EDUKASIANA
Journal of Islamic Education

Volume 4 Issue 2 (2025), Pages 456-463
Edukasiana: Journal of Islamic Education
P-ISSN 2830-1625, P-ISSN 2964-6979
https://ejournal.darunnajah.ac.id/index.php/edukasiana

Ability Of Madrasah Ibtidaiyah Students In Completing Multiplication Calculation Operations Using *The Lattice Method*

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Article Info

Article history:

Received: Agus 15, 2025
Revised: Sept 14, 2025
Accepted: Okt 29, 2025

Keywords:

Student abilities
Lattice Method
Multiplication
calculation operations

Abstract

This study aims to explore the application of *the lattice* method in improving students' ability to complete multiplication operations in class V of MI Tarbiyatul Islamiyah Jagakarsa, South Jakarta, as well as to describe the advantages and disadvantages of this method. The approach used in the study is qualitative descriptive, with data collection techniques through observation, interviews, and documentation. The research subjects consisted of 31 students of class V. Data analysis was carried out by data reduction steps, data presentation, and conclusion drawing using models from Miles and Huberman. The results indicate that the application of *the lattice method* makes it easier for students to understand the concept of multiplication through visualization in the form of grids. Students appear more excited, thorough, and confident when solving multiplication problems when compared to traditional methods. The learning outcome data showed a significant increase: the number of students who achieved complete scores increased from 5 students to 16 students, while students who did not complete decreased from 17 to 5 students. These findings are supported by interviews with teachers and students who stated that *the lattice* method is more interesting, structured, and can reduce errors in recording numbers or summation.

To cite this article: Khotimah, Sita Husnul & Nining Yuningsih. (2025). Ability Of Madrasah Ibtidaiyah Students In Completing Multiplication Calculation Operations Using The Lattice Method. 4(2), 456-463. Doi. https://doi.org/10.61159/edukasiana.v4i2

A. Introduction

Teaching mathematics education plays a role in providing provisions for students through logical, analytical, systematic, critical, creative, and deliberative thinking skills. In fact, the discovery and development of many other fields or sciences that use or relate to and from mathematical science. Thus, mathematics also plays an important role in various disciplines and increases the development of one's thinking power and plays a role for students to be able to apply in other fields.

In accordance with the opinion quoted by Sufri Mashuri (2019) who stated, "Mathematics is a universal science that has an important role in various disciplines and develops human thinking, as well as underlies the development of modern technology. Therefore, mathematics subjects need to be given to all students from elementary school to high school levels to equip students with logical, analytical, systematic, critical, and creative thinking skills and be able to solve problems they face in daily life".

In mathematics, numeracy skills at the elementary school or madrasah ibtidaiyah level are the initial potential to solve further problems, so it is necessary to pay attention from educators to students starting from the beginning. The problems that exist in students are the difficulty of students in understanding the concepts in mathematics subjects, especially in understanding the concept of multiplication.

Based on the findings of interviews conducted on certain students, it can be concluded that there are some students who do not like mathematics, this is obtained from students' lack of interest in mathematics subjects (Putri, 2023). Some of the reasons why students do not or do not understand the material in mathematics subjects, including feeling bored and not interested in mathematics at all because many students argue that mathematics is a subject that is very difficult to grasp and understand, and a scary lesson. In fact, it can also be caused by the factors of methods, media, or strategies applied by educators that are not attractive, especially educators who only rely on package books. Educators are lacking in applying and optimizing other methods that are more effective and efficient in building students' interest in following the learning process and stimulating students to think so that they can enable students to understand the material being taught.

Counting operations on numbers is a key arithmetic concept that children are supposed to learn. After they learn the operation of counting addition and subtraction, they then learn the operation of counting multiplication and division. Multiplication is the basic operation of arithmetic that children should learn after they learn addition and subtraction. Multiplication (x) is the repeated addition of the same number.

