



Analysis of The Maya Multiplication Method in Elementary School Mathematics Learning

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Abstract

The Maya numerical system is a unique base-20 (vigesimal) method that can serve as an alternative approach in elementary mathematics education. This study analyzes its effectiveness in enhancing students' understanding of number concepts and mathematical operations. Using an exploratory approach and limited experiments, this research examines how this method helps students recognize numerical patterns, perform calculations, and develop critical thinking skills. The analysis indicates that this method increases students' interest due to its visual and interactive nature. Additionally, students gain a broader understanding of numerical concepts through exposure to a different system. However, challenges arise due to structural differences and curriculum limitations.

Keywords: Maya counting method, mathematics, elementary school, number system, numeracy learning.

1. Introduction

Mathematics is a basic science that has an important role in various aspects of life, both in the fields of academics, technology, and daily life. One of the fundamental concepts in mathematics is multiplication, which is the basis for more complex mathematical operations such as division, ranking, and algebra. A strong understanding of the concept of multiplication is essential for students because these skills contribute to their ability to solve a variety of further math problems.

In the world of education, various multiplication methods have been developed to help students understand this concept better. Conventional methods commonly used today often focus on memorizing multiplication tables without providing a deep conceptual understanding. This causes many students to have difficulty applying multiplication to real-life situations or in more complex contexts. Therefore, a more innovative and conceptual understanding-based approach is needed so that students not only memorize numbers, but also understand how the multiplication process works.

One of the interesting methods of multiplication to study is the Mayan method of multiplication. The Mayan civilization, which flourished in Central America thousands of years ago, had a unique number system with a vigesimal base (base 20). This system is different from the decimal system (base 10) used in modern mathematics. Mayan multiplication techniques involve visual and symbolic approaches that can provide a new perspective in understanding the concept of multiplication. In some studies, this method has been studied as an alternative that can help students understand multiplication more logically and intuitively.

According to Brizuela & Schliemann (2018), number systems and multiplication methods from different cultures can enrich the way students understand mathematics. They argue that a different approach than conventional math systems can help students see the relationship between numbers more broadly and

develop better analytical thinking skills. In addition, Zaslavsky (1999) stated that studying mathematical systems from ancient cultures, including the Mayan method of multiplication, can increase students' appreciation of the diversity of mathematical concepts and provide a deeper insight into how numbers work in various contexts.

Based on a review of the existing literature, the analysis of the Mayan multiplication method in mathematics learning can provide benefits in improving students' understanding of the concept of multiplication. This article aims to examine the Mayan method of multiplication based on existing literature and explore its potential application in modern mathematics learning. By understanding this method in more depth, it is hoped that effective strategies can be found to integrate this technique in the mathematics learning curriculum to improve students' numeracy skills.

Despite its importance, the teaching of multiplication in many elementary school curricula tends to rely heavily on rote memorization of multiplication tables. While memorization can provide speed and accuracy, it often lacks the depth of conceptual understanding needed for flexible and meaningful application of multiplication in varied contexts. This traditional approach can hinder students' ability to transfer their mathematical knowledge to novel situations, solve real-world problems, or engage critically with mathematical content. Therefore, there is a growing need for instructional approaches that are not only effective in computation but also rich in conceptual depth.

In response to this need, educators and researchers have begun to explore culturally diverse mathematical systems as alternative pedagogical tools. One such system is the Maya multiplication method, derived from the ancient Maya civilization of Mesoamerica. Unlike the modern base-10 system, the Mayan number system is based on vigesimal (base-20) numeration and is visually represented through a combination of dots, bars, and shell symbols. The multiplication strategies used by the Maya involve symbolic manipulation and visual logic, offering students an intuitive and pattern-based perspective of mathematical operations.

The integration of non-Western mathematical methods, such as the Maya system, into contemporary education aligns with the principles of ethnomathematics—an interdisciplinary field that examines the relationship between mathematics and culture. According to scholars such as Brizuela & Schliemann (2018), exposing students to diverse mathematical traditions can enrich their understanding of numbers and operations by broadening their cognitive frameworks. Zaslavsky (1999) also emphasizes that learning from ancient mathematical systems not only enhances numeracy but also cultivates cultural appreciation and critical thinking.

