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Application of Mountain Tread Traditional Game and Fibonacci Concept in Developing Creative Thinking in Geometry Learning in Elementary School

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Abstract

Background – The background of this research is based on the perception that learning geometry at the elementary school level is often considered monotonous and less interesting, due to the lack of varied teaching methods and the lack of material connection with students' daily lives.

Purpose – To increase students' interest in learning, creativity, and understanding, this research integrates the traditional Mountain Tread game with the concept of Fibonacci.

Method/Approach – With a qualitative approach, data collection was done through observation, interviews, and documentation during the learning process.

Findings – The results showed that the use of this media was able to improve students' understanding of geometric shapes and patterns, while stimulating their creativity in forming and exploring geometric patterns based on the Fibonacci concept. In addition to providing a fun learning experience and increasing students' confidence, this method also enriches innovation in learning based on local culture and modern mathematical concepts.

Conclusions – In conclusion, combining traditional games and the Fibonacci concept is an effective strategy in developing creativity and understanding of geometry at the elementary school level, with the advantage of keeping up with the times while preserving local culture.

Novelty/Originality/Value – The innovation of this research lies in the application of traditional media combined with contemporary mathematical concepts as an innovative solution in the geometry learning process.

Keywords: *geometry learning; creative thinking; modified mountain tread; fibonacci concept*

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INTRODUCTION

Education is very important in ensuring the survival of mankind. This statement is in line with what was stated by (Makkawaru, 2019) that education covers all aspects of life and guides individuals to choose and shape a dignified life. According to (Rahman et al., 2022) education is not just about conveying information but also to help individuals develop their potential in order to achieve a satisfying personal and social life. Quality in education also greatly contributes to creating individuals who are intelligent, have integrity, and are competent to compete in the era of globalization (Nurfarkhan & Farabi, 2024). Improving the quality and access to education is an important step to deal with scientific advances and increasingly fierce global competition. Thus, children, especially at the primary school level, need appropriate and quality education. Education at primary school level is the first formal level that will determine the direction of students' potential development. In the educational process at the primary school level, there are various types of subjects, one of which is mathematics.

Mathematics is a science that has an important role in human life. According to (Van den Heuvel-Panhuizen & Drijvers, 2020) Mathematics is a human activity. This can be interpreted that everything in human life, including all daily activities carried out, cannot be separated from mathematics. Mathematics makes an important contribution to 21st century life, because every individual utilizes it in various aspects of their lives (Utami & Pramudiani, 2024). According to (Sumartini, 2016) and (Dewi & Saharuddin, 2024), learning mathematics not only supports students in understanding mathematical concepts more deeply, but also encourages the development of critical and creative thinking.

Creativity is one of the important provisions that students need to have to achieve academic success (Wibowo et al., 2020). Creativity is defined as a thinking process that combines ideas, imagination, and freedom of expression to explore new things and create innovative solutions that are relevant to the needs of elementary school students (Rosiana et al., 2024). Creativity includes 4C thinking, namely Critical Thinking, Creativity, Communication, and Collaboration (Nurhayati et al., 2024). On this occasion, the discussion will focus on creativity. Creative thinking is the ability a person has to produce a new, unique and innovative idea that can be used to solve problems and create something.

But in reality, the majority of students in elementary schools consider math as a subject that is difficult to understand, boring, and less interesting (Amanda et al., 2024). Especially in geometry subjects, because most teachers deliver geometry material with monotonous and less varied learning methods. So that students often face difficulties in understanding abstract concepts such as flat shapes, which require deep understanding and reasoning skills (Arnidha et al., 2022). As a result, students lose interest, inhibiting the development of creativity in exploring various shapes and variations of flat shapes.

At this stage, the approach through Traditional Mountain Tread Games and the Fibonacci Concept plays an important role. Traditional Mountain Tread games integrated with the Fibonacci concept can help learners to understand and explore more about flat buildings and develop learners' creativity in making shapes or patterns related to the Fibonacci concept (Arnidha et al., 2022). In addition, contextual learning through traditional games provides a relevant context for learners, helping them understand that math is not only in textbooks but can also be found in their daily lives (Serepinah & Nurhasanah, 2023). Therefore, this approach is very effective in improving learners' understanding and creativity in geometry and mathematical patterns.

