

# THE IMPACT OF VEDIC MATHEMATICS TECHNIQUES (VMT) ON STUDENTS' PERFORMANCE IN FACTORING POLYNOMIALS

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## ABSTRACT

*This study explores the impact of integrating Vedic Mathematics Techniques (VMT) in teaching polynomial factoring among grade 8 students at Amas National High School, Kidapawan City, Province of North Cotabato, Philippines. Polynomial factoring is a fundamental algebraic skill that often presents challenges to learners. Vedic Mathematics, with its emphasis on streamlined mental calculations, offers a potential alternative to traditional algebraic methods. This research employed a one group quasi-experimental design to investigate the effects of using Vedic Mathematics on the performance of the students. The quantitative data were collected through pre- and post-test assessments, while qualitative insights were obtained through open-ended survey questions. The findings of the study revealed that there is significant difference between the pre-test and post-test scores of students using Vedic Mathematics technique. This indicates that their performance had significantly increased. Qualitative analysis highlighted themes of simplicity, engagement, and varied learning preferences in students' perceptions of Vedic Mathematics. This study suggests that while Vedic Mathematics holds promise as an effective teaching technique, comprehensive instruction and diversified strategies are essential to cater to students' different learning styles. Thus, this empirical evidence contributes to the continued explorations on innovative pedagogical methods in mathematics education.*

**Keyword:** *Vedic Mathematics Technique (VMT), students' performance, algebraic skills, factoring polynomials, perception of students in using VMT*

## INTRODUCTION

Factoring is one of the essential topics in the mathematics curriculum. It simplifies algebraic expressions. This algebraic skill is a useful tool in solving problems with higher degree equations. Indeed, many real-life situations are anchored in polynomials. To find solutions to these problems requires skills in factoring polynomials.

In Kidapawan City, different schools have identified solving word problems involving factoring as one of the least learned competencies. Students must master the skills of factoring first, in order to solve more complex word problems. According to the study of Jiji (2012), many students have low proficiency and experience difficulty in factoring polynomials and the complexity of the process makes it more difficult to understand [1]. Time affects the accuracy of the solutions. In fact, the grade 8 students of Amas National High School also experienced difficulties in mastering the skills.

However, Ancient Indians developed methods of making complex solutions simpler. Vedic Mathematics deals with various branches of mathematics, like arithmetic, algebra, geometry, etc., which includes patterns for simple calculations. The Vedic Mathematics method is direct, efficient and makes the complex method in a simpler way (Dhanave & Kangale, 2014) [2]; it gives alternative ways of solving mathematical problems.

Moreover, the Vedic method provides easy solutions pertaining to 'difficult' problems or huge sums. These striking and beautiful methods are just a part of a complete system of mathematics which is far more systematic than the modern 'system' (Arya and Bhargava, 2017) [3]. Vedic mathematics techniques significantly reduce the time duration while solving some basic mathematical problems [4]. VMT also showed a promising effect in increasing students' problem-solving skills [5].

Hence, the researcher wants to explore the impact of teaching Vedic Mathematics techniques on students' performance in factoring polynomials. Thus, this study also considers the students' perception after using the techniques. This can offer a deeper understanding of the students' experience while learning and applying the Vedic math in factoring polynomials

### 1.1 Research Questions

This study aimed to investigate the effect of Vedic Mathematics techniques in relation to student's performance in factoring polynomials.

Specifically, this study sought answers to the following questions:

1. What are the pre-test scores of the students before implementing the Vedic mathematics techniques in factoring polynomials?
2. What are the post-test scores of the students after implementing the Vedic mathematics techniques in factoring polynomials?
3. Is there any significant difference between the students' performance in factoring polynomials before and after implementing the Vedic mathematics techniques?
4. What are the perceptions of students regarding the use of Vedic Mathematics techniques in learning and applying polynomial factoring?

### 1.2 Hypothesis

$H_0$ : There is no significant difference between the students' performance in factoring polynomials before and after implementing the Vedic Mathematics Techniques (VMT).

