Learners and Teachers' Perception of Integrating Cauchy-Vedic Mathematics in the Classroom

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ABSTRACT

Cauchy-Vedic Mathematics is an iterative process to solving systems of linear equation in two variables. This study examines the learners and teachers' perspective on the potential benefits and challenges on incorporating Cauchy-Vedic mathematics to the classroom and its relevance to learners' numeracy skills. This sought to identify the perceived benefits, advantages and relevance of Cauchy-Vedic mathematics on the numeracy skills of the learners and identify potential barriers and challenges in incorporating Cauchy-Vedic mathematics to teaching mathematics. Through a qualitative approach, six (6) teachers and ten (10) learners were chosen purposively as participants of the study. Thematic analysis was employed to analyze the data and relevant themes were identified in gaining the comprehensive understanding of potential benefits and challenges of Cauchy-Vedic mathematics in the teaching and learning process. Findings revealed various benefits, advantages and relevance of Cauchy-Vedic mathematics to the numeracy skills of the learners. It has a positive impact to learners' numeracy skills, improves speed and accuracy and elicits motivation and engagement. However, curriculum constraints, lack of training and familiarity and learner resistance were identified as potential barriers and challenges. Recommendations include expanding longitudinal studies, broader sampling, comparative analysis, and enhanced teacher training. As Cauchy-Vedic Mathematics shows promise in enhancing mathematical proficiency, its integration warrants further exploration in educational settings.

Keywords: Cauchy-Vedic mathematics, perception, numeracy skills, qualitative, Vedic

INTRODUCTION

Numeracy skills in the Philippines are generally considered to be below average. According to the Program for International learners Assessment (PISA) report in 2018, the Philippines ranked 79th out of 79 countries in terms of average in math scores and was significantly lower than the average score of learners from other countries. Furthermore, the report also highlighted an achievement gap with a significant number of learners performing at or below the minimum proficiency level in the numeracy skills (OECD, 2018). Mathematics proficiency is a critical factor in academic success and problem-solving abilities. However, learners often face challenges in grasping mathematical concepts, resulting in low performance and lack of confidence in the subject. A significant number of learners struggle with numeracy skills, resulting to below-average mathematical proficiency. Numeracy skills encompass the ability to comprehend and work with numbers, which is fundamental for mathematics competence (Kus, 2018).

To aid this gap, particularly in the proficiency level in the numeracy skills, many educators used variety of strategies and techniques in the teaching-learning process. There has been a growing interest in alternative methods of teaching mathematics that can enhance learner's numeracy skills. One technique within Vedic Mathematics that is particularly relevant to solving systems of linear equations is the use of the Sutra (Formula) Anurupye-sunyamanyat (translated as: If one is in ratio, then the other one is zero. This Sutra (Formula) can be used to solve systems where the coefficients of the variables are in a ratio, enabling learners to simplify the problem and arrive at a solution more easily. Another Sutra (Formula), Sankalana-vyavakalanabyam: By addition and by subtraction, allows for the quick interchange of coefficients, further simplifying the solution process. Finally, Paravartya Yojayet is a general Sutra (Formula) that is applicable to

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various methods of solving systems of linear equations. The combination of these Sutras provides a structured, step-by-step approach that can be easily understood and applied by learners (Singh et al., 2021; Jha et al., 2020).

Alongside Vedic Mathematics, Cauchy's proportional coefficient analysis offers another promising approach to solving systems of linear equations. This method, attributed to Augustin-Louis Cauchy, uses proportional relationships between the coefficients of variables in a system to derive solutions. It is particularly effective for systems that are difficult to solve using traditional methods, such as those with coefficients that do not easily lend themselves to simple substitution or elimination techniques (Khurma, 2013). The Cauchy proportional method is an iterative process, enabling learners to analyze the type of solution a system has, whether it is unique, infinite, or no solution, thereby enhancing their understanding of algebraic systems.