Given the potential benefits of using the Maya multiplication method in modern classrooms, especially in elementary education, this article aims to provide an in-depth analysis of its structure, pedagogical implications, and possible integration into the mathematics curriculum. The study is based on a review of existing literature, supported by theoretical frameworks from mathematics education and ethnomathematics. Ultimately, the goal is to highlight how the Maya method can serve as a supplementary tool to promote conceptual understanding of multiplication, thereby improving both the engagement and competence of young learners.

2. Methodology

This research uses an experimental method. According to Sugiyono (2017), the experimental method is a research approach that aims to find the relationship between certain variables and other variables under tightly controlled conditions. Meanwhile, Suharsimi (2006) stated that the experimental method is a way to identify the cause-and-effect relationship between two factors that are deliberately created by researchers by reducing, eliminating, or controlling other factors that can interfere.

In general, this experimental research has several characteristics, namely:

1. The researcher manipulates free variables by providing treatment in the form of mathematics learning using methods/techniques such as Vedic Math, Mayan Tribe. This treatment is given to achieve the research objectives that have been set;
2. Control or control is carried out by adding certain factors that are considered relevant to the variables being studied;
3. After the treatment is given for a certain period of time, the researcher conducts observations or measurements to determine the impact of manipulation/treatment on the variables studied. This observation is carried out through test-based data collection.

3. Results and Discussion

This study aims to test the improvement of students' ability to solve mathematical multiplication problems in grade 5 elementary school students. The selection of samples in this study was not carried out randomly, but based on certain characteristics. Individuals in the experimental group and control group were selected by considering the similarity of characteristics so that the results of the study were more accurate in measuring the effectiveness of the methods used.

In this study, treatment was given during 10 meeting sessions. The evaluation was carried out by comparing the pretest and posttest scores of the two groups. Initially, a pretest was carried out to measure students' initial ability to solve multiplication problems. After being given treatment, a posttest was carried out to see an improvement in learning outcomes. A comparison of posttest values between the control group and the experimental group was then analyzed to determine the effectiveness of the method applied.

Treatment in Research: Simple Multiplication Techniques in the Maya Dynasty

The multiplication method applied in the experimental group was adapted from the calculation techniques used by the Mayans. This technique was developed to simplify the multiplication process in a more visual and intuitive way, so that students can better understand multiplication patterns without relying entirely on memorizing multiplication tables.

This method has been applied to several students who previously had difficulty solving multiplication problems. The results showed that students were more likely to understand the concept of multiplication and more motivated in learning. In fact, some students who were previously less confident in solving multiplication problems showed increased interest and confidence after being taught this technique.

By applying the Mayan-style multiplication technique, students are not only invited to understand the concept of multiplication in a simpler way, but also given a more interesting and fun approach. This is expected to increase the effectiveness of learning and help students achieve a better understanding of multiplication operations.

The steps to calculate multiplication in the Mayan style are as follows:

1. Let's say we want to multiply two numbers, $4 \times 2 = ?$ Because this is an introduction, the multiplied numbers are deliberately chosen which is easy first, but the concept is still possible.

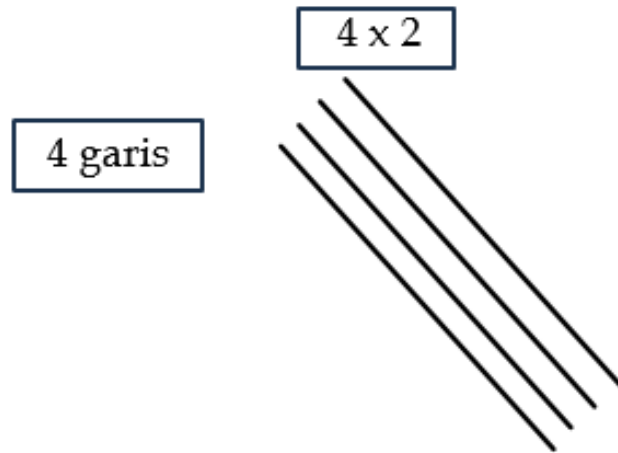


Figure 1. Multiplication Steps in the Maya Style

What is asked is 4 (four) times 2 (two). We first make 4 (four) slashes from the top left to the bottom right.

2. We make 2 (two) more slashes from the bottom left to the top right, intersecting with the line we made earlier. In order not to cause confusion, we just stipulate that the line creation is always from left to right.