### 1.3. Scope and Delimitation of the Study

The focus of this study is on the effect of Vedic Mathematics techniques on student's performance in factoring polynomials. Specifically, the study was delimited on factoring quadratic trinomials and third-degree polynomials with the use of the combination of 'anurupyena' and 'adymadyenantyamantyena', Lopana Sthapanabhyam ('by alternate elimination and retention') sutras.

## 2. METHODOLOGY

The study employs a one group quasi-experimental design to investigate the effects of using Vedic Mathematics on students' performance. The quantitative data were collected through pre- and post-test assessments, while qualitative insights were obtained through open-ended survey questions.

The t-test paired samples were used to examine the significant difference in the pre-test and post-test scores of the respondents. Meanwhile, the qualitative data collected from the students' perceptions of using Vedic Mathematics in factoring polynomials was analyzed using thematic analysis to identify themes and core ideas in their responses.

### 3. RESULTS AND DISCUSSION

This section presents a discussion of the findings regarding the performance of the respondents before and after implementing the Vedic Mathematics Techniques (VMT). This also discusses the impact of this intervention on their performance in factoring polynomials. This also includes the perceptions of the students regarding the use of this intervention in learning and applying polynomial factoring.

#### 3.1 Students' Performance in the Pre-test Assessment before the Implementation of Vedic Mathematics Techniques (VMT)

The frequency distribution of the performance of the students before implementing Vedic Mathematics in factoring polynomials is shown in table 1. In this study, a total of 20 item standardized test was administered to the respondents. Results revealed that out of the forty-eight (48) participants, twenty (20) or 41.67% got scores from 0 to 3. This means that most of them have very poor performance before the implementation of the intervention. Moreover, fifteen students (31.25%) had poor performance, with scores from 4 to 7. This study also revealed that twelve students had satisfactory performance with scores from 8 to 11. Meanwhile, only one student had a very satisfactory performance with scores from 12 to 15. Based on the findings, this implies that the majority of the respondents have very poor performance.

**Table 1.** Students' Performance in the Pre-test Assessment before the Intervention

Scores	Description	Frequency	Percentage
0-3	Very Poor	20	41.67
4-7	Poor	15	31.25
8-11	Satisfactory	12	25
12-15	Very Satisfactory	1	2.08
16-20	Outstanding	0	0
Total		48	100

#### 3.2 Students' Performance in the Post-test Assessment after the Implementation of Vedic Mathematics Techniques (VMT)

Table 2 shows the students' performance after implementing the Vedic Mathematics technique in factoring polynomials. The results revealed that twenty-five students (52.08%) got scores ranging from 8 to 11. This means that most of them have satisfactory performance after the intervention. Furthermore, nine students (18.75%) had very satisfactory performance with scores from 12 to 15. Results also revealed that four students (8.33%) had an outstanding performance with scores from 16 to 20. Only 10 students (20.08%) have poor performance. The findings concluded that the majority have satisfactory performance in factoring performance after the intervention.

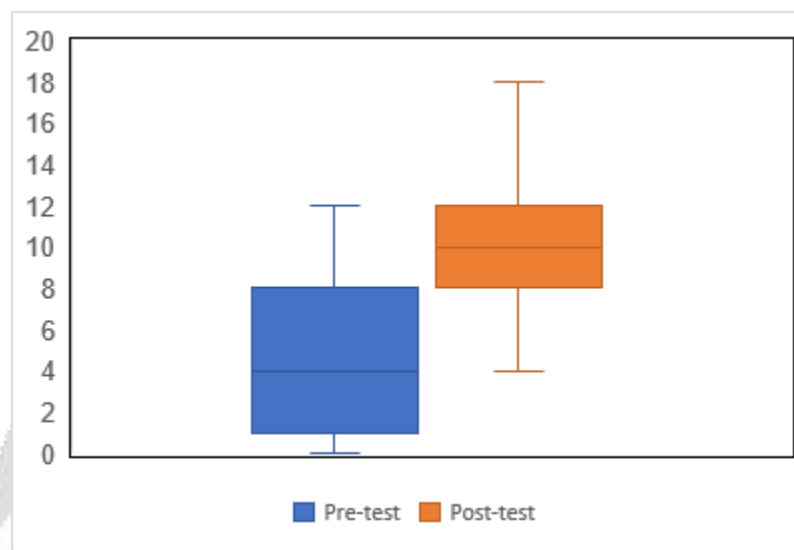
**Table 2.** Students' Performance in the Post-test Assessment after the Intervention