The contribution of this research lies in demonstrating how traditional games can be innovatively integrated with mathematical concepts, particularly the Fibonacci sequence, to create meaningful and enjoyable learning experiences. This study provides new insights into the development of contextual learning strategies that not only strengthen students' cognitive

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understanding of geometry and mathematical patterns but also foster their creativity and cultural appreciation. Furthermore, this research contributes to enriching mathematics education by offering a model of integrating local culture into modern learning, which can serve as a reference for teachers, curriculum developers, and future researchers.

METHODS

This research focuses on elementary school learners' creative thinking skills in mathematics, using a traditional Jakarta cultural game, Mountain Tread (Figure 1), as part of the learning process specifically designed for grade IV learners. A total of 29 learners were enrolled in an elementary school located in South Bekasi. To maintain research ethics, the name of the school was changed to SDN-J II by the research team.

This research uses a qualitative method with a description approach. According to (Ayuni Bila Kartika et al., 2022) a qualitative approach produces descriptive data obtained from various sources, such as oral or written observations. Qualitative research focuses on the observation and study of natural objects, with the aim of understanding and interpreting phenomena through description, decoding, and understanding of context. This approach aims to explain phenomena, views, and behavior, and present them according to the reality in the field. Descriptive or narrative data is formed from the results of the researcher's exploration and interpretation of the social environment under study (Waruwu, 2024). According to (Muhammad Rijal Fadli, 2021) to facilitate understanding of a phenomenon, research aims to create new insights that can lead to other hypotheses. Qualitative research focuses on describing objects with a variety of methods, such as using documentation in the form of photos, videos, or taking detailed notes in the field. In this study, the analysis method used is an interactive analysis model. Which according to Miles and Huberman (2002) and (Rony Zulfirman, 2022) explains, there are three main components in data analysis, namely: data reduction, presentation, and conclusion drawing, all of which are done interactively. In order to avoid errors in data acquisition or data processing, steps are needed to check data validity. One technique that is often applied in qualitative research is tringulation.

The data of this study were taken from the results of observations made at an elementary school, which is located in the Jatiluhur area, Jatiasih District, Bekasi City, West Java in the 2024/2025 semester. In this effort, researchers applied the creative thinking skills of students through traditional mountain tread game in geometry material integrated with Fibonacci concept., following the planned steps, namely: 1) The preparation stage includes scheduling the research, arranging collaboration with teachers, and determining research subjects. 2) The implementation stage, in which the researcher begins to enter the field and functions as a data collector. The data collection method applied in this study is observation, where the instrument used is a written test that has been validated by a mathematics education expert before being given to students.

The results of the validation process showed that the questions in the written test were classified as good and feasible to be delivered to students during data collection. In addition, interviews were conducted with 6 students selected as representatives, and the results of these interviews were documented in the form of photos and videos as supporting evidence of the research. These three data collection methods aimed to ensure that the data obtained was comprehensive, including written responses as well as visual evidence. In the data processing stage, the researchers analyzed the data that had been collected by applying triangulation techniques. This process included results from field observations, interviews with respondents, as well as documentation obtained from photos and videos to formulate conclusions regarding the research findings. Assessment of creative thinking skills was applied to evaluate the level of creativity of learners.

RESULTS AND DISCUSSION

At the elementary school level, especially the lower grades, students have been introduced to the concepts of geometry. Therefore, to make this geometry material more interesting, a learning approach that is connected to cultural elements or can be connected to everyday life is needed. Geometry concepts that are abstract can be more easily understood by students if associated with things that students meet and experience in everyday life (Fauzi & Setiawan, 2020). One interesting approach is the integration of traditional games with mathematical concepts. This study aims to apply the traditional Mountain Tread games combined with the concept of Fibonacci in geometry learning to improve student creativity.

