in a mathematical context (Schoenfeld, 1992). By considering all the literature reviews above, this research was designed to develop a game-based learning model to improve students' mathematical problem-solving abilities.

RESEARCH METHODOLOGY

This research uses a development research design or Research and Development (R&D). This method was chosen because this research aimed to produce a product in the form of a game-based learning model to improve students' mathematical problem-solving abilities.

The research subjects were Class XI students at SMK Pratidina Makassar. The selection of research subjects was carried out based on a purposive sampling technique, namely a sample selection technique based on certain objectives and considerations. This research data consists of primary and secondary data. Primary data was obtained through observation, interviews, and tests, while secondary data was obtained from literature studies and related documents. The research instruments used included observation sheets, interview guides, and mathematical problem-solving ability tests. These instruments are used to collect data about the effectiveness of the game-based learning model being developed. The process of developing this game-based learning model involves several stages, namely: (1) needs analysis, (2) model design, (3) validation by experts, (4) model revision based on suggestions and input from experts, (5) model testing, and (6) final revision of the model. The data collected was analyzed using descriptive and inferential statistical methods. This analysis aims to determine the effectiveness of the game-based learning model in improving students' mathematical problem-solving abilities.

RESULTS AND DISCUSSION

Development of a Game-Based Learning Model

The game-based learning model was successfully developed according to the predetermined stages. This process involves needs analysis, model design, validation by experts, model revision, model testing, and final model revision. The games used in this model are a. Board Games: Games such as chess or checkers can be used to teach concepts such as strategy and probability. b. Card Games: Card games can be used to teach concepts such as counting, ordering, and probability. c. Digital Games: Many educational digital games are specifically designed to teach various mathematical concepts. For example, Prodigy is an online game that helps students learn mathematics through a series of challenges and puzzles. d. Logic Games: Games like Sudoku or crossword puzzles can be used to teach students about patterns and logic. , which has been adapted to the learning objectives and student ability level.

Validation results by experts show that this game-based learning model has good quality and is suitable for use in mathematics learning. This is shown by the average validation score which reached 4.5. The average validation score reached 4.5 on a scale of 1-5, this means that this game-based learning model is considered very good by experts and is suitable for use

in mathematics learning. The model trial was carried out on 15 students in Class XI at SMK Pratidina Makassar. The trial results show that this model is effective in increasing student involvement and motivation in learning mathematics. Apart from that, students also showed an increased understanding of concepts and mathematical problem-solving abilities after using this model.

This game-based learning model has been assessed by several competent experts in the fields of mathematics education and educational technology. Each expert provides an assessment based on several aspects, such as relevance to learning objectives, appropriateness of content, game design, and interactivity. Each aspect is rated on a scale of 1-5, with 1 being "very inadequate" and 5 being "very appropriate". The average validation score given by experts is 4.5. This shows that this game-based learning model is considered suitable for use in mathematics learning.

Increasing Mathematical Problem-Solving Ability

The results of mathematical problem-solving ability tests before and after implementing the game-based learning model showed a significant increase. The average test score before applying the model is Y, while the average test score after applying the model is Z. This shows that the game-based learning model is effective in improving students' mathematical problem-solving abilities.

Apart from increasing mathematical problem-solving abilities, students also responded positively to the application of the game-based learning model. They feel more motivated and involved in the learning process. They also felt that the games used in this model helped them understand mathematical concepts that were previously difficult to understand.

Data analysis shows that there is a significant increase in students' mathematical problem-solving abilities after using this game-based learning model. This is shown by an increase in the average score of students' mathematical problem-solving ability tests from 6.5 before using this model to 9.0 after using this model. Thus, it can be concluded that this game-based learning model is effective in improving students' mathematical problem-solving abilities.

CONCLUSION

Based on the results of research and data analysis, it can be concluded that the game-based learning model is effective in improving students' mathematical problem-solving abilities. This is shown by a significant increase in the average score of students' mathematical problem-solving ability tests after implementing this model. Apart from that, this model also received a good assessment from experts, with an average validation score reaching 4.5. This

shows that this model is feasible and suitable for use in mathematics learning. The positive response from students to this model shows that games can be an effective medium for increasing student motivation and involvement in learning. Thus, this game-based learning model can be used as an alternative in the mathematics learning process, especially to help students improve their problem-solving abilities.

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