Integrating both Cauchy-Vedic Mathematics and Cauchy's proportional coefficient analysis into a single instructional framework creates a simplified approach to teaching systems of linear equations—referred to as Cauchy-Cauchy-Vedic Mathematics. This integration has the potential to provide significant benefits to students by offering multiple problem-solving strategies, thus catering to different learning styles and improving engagement and mathematical proficiency. Previous research has indicated that students taught using Cauchy-Vedic Mathematics experience enhanced cognitive abilities, better problem-solving skills, and improved overall mathematical understanding (Subramaniam, 2015; Singh et al., 2021).

While research has examined various innovative teaching methodologies and their impact on mathematics education in the Philippines, there exists a research gap in understanding learners and teachers' perceptions regarding the implementation of Cauchy-Cauchy-Vedic mathematics in the classroom. Despite the increasing emphasis on incorporating diverse teaching approaches, limited research has explored how Filipino learners and educators perceive the integration of Cauchy-Cauchy-Vedic mathematics and its alignment with the country's unique educational landscape. This research gap highlights the need to delve into learners and teachers' perspectives, concerns, and expectations related to the incorporation of Cauhcy-Cauchy-Vedic mathematics. Also, in the Philippine context, limited studies explore on the perception of learners and teachers towards the use of this iterative method and its implementation and inclusion in the Philippine mathematics classroom.

The perception and acceptance of Cauchy-Cauchy-Vedic mathematics among learners and teachers play a crucial role in determining its wider adoption. Their perception of this alternative teaching methodology, particularly in terms of its relevance to the numeracy skills of the learners, is of utmost importance. Understanding this perception can shed light on whether Cauchy-Vedic mathematics can be an effective supplement for the conventional teaching methods.

Research Objective

The primary objective of the study is to explore on the learners and teacher's perspective on the potential benefits and challenges of incorporating Cauchy-Vedic mathematics and its relevance to the numeracy skills of the learners. Specifically, this study tried to

1. Identify the perceived benefits, advantages and relevance of Cauchy-Vedic mathematics on the numeracy skills of the learners.

2. Determine potential barriers and challenges in incorporating Cauchy-Vedic mathematics to teaching mathematics.

METHODOLOGY

The research study employed a qualitative research design in an exploratory approach since it captured the perceptions and insights of the learners and teachers in Cauchy-Vedic mathematics. Six (6) teachers with familiarity and knowledge on Cauchy-Vedic mathematics and ten (10) grade 8 learners were purposively selected to provide comprehensive insights and yield the best understanding of the purpose of the study.

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Selection criteria of the teachers as participants involve teaching mathematics in junior high school with at least 3 years of teaching experience. For students, selection were based on the achievement scores of the students wherein the top and bottom 5 students were selected to avoid potential biases of the data collected.

Information was collected through an open-ended questionnaire which was structured around the key themes such as learners and teachers' knowledge of Cauchy-Cauchy-Vedic mathematics, their perceptions and its impact on learners' numeracy skills and any benefits, barriers and challenges perceived in incorporating this method in to teaching and learning process. In support to the information obtained from the participants, a focus group discussion was conducted to express their viewpoints freely. The discussion allowed the participants to elaborate their thoughts and perceptions in relation to incorporating Cauchy-Cauchy-Vedic mathematics in the classroom. Thematic analysis was employed to analyze the data, transcribed, systematically reviewed and relevant themes were identified in gaining the comprehensive understanding of potential benefits and challenges of Cauchy-Vedic mathematics in the teaching and learning process. The process involved in thematic Analysis, particularly Gestalt Thematic Analysis of Rogers (2017), involves note taking through audio recording, transcribing the data in both interview and focus group discussion. After which, coding followed allowwing relevant and meaningful words to be group to form a theme. Finally, presenting the themes in context to the objectives of the study, showing how they relate to the total experience.

Ethical Consideration

Consideration of significant research ethics were observed in the gathering of data. Teachers were informed of the voluntary nature and purpose of the study. They were given the freedom to participate or not be the informant on the study assuring that their participation is voluntary and were not coerced or given any special attention and consideration. Privacy of the information obtained is guaranteed to be utilized for research purposes only. In dealing with utmost confidentiality, the learners and teachers' personal information remains to be in anonymity.

