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# Stem Approach to Recognition of Fractions with Traditional Anglek

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**Abstract.**
This research was conducted to find the easiest solution in mathematics lessons about fraction recognition. With STEM learning which is an acronym for Science, Technology, Engineering, and Mathematics, fractional material is integrated into it with traditional engklek (paying) media. Through a qualitative descriptive study with research subjects of 3rd-grade students at Tegalweru Public Elementary School, Dau District, totaling 23 people, the results were obtained by research: (1) development of design skills; (2) development of collaboration and communication skills; (3) improvement of cognitive abilities about fractions; (4) increasing obedience to rules; and (5) developing motor skills.

**Keywords:** traditional games, Engklek, STEM, fraction

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## 1. INTRODUCTION

Problems that often arise in learning mathematics are anxiety and concern that mathematics is difficult and complicated. The mindset that is often transmitted by the closest people about the difficulty of mathematics causes negative perceptions of mathematics. The relatively low numeracy ability is caused by several factors, one of which is teaching and learning activities that are less in favor of students or do not involve children's activities to be creative or have fun, resulting in a decrease in interest in learning.[1] This also happened to the fractional material introduced to grade 3 students, many of whom had difficulty accepting fractional material. Students have difficulty understanding something abstract, so the author tries to find the easiest approach in learning fractions.

Fraction recognition material is given in grade 3 where in this class, students' cognitive abilities are at the stage of concrete thinking operations.[2] This stage of concrete operations is at the age of 7-11 years, in this phase the logical way of thinking is based on the physical manipulation of objects, where there is difficulty in drawing logical

conclusions from special experiences. In this phase, the orientation of students is based on experiences that are specifically experienced by children, or it can be said that personal experiences are still formal and not yet concrete.

Based on the above theory, it is important for educators to find ways so that the learning provided provides a meaningful experience. Meaningful here can be interpreted as taking a fun learning role to provide students with an unforgettable experience. A fun experience for children is to play with their peers, both at home and at school. By playing indirectly children develop the ability to think, behave, and develop skills that are growing rapidly at this age. By taking advantage of this developmental period, the teacher takes advantage of developing the traditional engklek game media for the introduction of fractional material.

According to David Cram, Jeffrey L. Forgeng in [3] in their book Optimizing Multiple Intelligences for Early Childhood with Traditional Games, it is explained that the engklek game was played by children in Ancient Rome. Therefore, the engklek game has been in Indonesia since the Dutch colonial era. The term used is ”zondag-maandag”, where zondag means Sunday and maandag mean Monday. In the Indonesian dictionary, engklek means walking on one leg or jumping on one leg. The engklek game is played by at least two people. The way to play the engklek is to create a flat wake consisting of several interconnected flat shapes. Players will determine who will play first by agreement or drawing first. The player who wins the draw will go first by placing a ”geco” on the closest to the farthest field or in order. The player will be stopped if the foot hits the field line or moves out of the intended zone, thus the player will be replaced by the next player. The goal of the game is to get a piece of the flat that is built as private property if the player has completed one round. The ownership of this part of the flat shape is explored as an introduction to fractions for students.

In a previous study conducted by Khoirotul Badriyah which was written in an article entitled ”Improving Motor Skills and Math Logic through the Method of Traditional Games Engklek in Early Childhood” [4], it was explained that through engklek games performed on students, students could improve motor skills. and mathematical logic. This research was conducted with the subjects of kindergarten students, using action research methods, and data collection techniques by observation.

In research, the crank game can improve motor skills and can be combined with other subjects through STEM learning. STEM is an acronym for Science, Technology, Engineering, and Mathematics. (Pimthong and William in [5]. Meanwhile, according to Mark Sanders in [5], STEM learning is learning that links one or more subjects. According to Tsupros [6], Integrated STEM education is an interdisciplinary approach to learning in

which students use science, technology, engineering, and mathematics in real contexts that connect schools, the world of work, and the global world, thus developing STEM literacy that enables students to compete in the new economic era.

Winarni, Zubaidah, and Koes also explained in [7] that through the STEM approach it is hoped that students can grow creative, innovative, critical thinking, communication, and collaboration skills. Erdoğan, I & Ciftci, A explained in [8], that STEM learning places an emphasis on the learning process. The strategies in STEM include: (1) asking questions and formulating problems; (2) developing and using models and conducting investigations; (3) conducting analysis using mathematics, information technology, computers, and computational thinking; (4) building explanations and designing solutions and engaging in discussions; (5) concluding and evaluating. With the STEM approach, which uses a traditional hopscotch game in collaboration with mathematics about fractions, in addition to engineering or design, students are developed by depicting an umbrella crank (a circle divided into several parts by a number of game members).