Scores	Description	Frequency	Percentage
0-3	Very Poor	0	0
4-7	Poor	10	20.08
8-11	Satisfactory	25	52.08
12-15	Very Satisfactory	9	18.75
16-20	Outstanding	4	8.33
Total		48	100

#### 3.3 Comparison of Students' Performance in Factoring Polynomials Before and After the Implementation of Vedic Mathematics Techniques (VMT)

Figure 1 shows the visual comparison of the pre-test and post-test scores of the respondents. This reveals that the minimum scores increased from 0-4 in their pre-test and post-test scores, respectively. Moreover, the

maximum score in the pre-test is twelve (12) and the median is 4. While the minimum score in the post-test is four (4) with a maximum score of 18 and the median is 10. Based on the figure below, it clearly shows that the scores of the students have improved.



**Figure 1.** Comparison of Pre-test and Post-test Scores of the Respondents

### 3.4 Effect of Vedic Mathematics Techniques (VMT) on Student's Performance in Factoring Polynomials

In the study of Sheron, P. et al. (2022) and Kakkar, R. (2016), they emphasized that Vedic mathematics is more effective than conventional method [6] [7]. In this study, table 3 shows the results of a t-test of paired samples, which are the pre-test and post-test results. The results revealed that the mean scores of the respondents in the pre-test and post-test are 3.92 and 10.10 respectively. This indicates a mean difference of -6.18, which implies that the post-test mean score is higher than the pre-test mean score. Moreover, the computed t-value of -37.053 with p value of  $0.000 < 0.05$  which means that the difference is highly significant. Based on these results, the null hypothesis which states that there is no significant difference between the pre-test and post-test scores of the group is rejected.

These findings imply that the intervention has a significant effect on the students' performance. Thus, their performance in factoring polynomials improved after the implementation of Vedic Mathematics techniques.

**Table 3.** Test of Significant Difference between the Pre-test and Post-test Scores of the Respondents.

Variables	Mean	Mean difference ( $\bar{x}_d$ )	$t_c$	p-value
Pre- test score	3.92			
Post-test score	10.10	-6.18	-37.53	0.000

### 3.5 Perceptions of Students regarding the Use of Vedic Mathematics Techniques (VMT)

Table 4 shows the themes of simplicity, engagement, and varied learning preferences in students' perceptions of Vedic Mathematics. The majority of participants found value in Vedic Mathematics techniques, particularly emphasizing their simplicity and the streamlined approach they offer to polynomial factoring. This supports the hypothesis that Vedic Mathematics can serve as an effective alternative or supplementary technique in mathematics education.

However, the qualitative feedback highlights the importance of thorough instruction when introducing these methods. A brief introduction might not be sufficient for all students, and a more in-depth exploration could be beneficial. Additionally, while the majority found the methods engaging and effective, it's evident that they may not

cater to all learning styles. This underlines the importance of providing diverse methods in teaching, ensuring that all students have an approach that resonates with their learning style.