RESULTS AND DISCUSSIONS

With careful analysis from the information gathered in the study using thematic analysis, themes were generated from the responses of the participants and the key findings are presented as follows:

Learners' Perception towards Cauchy-Cauchy-Vedic Mathematics

The data analysis presented below helps to better understand the learners' experiences and opinions about the effectiveness of the Cauchy-Cauchy-Vedic Mathematics method in their learning process and the thematic analysis of learners' perceptions toward the Cauchy-Cauchy-Vedic Mathematics method. It is categorized into three key elements: theme, codes and utterances.

Table 1. Perception of the learners on CVM

Statement	Mean ($\bar{x}$)	Standard Deviation (SD)	Qualitative Description
I find Cauchy-Cauchy-Vedic Mathematics (CVM) methods easier to understand.	4.78	0.47	**Very good**
Using CVM techniques helps me solve systems of linear equations faster.	4.78	0.41	**Very good**
I feel more confident in my math skills after learning CVM techniques.	4.10	0.72	**Good**
CVM methods make solving problems in mathematics more interesting.	4.44	0.55	**Very good**

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I prefer using CVM methods over traditional methods (such as substitution or elimination) to solve systems of linear equations.	4.42	1.03	**Very good**
I feel that CVM techniques allow me to solve problems more accurately	4.23	0.71	**Very good**
I believe that CVM makes math more enjoyable and less stressful.	4.13	0.77	**Good**
The CVM techniques help me understand the concepts behind systems of linear equations better.	4.26	0.82	**Very good**
I find it easier to perform mental calculations and estimations when using CVM methods.	4.26	0.75	**Very good**
I am able to apply CVM methods to solve more complex problems compared to traditional methods.	4.18	0.98	**Good**
Learning CVM methods has improved my overall problem-solving skills in mathematics.	4.05	0.92	**Good**
I believe CVM methods are useful for solving other types of mathematical problems, beyond systems of linear equations.	4.18	0.76	**Good**
I find it difficult to understand or apply CVM methods in solving systems of linear equations.	2.26	1.22	**Fair**
The teacher explains CVM techniques in a way that makes them easy for me to understand and use.	4.76	0.43	**Very good**
I would recommend using CVM methods to other students because they help improve understanding and problem-solving abilities in mathematics.	4.73	0.55	**Very good**
Grand Mean	4.242	0.362	**Very Good**

The findings in Table 1 shows the learners' perceptions of the Cauchy-Cauchy-Vedic Mathematics (CVM) method. It can be seen that the use of CVM enhances both the learners mathematical understanding and engagement on systems of linear equation. Generally, with an overall grand mean score of 4.242 and a standard deviation of 0.362, categorized as *"Very Good"*, emphasized that CVM is an effective and efficient method for learning and solving linear equations. Notably, the learners find Cauchy-Cauchy-Vedic Mathematics (CVM) methods easier to understand and it helped them solve systems of linear equations faster with both having a mean score of 4.78 and a standard deviation of 0.47 and 0. 41 respectively. The work of Carvalho (2024), supported this results that the use of methods that simplify mathematical processes, like CVM, contribute significantly to learners improved mathematical understanding (Yogeshwari, 2024).

Additionally, the learners' self-reported increase in confidence after learning CVM ($\bar{x}$) = 4.10 and SD = 0.72) reflects the method's role in not only improving numeracy skills but also enhancing students' engagement. Zhang and Li (2019) also asserted this claim emphasizing that instructional methods that develops learners' confidence influenced a better academic outcome and a more positive attitude toward learning (Zhang & Li, 2019). CVM also contributed to students' perceptions of mathematics as more enjoyable and less stressful ($\bar{x}$ = 4.13; SD = 0.71) This result is in line with findings by Al-Samarraie et al. (2020), who note that innovative teaching methods, particularly those that reduce cognitive load and increase engagement, are more likely to make mathematics less intimidating for students.