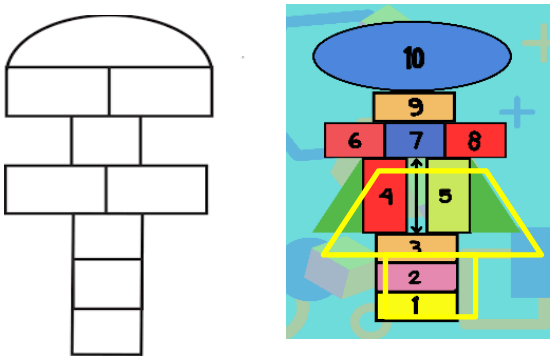

Figure 1. Mountain Tread before and after Modification

Mountain Tread, often known as engklek, is a traditional game that is quite popular in Indonesia, especially among rural communities (Widhyanto & Priambodo, 2024). The name of this game varies depending on the region. In Jakarta, this game is known as Mountain Tread, but in Java this game is known as Engklek and is usually played with several children or more. According to (Pipit Muliyah et al, 2020) and (Widyastuti et al., 2020) the traditional game of Mountain Tread is played individually by jumping using one foot on a flat plane drawn on the ground in the form of boxes, then the player jumps from one box to another.

Mountain Tread integrated with the Fibonacci concept explains that the Fibonacci pattern is generated by adding the two previous numbers in a sequence, starting from 0 and 1, resulting in a sequence of numbers such as 0, 1, 1, 2, 3, 5, 8, 13, and so on. Learners are given the opportunity to create abstract flat shapes from Mountain Tread according to their own imagination. After understanding the concept of Fibonacci, the researcher gave examples of the application of Fibonacci number patterns in flat shapes. For example, the number 2 + 3 = 5 is illustrated as a square, while the number 4 + 5 = 9 is depicted as a trapezoid (Figure 1). This explanation was done repeatedly with a variety of patterns to help students understand the relationship between Fibonacci numbers and geometric shapes.

Figure 2. Illustration of the application of the Modified **Mountain Tread** game

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Figure 2 shows an illustration of the modified Mountain Tread game that became the learning point in this study. Learners play the modified Mountain Tread game in groups. Before starting the game, learners hompimpa to determine which group will go first. Then, a learner representative throws a coin that must hit one of the flat shapes on the mountain tread. Next, learners jump without stepping on the flat shape that has a coin. After finishing, they return to the starting place. The teacher then marks two points using a mading pin in the area of the flat that has a coin. Finally, the teacher directs the learners to explore what flat shapes are formed from the two points that have been marked using mattress ropes and tape.

The modified Mountain Tread game not only provides fun but also trains students' creative thinking skills. In addition, this game can be used as a context for learning mathematics, especially in geometry. The concept of point, which is basic in geometry, can be taught effectively through this game. This can be seen in Figure 2, where learners are invited to identify geometric shapes on the modified Tread Mountain banner that has been laid out on the floor.

Figure 3. Learners explore the flat shapes on the modified **Mountain Tread** banner.

After the discussion, the learners were asked to work on written questions that had been prepared by the researcher. As shown in Figure 3, the research findings show that learners found various flat shapes in the modified Mountain Tread game. Among them, the shape of a jajargenjang, right triangle, square, and trapezoid. In addition, learners also managed to form additional flat shapes by applying Fibonacci addition theory. They created a modified version of Mountain Tread according to their own creativity.

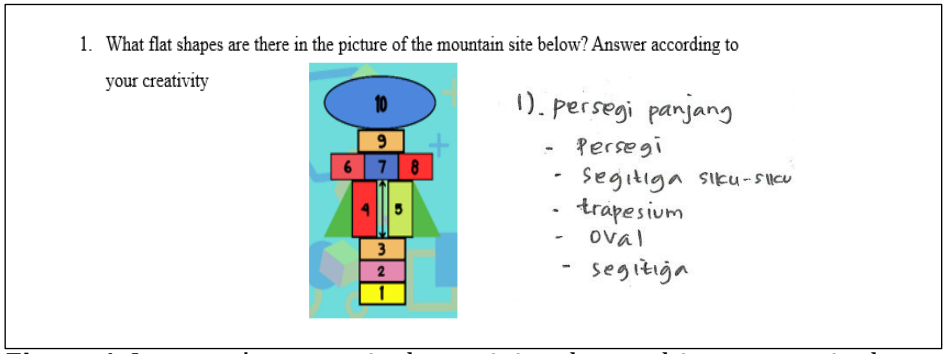

Figure 4. Learners' answers in determining the resulting geometric shapes.