Multiplication is one of the basic operations in mathematics that is the foundation for many other mathematical concepts, such as division, fraction, and equations. The ability to master multiplication well allows students to more easily understand and solve a variety of more complex math problems. Without a strong mastery of multiplication, students may face difficulties in understanding higher concepts and solving math problems with confidence.

Based on the results of the initial observation, it was obtained that there were still students who could not determine the results of the multiplication calculation. Therefore, there needs to be another effort to overcome students who have not mastered multiplication with the stacking method. Some teachers are looking for solutions related to these problems. One of the methods and solutions to this problem is the desire to try to apply the *Lattice Method*. There are several studies related to the application of *the Lattice* method to students' errors in completing multiplication calculation operations. The *Lattice* method according to Suryati, Hendrawan and Pratiwi is a multiplication method introduced in Europe in the 13th century by an Italian mathematician named Leonardo Fibonacci which can be used as a solution in solving Length multiplication (Suyanti, 2020). The *Lattice*

method is one of the many methods that are displayed in the form of columns/tables that contain the result of multiplication and the result of the sum of each column must not be more than one digit.

The Lattice *method* is an alternative way to solve multiplication tens, hundreds, thousands, and more. The *Lattice* method is a multiplication method that uses gaps to multiply two numbers that are large numbers. This method is done in an orderly way when compared to doing it conventionally (stacked) which must be done with alternating combinations of multiplication and addition. The latis method is formed from a line in the form of a square so that the latis method is also called the box method Students who master multiplication well will feel more confident and less anxious when facing mathematical problems involving this operation. They don't have to spend a lot of time and effort calculating the basics, so they can focus on solving more complex problems.

B. Methods

This study uses a descriptive qualitative approach. The location of this research is at Madrasah Ibtidaiyah (MI) Tarbiyatul Islamiyah South Jakarta. The data collection techniques used were observation, interviews and documentation. Observations were made to directly observe the mathematics learning process using *the lattice* method. The things observed included teacher and student activities, classroom atmosphere, and students' difficulties and success in using the method. Interviews wereconducted directly with grade V teachers and several students to find out their responses regarding the use of *the lattice* method in multiplication learning. The interview is semi-structured so that the data obtained is more in-depth but still directed. Documentation is used to collect secondary data in the form of photos of learning activities, notes of student worksheets, student worksheets (LKS), daily test scores, and other supporting data relevant to the research.

The data collected in this study was analyzed using qualitative data analysis techniques of data reduction, data presentation and conclusion drawn. Meanwhile, the validity of the data is carried out using triangulation techniques, Increasing Diligence and member checks.

C. Result and Discussion

This research was carried out on students in grade V of MI Tarbiyatul Islamiyah Jagakarsa, South Jakarta, with a total of 31 students. The research aims to test the effectiveness of the lattice method in improving students' ability to complete multiplication calculation operations. Data was obtained through observation, interviews, documentation, as well as preliminary test results (pre-test) and final test (post-test).

1. Pre-test results

Before the lattice method was applied, students were asked to work on multiplication problems with the conventional method. The results showed that most students had difficulties, especially in the problem of multiplying two to three digits. Of the total 31 students, 17 students (55%) obtained a score below KKM (< 60), 10 students (32%) were in the sufficient category (60–74), and only 5 students (16%) achieved a complete score (≥ 75). These findings indicate the low mastery of students on the concept of layered multiplication.

2. Learning Process with the Lattice Method

The teacher introduced the lattice method through the stages of visualizing the grid, filling in partial multiplication, and diagonal summation. This process is carried out in stages from a two-digit question to a three-digit question. Observations show that students seem more focused, excited, and interested in trying this method. Teacher-student interaction is also more lively, with students actively asking questions and trying directly on the board.

3. Post-test results

After learning with the lattice method, students were again given a test with a similar level of difficulty. The results showed a significant improvement: only 5 students (16%) were below the KKM, 11 students (35%) obtained the sufficient category, and 16 students (52%) managed to achieve learning completeness (≥ 75). This comparison shows that the number of students who complete is almost three times as high as before the use of the lattice method.