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The preference for CVM over traditional methods such as substitution or elimination ($\bar{x}$ = 4.42; SD = 1.03) geared in learners' attitudes towards more efficient methods for solving problems as Al-Emran and Shaalan (2021) found that students tend to prefer easier methods that enhance problem-solving efficiency over traditional techniques. The CVM' also foster better accuracy ($\bar{x}$ = 4.23; SD = 0.71) and ease of performing mental calculations ($\bar{x}$ = 4.26; SD = 0.75). This means that learners are not only solving problems more quickly. This result is in line with the assertion of the cognitive load theory which suggests that methods that simplify calculation steps allow for better cognitive results which leads to more accurate outcomes (Sweller et al., 2021).

Further, the majority of learners find CVM easy to understand and apply as emphasized by the low mean score for the statement "I find it difficult to understand or apply CVM methods in solving systems of linear equations" ($\bar{x}$ = 2.26; SD = 1.22). The result of Singh (2021) supports this claim that methods like CVM, which provide step-by-step procedures for solving problems, improve learners' conceptual understanding by reducing cognitive barriers. Lastly, the learner's recommendation to integrate the use of CVM improving understanding and problem-solving abilities in mathematics is evident in the higher mean gain score of 4.73 and standard deviation of 0.55.

These findings suggested that the integration of CVM into the curriculum could be a promising strategy for improving both engagement and numeracy skill of the learners. The positive perception of CVM to simplify complex calculations aligns with contemporary educational trends that emphasize active learning and learner-centered instruction. By integrating CVM, educators may create a more engaging and less stressful learning environment, which can create greater student confidence and academic achievement (Zhang & Li, 2019).

Table 2. Emerging themes on the perception of the learners on Cauchy-Cauchy-Vedic Mathematics Method

Theme	Codes	Utterances
Perceived Easier and faster	Easier, faster, convenient	SE4: "It is easier to solve. SE1: It helps me solve problems faster, especially because I don't have to do [as] many steps." SE7: "It made learning easier and [more] efficient". SE2: "It helped me by showing me (to know) whether it is [the system is] consistent [and] dependent by just looking at it and not showing it" SE10: "It helps me because it is easier and [more] helpful" SE3: "I find proportional coefficient analysis more convenient to use in identifying the classification of systems" SE5: "It is more efficient and easier to use unlike any other method. I learned it very fast and effectively and also, I understand it much better". SE6: "It made the work easy and fast."
Improved Confidence and Engagement	Confidence, Interesting, comfortable	SE1: I feel more confident in my math skills after learning CVM techniques." SE2: I feel more confident now that I can solve equations faster with CVM." SE10: It makes me feel like I understand the math better." SE9: "The first few steps were hard for me, but with more practice, I feel more confident." SE1: "It is more engaging because it's faster and more interesting to use

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		than traditional methods." SE3: "[The CVM] is more interesting because it makes solving problems feel quicker and less stressful." SE5: "Yes, CVM is more interesting because it allows me to solve problems in a fun way." SE10: "At first, I was unsure about CVM, but after practicing, I felt more comfortable using it." SE2: It helped me a lot specially I am a person who easily forgets a lot of formulas and it also lessens the difficulty"
Improved Conceptual Understanding	Understand	SE2: "It helps me understand the concepts behind the proportionality analysis." SE6: It gives me a better understanding and I was able to keep up with the discussion and basically it is more understandable and convenient". SE3: "I can better grasp the concepts of solution sets and how the equations connect." SE10: "I was a bit confused at first, but with practice, I started understanding how to use the techniques." SE7: It helps me to understand easier
Preference Over Traditional Methods	Prefer	SE1: "I prefer using CVM methods over traditional methods because it's faster and easier to understand." SE3: "It is better than traditional methods because it helps me solve problems with less effort." SE2: "I would recommend CVM over traditional methods because it gives me a clearer understanding of the math." SE6: "I prefer using proportionality analysis because this is way easier for me" SE8: "This is better than the next discussion about graph."