Based on the students' answers in Figure 4, it can be seen that their answers are correct. With the modified Mountain Tread media, students can create and identify new flat shapes, such as right triangles, jajargenjang, and trapezoids. The average student shows good ability in answering questions and independent exploration. The interview results show that all students understand the basic concepts of flat shapes thanks to the application of the game, including direct experience with the modified Mountain Tread game.

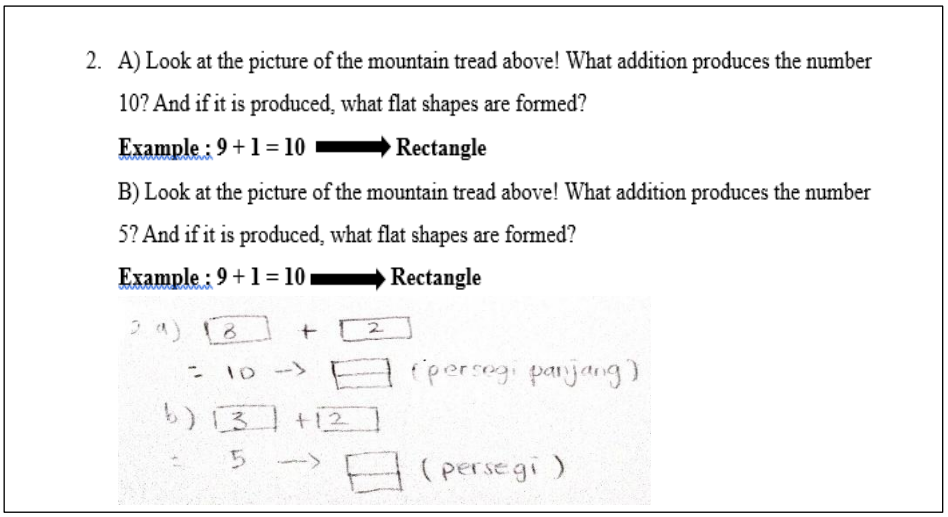

Figure 5. Learners' answers using the fibonacci pattern

Based on the students' answers in Figure 5, it can be seen that their answers are very good, they can understand the concept of Fibonacci which is integrated into Mountain Tread. they can unite and explore geometric shapes using the concept of Fibonacci.

The use of the modified Mountain Tread media linked to the Fibonacci concept significantly improved students' creative thinking skills. Results from written tests, direct observations, and interview data show that this media is effective in facilitating a deep and meaningful understanding of basic geometry concepts. Students become more confident in explaining and drawing flat figures, as well as applying Fibonacci patterns in that context. Before the application of the media, many students had difficulty understanding the material, but afterward, all students were able to explain and demonstrate a good understanding of geometry. They not only mastered the concepts theoretically but could also implement them in creative and innovative ways.

The integration of Mountain Tread media with the Fibonacci concept has proven to be able to increase students' interest in learning geometry material. Students feel more interested and enthusiastic because learning becomes more fun and relevant to local culture, as well as utilizing interesting mathematical patterns. With this approach, the learning process does not only focus on memorization, but also on developing creativity and problem-solving skills independently through the exploration of geometric shapes.

CONCLUSION

Based on the results of the research and analysis, it can be concluded that the application of the modified Tapak Gunung media and the integration of the Fibonacci concept is effective in improving the understanding, creativity, and interest in learning of primary grade students in geometry. This method provides a fun and meaningful learning experience, and is able to facilitate the exploration of geometric shapes and patterns independently and creatively. This

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success proves that learning innovation based on traditional games and mathematical patterns is a very effective strategy in achieving learning objectives at the elementary school level. The novelty of this research lies in the innovative combination of a traditional cultural game Tapak Gunung with the universal mathematical concept of Fibonacci. Unlike previous studies that generally focus only on contextual learning or the use of mathematical patterns in abstract form, this study uniquely integrates cultural heritage with modern mathematical concepts to create a holistic and engaging learning approach. This integration not only strengthens students' mastery of geometry but also enhances their appreciation of local wisdom, making mathematics more meaningful, contextual, and culturally relevant. Such an approach provides a fresh perspective in mathematics education and offers a replicable model for integrating cultural values with global mathematical knowledge.

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