4. Observation and Interview Results

Observations show that students are more careful in placing partial multiplication results into diagonal squares, so that errors due to misstoring numbers or incorrectly adding can be reduced. The teacher stated that the lattice method was very helpful for students who previously gave up easily. Students also admitted that they liked this method more, because it looked like a game and helped them be more confident. Some students said that with this method they are no longer afraid of making mistakes, because the results of the calculations can be checked systematically.

5. Analysis/Discussion

a. Application of the *Lattice* Method to the Multiplication Operation Capability.

The application of *the lattice method* in the learning process of multiplication calculation operations in class V MI students has a positive influence in improving their understanding and abilities. According to the results of interviews with teachers, *the lattice method* was introduced to students after the teacher observed that many students had difficulty solving two- and three-digit multiplication problems using conventional methods. The traditional method of multiplication is considered to make it difficult for students to store numbers and understand the long steps in calculation.

The *Lattice method* provides strong visual support so that students can more easily understand the process of doubling and three-digits through a systematic table. The *lattice method* is introduced by using visual media in the form of boxes that help students in arranging numbers and calculating totals systematically. With the teacher's explanation, the introduction steps start from creating a grid, putting numbers on the top and sides sides, filling in the results of small multiplications into boxes, and then adding the numbers on the diagonal lines. Students are also trained gradually until they get used to applying this method.

Based on interviews with students, most of them responded positively to the application of the lattice method. Students find this method fun, easier to understand, and not confusing them like when using the old way. Students also feel more confident and able to solve multiplication problems faster. This shows that the lattice method has appeal and effectiveness in helping students overcome difficulties in multiplication calculation operations.

This research is also in line with the research by Alamsyah et al. which stated that *the Lattice method* significantly assists students in understanding the multiplication calculation operation because it provides a clear and systematic visual structure, especially for students who experience difficulties in conventional methods such as Long stacked multiplication. In addition, the results of research by Saputri and Santoso also prove that the application *of the lattice method* is able to improve student

learning outcomes in multiplication materials, because it is able to minimize errors and increase students' concentration while working on problems. The application of this method also fosters a sense of joy and confidence in students because they feel able to solve problems that were previously considered difficult (Santoso, 2022).

However, teachers also acknowledge that the application of this method takes time in the early stages of introduction. It takes practice and habituation so that students really understand the flow of the *lattice method*. This is in accordance with the findings of Ningsih and Huda that the lattice method, although effective, requires a gradual implementation strategy so as not to confuse students who are not used to it (Huda, 2020).

b. The results of the application of the lattice method to improve students' abilities

After the introduction of the lattice method, there was an increase in the accuracy, understanding, and speed of students in solving multiplication problems. The *lattice* method offers a visual way to perform multiplication through grids or tables, so that students can complete the steps systematically and in a directed manner. This is in line with Jerome Bruner's theory of the representational stage, where students more easily grasp concepts through the visual stage (iconic stage) before moving on to the symbolic stage (abstract) (Anisa Rizki, 2019).

The test results showed a significant increase: the number of students who previously obtained a score below the KKM (<60) decreased from 17 to 5 students, while students who achieved a complete score (≥75) increased from 5 to 16 students. These findings were also reinforced by teacher interviews who stated that students became more conscientious, enthusiastic, and confident when using the lattice method. They are more focused on placing numbers in a grid and it is easier to double-check the multiplication results through diagonal lines.

In addition to improving thinking skills, *the lattice* method also affects the emotional aspect of students. Based on interviews, the majority of students revealed that they prefer this method compared to the traditional method. They feel the experience of playing puzzles, thus making the learning process more exciting and not boring. This is in line with research by Herwinsyah et al. who found that *the lattice* method not only improves learning outcomes but also students' motivation to take Mathematics lessons (Herwinsyah, 2022).