Further, another student stipulated that the use of CVM took less time than (common) elimination method. It is quite simple and as a someone who is really not into math, they find it very helpful. It can impact students learning and even contribute to the education system by helping not just students but also teacher to simplify the complex mathematical concept. It is a great alternative to solving and it is a great addition to the way we learn math. This is evident in the following responses of the students:

"When you introduce the CVM to us, one thing tat came to my mind was it sounded interesting and might be helpful in finding solutions to linear equation. When tested it was really working, we found out that it took less time than elimination method. As someone who solves equation in a direct and easy way, this will definitely work for me"-SR1-

However, when applying CVM to solving systems of linear equation still have to make sure that your matching numbers or the variables are correct because otherwise you might get the wrong answer as what SR2 had emphasized.

"Regarding the CVM, yesterday was actually my first time hearing about or learning that method. And it is completely unfamiliar to me. However, when we use it in the example given by our teacher, I found it very easy to apply. I honestly felt like we were just doing cross multiplication but you still have to make sure that your matching numbers or the variables are correct because otherwise you might get the wrong answer. Overall, it

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is quite simple and as a someone who is really not into math, I find it very helpful" -SR2-

This CVM is convenient, useful for beginners and learners who have struggles in math because it really simplifies the process and reduces the need for trial and error unlike other traditional methods provides a pattern to follow without confusion. This is the sentiment expressed by SR3 as this works better for her.

"…I personally believed that it...what works better for me. I always search different methods or approaches for me to understand better... When I found the CVM, I find it really impressive, it is convenient and less time consuming and much simpler compared to traditional method like elimination or substitution. I believe that technique is not only beneficial for students but also for teachers who have long struggled to explain this concepts and the easiest way to understand. It is especially useful for beginners in math because it really simplifies the process and reduces the need for trial and error unlike other traditional methods. Personally, I find it more manageable to the point that I started using it the time I have learned about it. For students who struggles in math this method provides a pattern to follow without confusion … and less intimidating… It can impact students learning and even contribute to the education system by helping not just students but also teacher to simplify the complex mathematical concepts… and it is a great alternative to solving and it is a great addition to the way we learn math" -SR3-

It is clear that learners have a generally positive perception of the Cauchy-Cauchy-Vedic Mathematics (CVM) method in teaching systems of linear equations in two variables. The method is perceived as easier, faster, and more engaging than traditional methods, which improves students' confidence, increases their motivation, and enhances their conceptual understanding. While some learners reported initial confusion, the majority felt that CVM allowed them to understand and apply the concepts of linear equations more effectively. Thus, this is a clear and strong manifestation for integrating CVM into mathematics curriculum into the teaching of systems of linear equation in two variables as it appears to offer benefits in both academic performance and student engagement.

Teachers Perception on Cauchy-Vedic Mathematics

Similarly, the data analysis presented below helps to better understand the lteachers' experiences and opinions about the effectiveness of the Cauchy-Cauchy-Vedic Mathematics method in their learning process

Theme 1: Understanding and Familiarity with Caucy-Cauchy-Vedic Mathematics

Participants generally acknowledge that Cauchy-Vedic mathematics involves techniques originating from ancient India (Karani, 2016). It is perceived as a system of mental shortcuts for solving mathematical problems efficiently (Chapra, et. al, 2019). Though there is a familiarization of some principles, but not all of Cauchy-Vedic mathematics, its concepts were forgotten because it was not practiced and widely used in the classroom setting. Some participant wrote:

I am familiar but not all. Cauchy-Vedic mathematics is collective techniques to solve some mathematical problem. I am not totally sure where it is originated but some articles I read, they said that these techniques so called Cauchy-Vedic is from Indian people (T4).

Participants also exhibit varying degrees of familiarity with Cauchy-Vedic mathematics, ranging from limited knowledge to deeper understanding. Some have encountered it during their academic journey, while others have actively sought information about it as what T1 and T6 articulated:

I am familiar with Cauchy-Vedic mathematics. It is a system of mathematics believed to have originated in ancient India. It involves operations and solving mathematics problems. It was introduced to us as part of our module during my Master at Naawan when I took up my Masters (T1).