**Table 4:** Themes and Core Ideas on the Perceptions of Students regarding the Use of Vedic Mathematics Techniques (VMT)

Themes	Core Ideas
Simplicity of Methods	<ul style="list-style-type: none"> <li>• find the techniques simple and easy to use</li> <li>• reduce reliance on manual computation</li> </ul>
Students' engagement	<ul style="list-style-type: none"> <li>• captures attention, promoting curiosity and enthusiasm</li> <li>• gives active involvement in the learning process, fostering sustained engagement and participation.</li> </ul>
Varied Learning Preference	<ul style="list-style-type: none"> <li>• encourage to select the approach that suits them best</li> <li>• approach that resonates with their learning style</li> </ul>

**Simplicity of Methods.** In using the Vedic Mathematics techniques (VMT), participants find it simple and easy to use in factoring polynomials. They said it reduces their reliance on manual computation. As revealed by one of the students being interviewed, he does find this technique easier than the traditional approach of factoring polynomials.

*Para sa akoa mas dali gamiton ang vedic math sa pagfactor og polynomial expressions. (For me, vedic math is easier to use in factoring polynomial expressions.) P5*

Similarly, the experience of the use of this technique reduces reliance on manual computation. As shared by students, this is the reason why she likes this new approach to factoring polynomials.

*Wala na ko gamanual og compute. Mas dalian na jud ko og solve. (I don't do manual computation anymore. It is now easier to solve.) P7*

**Students' Engagement.** The participants also shared their experience of using Vedic Math. They find it more interesting for them. They are more involved in the learning process and sustain their engagement in activities involving factoring polynomials. These findings are supported by the responses of the students in the interview.

*Mas natututo na ako sa pag-factor. Gusto na nako magsolve after ma introduce ni sir ang vedic math. (I have learned how to factor polynomial. I became interested after he introduced to us the Vedic math.) P12*

Similarly participant 2 and participant 10 responded:

*Mas nagpaparticipate na ako ngayon kasi naiintindihan ko na paano magsolve. (I participate now because I understand how to solve it.) P2*

*Masaya ako kasi nakaksunod ako sa pagsolve og problems. (I am happy because I can follow on solving problems). P10*

**Various Learning Preference.** However, there are also students who share that they want the traditional method compared to Vedic. They wanted to use a step-by-step process. This is supported by the following responses of the participants.

*Gusto nako ang step by step na process sir. Katung una nato na pagsolve sir. (I want the step-by-step process, sir. The first solution, sir). P4*

*Mas nalibog ko sir sa Vedic kay dili ko kasabay. (I am more confused about the Vedic, sir. I cannot cope up.). P6*

#### 4. CONCLUSIONS

Based on the findings, the following conclusions were drawn:

1. The majority of the respondents had very poor performance in the pre-test before implementing the Vedic Mathematics Techniques (VMT).
2. The majority of the respondents had satisfactory performance in the post-test after implementing the Vedic Mathematics Techniques (VMT).
3. The results of this study reveal a statistically significant improvement in post-test scores among students who were exposed to Vedic Mathematics techniques. This improvement suggests that Vedic Mathematics contributed to enhanced understanding and performance in polynomial factoring.
4. The qualitative insights garnered from students' feedback highlight the diverse nature of student learning preferences. While a majority of students found Vedic Mathematics engaging, simple and effective, the study also recognized that individual preferences vary.

#### 5. RECOMMENDATIONS

Based on the foregoing findings and conclusions, the following recommendations are offered:

1. Schools and curriculum developers should consider integrating Vedic mathematics techniques into algebraic instruction. The streamlined and intuitive nature of these techniques can enhance students' understanding of complex topics like polynomial factoring.
2. Schools should provide teachers with comprehensive training in order to effectively incorporate these techniques into the curriculum. There should be workshops, professional development sessions, and resources dedicated to Vedic Mathematics that will equip teachers with the skills and confidence needed to successfully implement these strategies in the classroom.
3. Educators should aim to provide a range of instructional approaches. While Vedic Mathematics may resonate with some learners, others may prefer conventional methods. They can create a balanced and inclusive learning environment where students can choose the strategies that work best for them by offering a combination of both approaches.
4. Researchers are encouraged to conduct longitudinal studies that assess the sustainability of the benefits associated with Vedic mathematics techniques. They can examine the long-term impact of these techniques on students' performance to provide a deeper understanding of the effects of integrating this intervention into learning Algebra.

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