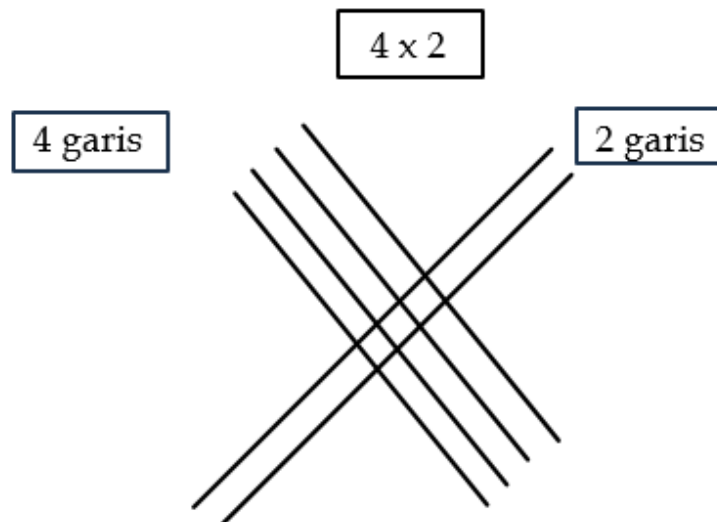


Figure 2. Multiplication Steps in the Maya Style

3. The result of the intersection of 4 (four) lines and 2 (two) lines results in six cut points that are identical to 4×2 multiplication. The child is only asked to count the number of points that are the intersection of the intersecting lines. The result was 8 (eight) points.

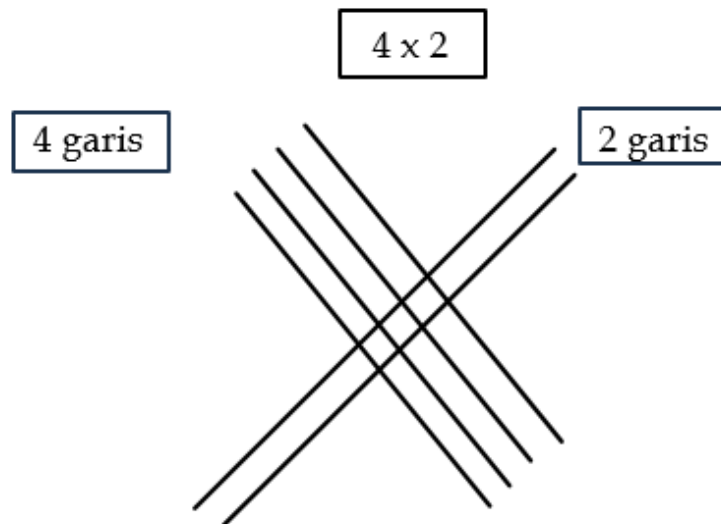


Figure 3. Multiplication Steps in the Maya Style

Easy Multiplication Technique in the style of the Mayan Tribe

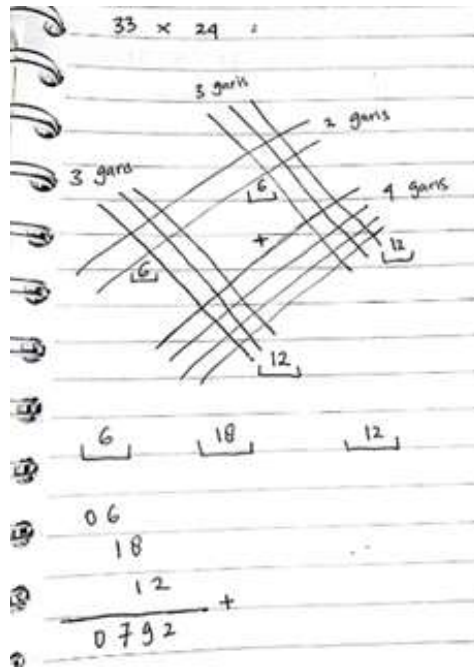
The Mayans are known as a civilization that has very advanced mathematical abilities. They developed a unique numerical system as well as an efficient method of calculation. One of the interesting techniques of Mayan calculation is the multiplication method that utilizes visual patterns in the form of lines and dots. This technique helps to make the multiplication process easier, especially for those who have difficulty memorizing multiplication tables or understanding the concept of multiplication conventionally.

This method has been tested on elementary school students who previously experienced difficulties in solving multiplication problems. The results show that this technique can help students understand the concept of multiplication more easily. In fact, some students who initially found it difficult became more enthusiastic and confident in working on multiplication problems after being introduced to this method.