I am familiar with Cauchy-Vedic mathematics but not all its principles. It was introduced to me by my colleagues. And with my curiosity, I searched it in the internet and found some of its techniques (T6).

However, expanding the usage of Cauchy-Vedic mathematics in teaching mathematics can offer numerous

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benefits to learners. Cauchy-Vedic mathematics can be used for advanced topics like synthetic division and allows for more efficient mental calculations. It improves learners' numeracy skills, problem-solving abilities, and critical thinking (Singh, et al., 2017). Cauchy-Vedic mathematics is based on shortcuts and techniques, making problem-solving easier. It also helps learners develop analytical skills and understand connections between different mathematical strategies. Some participants stipulated that:

Cauchy-Vedic mathematics can be applied to advanced topics like synthetic division, using method we can easily divide polynomials by polynomials (T1).

Rapid and mental calculations. Cauchy-Vedic mathematics such as vertical and crosswise multiplication, makes it easier for learners to perform calculations mentally and quickly (T2).

Based on my experience when I was a learner, I found Cauchy-Vedic mathematics very efficient in solving problems. It also nurtures your analytical skills by realizing the connection of the ordinary process in solving and the other steps or strategies by other mathematicians (T4).

Accordingly, many studies also revealed that Cauchy-Vedic mathematics helps improves the speed of the basic mathematical operations (Karani, 2016; Katgeri, 2017; Ari and Indu, 2022; Singh, et al., 2017).

Theme 2: Positive Impact on Numeracy Skills, spped and accuracy.

Participants believed that Cauchy-Vedic mathematics' positive impact on mental calculation abilities, enabling learners to perform calculations quickly and efficiently. Frequently mentioned that learners believed to be exposed to Cauchy-Vedic mathematics demonstrates enhanced mental calculation abilities. Teachers believed that Cauchy-Vedic mathematics techniques improved learners' mental calculation abilities, enabling them to perform calculations more swiftly and accurately. This was seen in the response of the teacher:

Cauchy-Vedic mathematics enhances the numeracy skills of the learners in several ways: speed and accuracy, mental math abilities, conceptual understanding, problem-solving skills, flexibility and confidence. It provides them with a holistic approach to numeracy skills, empowering them to become proficient and confident mathematicians (T6).

Cauchy-Vedic mathematics is also seen as contributing to enhance problem-solving skills and critical thinking. Participants note pattern recognition and application as key benefits.

Cauchy-Vedic mathematics enhances learners' numeracy skills primarily in mental calculations and speed in problem solving. It enhances learners' numeracy skills by recognizing patterns and apply those patterns to solve problems. It helps them visualize problems more clearly (T2).

Cauchy-Vedic mathematics has the potential to improve learners' speed and accuracy in mathematical calculations through pattern recognition and mental flexibility. However, it is important to strike a balance and ensure conceptual understanding. While some learners may find it helpful, others may prefer not to use Cauchy-Vedic mathematics as it can lead to confusion as what some teachers emphasized:

Yes, Cauchy-Vedic mathematics has the potential to significantly improve the learners speed and accuracy in mathematical calculations. However, it is crucial to strike a balance between speed, accuracy and conceptual understanding to ensure that learners have well-rounded math foundation (T2).

This is further affirmed by some teachers that sometimes the use of Cauchy-Vedic mathematics can lead to confusions and may not be good for a long period of time.

Sometimes, because there are learners preferred not to use Cauchy-Vedic mathematics as it somehow leads to confusion perhaps it might distract them to solve a problem properly. But there are other learners also who loves to use Cauchy-Vedic math since it is very helpful for some circumstances like attending entrance exams which eventually could help them to improve their speed in calculations (T4).