The use of STEM learning from an early age is intended to build high-quality learning [9]. Through the STEM approach, teachers facilitate their students to develop themselves in several fields of study at once. Students are taught to look for connections between materials and analytical skills are one of the skills developed in the 21st century[10]. The carrying capacity of STEM learning in schools by utilizing existing facilities and infrastructure, there is no need to use expensive media to apply. Availability of school yard, chalk, and other materials available at school.

## 2. METHODS

This study used a qualitative descriptive research method in which this research was conducted to understand the reality or events experienced directly by the subjects in their research, then explained in a narrative of words based on the results of observations made during the learning activities to students. The research subjects were $3^{rd}$-grade students from Tegalweru Elementary School, Dau District, Malang Regency, totaling 23 students. Data collection techniques in the form of observation, interviews using data collection instruments in the form of observation sheets, student worksheets, and interview question sheets indirectly.[11] The participants taken were as many as 3 people who had difficulty understanding fractional material. The results of the research conducted were processed in a qualitative descriptive manner so that the resulting data can be used as a guide or description of the results in the form of conclusions and compiled into a research report.

## 3. RESULTS AND DISCUSSION

Based on the results of initial observations where students were introduced to fractional material, it appears that some students had difficulty understanding fractions from the pictures exemplified by the teacher. Students when asked to describe the fractions requested by the teacher are still not quite right, giving rise to a lack of confidence in learning mathematics. By playing the hopscotch game, several aspects can be obtained, including:

### 3.1. Design and Build Capability Development.

In this game, students are divided into several groups, consisting of at least two or more people. Then the group poles work together to design an umbrella crankcase model like the teacher's example. The group jointly determines the location, as well as the tools used to make the crankshaft flat design.

**Figure** 1: Student's activities in figuring the engklek.

## 3.2. Communication and Collaboration Ability Development

By doing hopscotch activities with the group, the collaboration will be established, where students are made aware that the hopscotch game cannot be done alone but needs collaboration with fellow group members. When drawing or during the game students will communicate, of course, the teacher as a bodyguard can provide direction regarding how to communicate well among group members. In these activities a fun game atmosphere will be created, where students are not aware that by playing these games indirectly the learning process is also involved. In the journal written by Gheny Aosi [12] entitled ”STEM Based Learning to Create Joyful Investigating Pumpkins for Mathematical Learning on Primary School” in 2019, it is explained that STEM learning will create a fun learning so that meaningfulness in learning will last a long time in the memory of students.

**Figure** 2: The student’s activity in playing engklek.

## 3.3. Improvement of Cognitive Ability About Fraction

An increase in fractional ability is observed when the game has been completed, at this stage, the teacher will conduct questions and answers regarding the results of the game. The possession field is a fractional statement that the player submits. Each group reports the gains of each member and then conveys them in the discussion. In a journal written by Jennifer Ward, et al in an article entitled ”Instructional Perseverance in Early-Childhood Classrooms: Supporting Children’s Development of STEM Reasoning

in a Social Justice Context", in 2022, it is explained that in STEM learning students can develop concepts the idea [13]. It is during the discussion that students can convey ideas or ideas regarding the activities that have been carried out, while other students can retrieve information so that knowledge transfer occurs.

### 3.4. Improvement of Positive Attitude

Character development obeying the rules developed in this game. Students agree on a number of rules in the game, such as: players will change if their feet touch the crankshaft line, geco comes out of the designated area at the time it is thrown, may not step on areas or areas that already belong to other members. These agreements are instilled in students, and if they are violated, it is their turn to be transferred to the next participant. By instilling these rules, students have a moral responsibility to uphold honesty and sportsmanship in the game. In the scientific journal "Social Connectedness in Physical Isolation: Online Teaching Practices That Support Under-Represented Undergraduate Students' Feelings of Belonging and Engagement in STEM" written by Ian Thacker et al [14] that STEM learning has a positive impact on a sense of belonging or caring.

### 3.5. Motoric Ability Development

In engklek games, students need good physical movement skills. Some students who are less active will begin to be motivated to take an active part in the game. The urge to win the game which is shown from the acquisition of the area is a motivation for students. Imam explained in [15] that motor skills depend on the experience of carrying out the movements he has mastered. It is also explained that there are 5 components, namely strength, speed, balance, coordination, and agility. In the game of hopscotch there is the repetition of movement, it requires balance because it is done with one foot, strength is needed because it has to repeat the movement, and coordination is needed through throwing geco and alternating leg movements. Kusmiati and Sumarno further explained in [15] that a smart child is a child who is able to combine his thoughts and body movements to achieve his goals.

## 4. CONCLUSION

Teachers need to design innovative learning so that what is conveyed to students can improve cognitive, affective, and (motor) skills. Utilization of traditional game media can

be used as an enrichment learning experience that is fun and has a positive meaning. Through learning experiences in games, students are unconsciously carrying out the process of solving problems when they have difficulty understanding fractions. Through the enrichment of learning experiences that are integrated with other subjects, it teaches students to convey positive ideas and ideas without being compartmentalized in one subject. This is the advantage of STEM learning.

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