The following is an example of a question given to students and how to solve it using the Mayan-style multiplication technique. By using the method of drawing lines and counting points, students can solve multiplication in a more interactive and fun way.

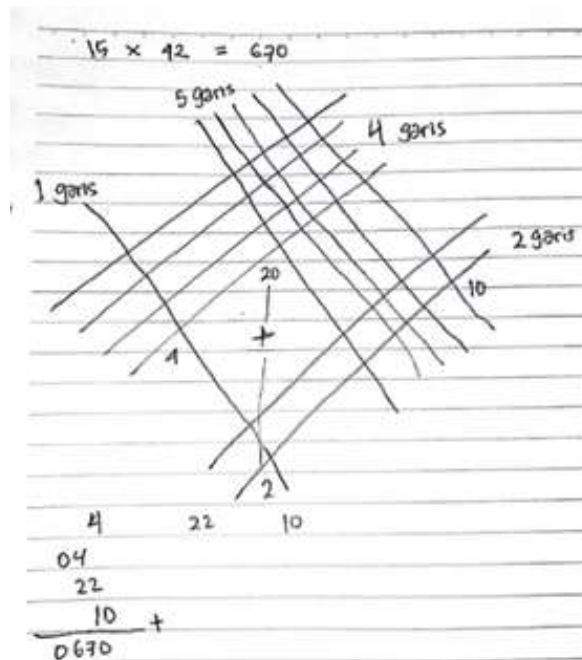
The following questions are given to students with the technique of drawing lines and counting points in the style of the Mayan tribe.

1. Count 33×24



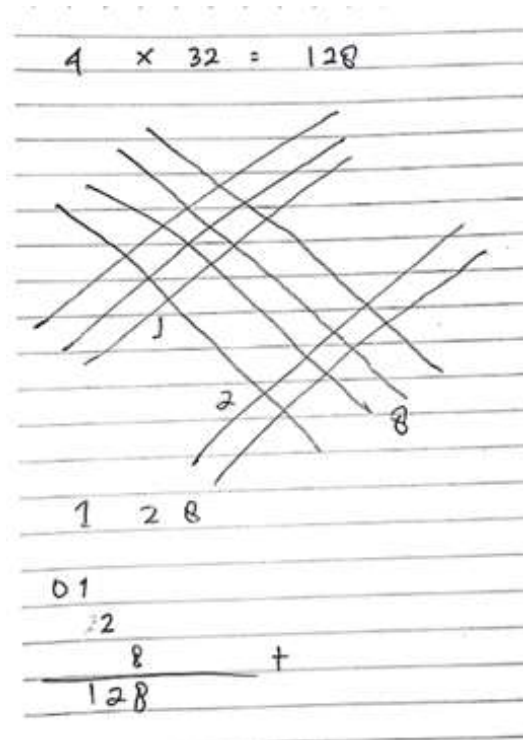
Each point has been calculated then all the number of points are added and the result is 792.

2. Count 15×42



Each point has been calculated then all the number of points are added and the result is 670.

3. Count 4 x 32



Each point has been calculated then all the number of points are added and the result is 128.

4. Conclusion and Recommendations

Conclusion

1. The Maya method of calculation in mathematics learning in elementary school offers an interesting alternative approach to understanding the concept of numbers and mathematical operations. The 20-based number system (vigesimal) used by the Mayans provides a different learning experience than the conventional decimal system, thus improving students' understanding of various numeracy systems. Additionally, this method involves unique symbolic representations, which can help students develop logical and analytical thinking skills.
2. The application of this method in mathematics learning in elementary school can increase students' interest in learning, as it is interactive and provides a new perspective in understanding numbers and mathematical operations. However, the challenge of adapting this system into a decimal-based curriculum needs to be considered to remain relevant to applicable educational standards.

Recommendations

1. **Integration in the Curriculum**
To optimize the benefits of the Mayan calculation method, teachers can integrate it as additional material in learning the concept of numbers and numeracy systems.
2. **Contextual Approach**
Teachers can teach this method by relating it to the history and culture of the Mayans, so that students not only learn mathematics but also gain insight into other cultures.
3. **Use of Interactive Media**
The use of visual media such as images, games, or digital applications can help students more easily understand the concept of Mayan calculations.
4. **Evaluation and Adjustment**

Further research is needed to evaluate the effectiveness of this method in improving students' mathematical understanding and how it can be adapted to national curriculum-based learning.

5. Referensi

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