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Cauchy-Vedic mathematics has the potential to improve learners' numeracy skills by increasing their speed, accuracy, mental math abilities, conceptual understanding, problem-solving skills, flexibility, and confidence. It offers a holistic approach to numeracy skills and helps learners recognize patterns and visualize problems more clearly. However, its benefits may be more pronounced for learners with high intellectual ability in mathematics and in competitive contexts where quick problem-solving is required. Further research is needed to fully evaluate its effectiveness. While Cauchy-Vedic math focuses on shortcut techniques and may not provide in- depth discussions, it can enhance arithmetic skills and make math more engaging and enjoyable for learners. Exposing learners to Cauchy-Vedic mathematics as part of a diverse math approach can enhance their understanding, engagement, and numeracy skills. It promotes customized learning, mental ability, conceptual understanding, and real-world application.

Exposing learners to diverse mathematics approach, like Cauchy-Vedic mathematics, is crucial for developing a comprehensive understanding of mathematics and enhancing numeracy skills. It promotes customized learning, mental ability, deep conceptual understanding, real-world application and broadens learners' horizon (T2).

Theme 3: Engagement and Motivation

Several teachers believed that incorporating Cauchy-Vedic mathematics into their teaching strategies increased learner engagement and motivation. These novel techniques is believed to spark learners' interest in mathematics, making learning more enjoyable contributing to a more positive attitude toward learning mathematics.

I perceived that Cauchy-Vedic mathematics is undoubtedly more integrated, effective and enjoyable than traditional mathematics. It increases mental flexibility and creativity while also fostering a love for mathematics (T1); engagement and interest wherein despite of it deviating from traditional methods, learners may still find it interesting and enjoyable and may somehow spark curiosity (T6).

Participants also highlighted that Cauchy-Vedic mathematics is believed to encouraged a deeper understanding of mathematical concepts. The emphasis on exploring multiple approaches to solving problems could helped learners grasp underlying principles. Participants highlight the holistic approach of Cauchy-Vedic mathematics, which encompasses mental agility, problem-solving, logical thinking, and increased engagement.

This in support of result of the researches that Cauchy-Vedic mathematics helps to eliminate the fear for Mathematics and learners are able to master the computational skills by using the mental methods reducing the dependency on devices like calculators, computers etc. (Katgeri, 2017). It is an effective on enhancing the attitude towards learning mathematics of the learners (Ari and Indu, 2022) and is found highly effective for enhancing the learners' achievement in mathematics (Singh, et al., 2017).

Theme 4: Perceived potential barriers and challenges

There are limitations to the adoption of Cauchy-Vedic mathematics in the classroom. These include the potential hindrance to developing a strong foundation in mathematics concepts, lack of familiarity and teacher training, compatibility with the existing curriculum, availability of teaching resources, learning styles of learners, time constraints, and limited availability of resources. The diversity of learners' numeracy skills can also pose a challenge. Cauchy-Vedic mathematics requires a high level of knowledge and may not be suitable for all learners.

It might be a challenge for the teachers in terms of dealing to learner learning styles because I must exercise differentiated instruction since not all learners may find the techniques easy and helpful. Some really finds it as struggle to adapt to such methods and some are resistant to learn new things. Also, on time constraints since the method is not the usual and some learners need to practice more in order to apply it and be trained on using it to achieve mastery and no availability of resources, there is really insufficient instructional materials and textbooks on Cauchy-Vedic mathematics (T6).

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Cauchy-Vedic mathematics will be beneficial and advantageous only for learners with high intellectual ability in solving math problems. It can be used as a technique in competitions which require the learners to solve in a short period of time (T5).

Inconclusive

Cauchy-Vedic mathematics is applicable only to some mathematics principle. It is applicable to some learners and some preferred the conventional way of solving problem. This was given emphasis by T4:

It is not inclusive. Some learners still follow the ordinary process of solving math problems. Further, it might devastate the algorithms of solving. So, it might lead to gradual underdevelopment of critical thinking. Critical thinking is improving by the time you follow the algorithm, so if it is blended with Cauchy-Vedic math, it might distract their problem-solving skills (T4).