The results of observations and interviews also show progress in aspects of the student learning process. The teacher explained that *the lattice* method can increase student involvement in the learning process. Students appeared to ask more questions, discuss how to fill in *lattice grids,* and show a high level of curiosity. This change indicates that *the lattice* method can also encourage an active and collaborative learner attitude in the classroom. Students who had previously lacked confidence in Math lessons, began to show courage to try to work on the problems on the board. Even students who previously scored low showed higher enthusiasm for learning. This is in line with the opinion of Zubaidah et al. who stated that *the lattice* method can increase students' intrinsic motivation because the learning structure is easier to follow and provides a pleasant learning experience (Zubaidah, 2021).

In addition to contributing to improving academic achievement, the use of the lattice method also builds the character of students who are more independent, meticulous, and confident. The teacher in the interview stated that after learning with the lattice method repeatedly, students showed the desire to try to solve the problem independently. Even students who are initially passive and afraid of making mistakes begin to show the courage to try and discuss with friends. This indicates that *the lattice* method not only functions as a cognitive technique, but also builds a strong and persistent character in solving mathematical problems.

Overall, the results of the study show that *the lattice* method not only has an impact on improving learning outcomes, but also affects the affective aspects and cognitive processes of

students. Students become more thorough, actively involved, and show a positive attitude towards Mathematics lessons. Thus, *the lattice* method can be recommended as one of the effective alternative learning approaches to improve students' multiplication operation abilities at the elementary school level.

The results of interviews and observations during the learning process reveal that *the lattice* method has a number of advantages that make it an efficient option to improve students' skills in solving multiplication operations. However, like other methods, lattices also have drawbacks that need to be considered when implemented in the classroom.

1) Advantages of Using the *Lattice Method*

a) Helping to Understand the Concept of Place Value
The lattice method presents the multiplication process in a systematic visual form. With the presence of squares and diagonal lines, students can more easily understand the concept of place values, namely which represents units, tens, hundreds, and so on. This is very helpful in preventing number placement errors that often occur in conventional methods.

b) Minimizing Calculation Errors
Because the results of each small multiplication are written directly into the grid cell, students don't need to remember numbers or keep the results temporarily in mind. This reduces the chance of miscalculations, especially for students who still have trouble managing mental processes in long multiplication.

c) Increase student confidence
Students feel more confident because they can follow the procedure gradually without worrying about making a serious mistake. The teacher explained that students who were previously easily discouraged when working on multiplication problems, now become more confident to try and solve problems independently

d) Makes it easier for teachers to analyze student mistakes
With neat visual shapes, teachers can easily trace where students' mistakes lie, whether in the initial multiplication process, number placement, or when adding diagonals. This makes it easier to evaluate and provide feedback.

These advantages are reinforced by the research of Zubaidah et al. which concluded that *the lattice* method improves students' accuracy and learning outcomes due to its clear and easy-to-understand visual approach.

2) Disadvantages of Using *the Lattice Method*

a) Takes more time
Students must first draw a grid before working on the problem. For some students, especially those who are not used to it, this process takes a long time and can interfere with the effectiveness of learning, especially in sessions with limited study time.

b) Not suitable for all types of questions
The *lattice method* is more suitable for integer multiplication problems of two to four digits. However, for story questions or questions that emphasize narrative conceptual understanding, this method is less flexible because it focuses on procedure.

c) Requires Intensive Initial Training
At first, students need intensive guidance to understand how *the lattice* method works. Without proper recognition, students can get confused with diagonal lines and reading results.

This is in line with the findings of Javornik & Lipovec who stated that although the lattice method facilitates the multiplication process, its implementation must be well designed so as not to sacrifice the efficiency of learning time (Lipovec, 2020).

6. Conclusion

Overall, this study proves that the lattice method is an effective learning strategy to improve the multiplication ability of elementary school students. This method not only improves academic results, but also has a positive impact on students' learning attitudes. Consistency with previous research strengthens the validity of these findings, although there are some limitations that must be noted. Thus, the lattice method can be used as one of the innovative alternatives in mathematics learning, especially in multiplication materials, while opening up opportunities for further research in the future.

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