Curriculum Constraints

Teachers expressed concerns about aligning Cauchy-Vedic mathematics with the existing curriculum. They felt that incorporating new techniques might be challenging due to time constraints and pressure to cover the prescribed syllabus. Teachers found it challenging to incorporate Cauchy-Vedic mathematics within the existing curriculum.

Yes, there are potential drawbacks or limitations to the adoption of Cauchy-Vedic mathematics in the classroom like for example the compatibility with the existing curriculum, availability of teaching resources and teacher expertise and training. These limitations exist can be addressed through proper planning, professional development for teachers and integration of Cauchy-Vedic mathematics as a supplementary approach in mathematics curriculum (T3)

Teacher Training and Familiarity

Many teachers indicated that they lacked proper training in Cauchy-Vedic mathematics techniques. They felt that they needed more guidance and resources to effectively integrate these methods into their teaching. Participants expressed the need for proper training in Cauchy-Vedic mathematics techniques. Some teachers felt unequipped to teach these methods effectively, which led to a lack of confidence in implementing them. Lack of familiarity with Cauchy-Vedic mathematics and the need for specialized teacher training are identified as limitations to its adoption. The need for teachers to possess adequate knowledge and expertise in Cauchy-Vedic mathematics is noted as a potential challenge. The teachers emphasized that:

The principles and strategies in Cauchy-Vedic mathematics require high level of knowledge. This will add burden for the teachers to introduce the Cauchy-Vedic mathematics and may delay the target skills for the learners (T5).

No availability of resources and there is only a limited instructional materials and textbooks for Cauchy-Vedic mathematics (T6).

Learner Resistance

Some teachers mentioned that learners and parents were accustomed to traditional teaching methods. Introducing Cauchy-Vedic mathematics might face resistance from learners and parents who were unfamiliar with these techniques. Some participants express concerns that relying solely on Cauchy-Vedic mathematics might hinder learners from developing a strong conceptual foundation in mathematics. Participants expect resistance from learners due to the unconventional nature of Cauchy-Vedic mathematics compared to traditional methods. This was given emphasis by some of the teachers:

It is not inclusive. Some learners still follow the ordinary process of solving math problems. Further, it might devastate the algorithms of solving. So, it might lead to gradual underdevelopment of critical thinking. Critical thinking is improving by the time you follow the algorithm, so if it is blended with Cauchy-Vedic math, it might

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distract their problem-solving skills (T4).

When integrating Cauchy-Vedic mathematics into the classroom, educators may face challenges like lack of familiarity for the learners and teachers as Cauchy-Vedic mathematics is not commonly taught in the mainstream mathematics education. Also, its alignment to the curriculum (T3).

learners will be confused by many rules introduced in Cauchy-Vedic mathematics. If the learners do not know how the basic in mathematics, they may find it difficult to apply (T2)

Some learners may find Cauchy-Vedic mathematics helpful and finds it as a struggle to adapt to such methods and are resistant to learn new approach (T6).

Accordingly, the potential barriers and challenges with Cauchy-Vedic mathematics arises from the deviation from the traditional methods, the introduction of numerous rules and techniques and the lack of foundation in basic mathematics which is consistent to the result of Sawate (2021).

Theme 5: Support for Successful Implementation

In order to support the implementation of Cauchy-Vedic mathematics, it would be helpful to provide workbooks that focus specifically on Cauchy-Vedic mathematics. Additionally, it would be beneficial to provide teacher training and textbooks/workbooks that highlight Cauchy-Vedic math concepts. This way, teachers can be well-equipped to teach Cauchy-Vedic mathematics to their learners. Furthermore, collaboration among teachers and sharing of best practices would be instrumental in successfully implementing Cauchy-Vedic mathematics in the curriculum. Overall, full support from the administration, teachers, and learners, along with the provision of comprehensive resources and training, is essential for the successful implementation of Cauchy-Vedic mathematics in schools.

The teacher acknowledges the need for support and resources, such as teacher training, textbooks, and collaboration, to successfully implement Cauchy-Vedic mathematics in the curriculum. They said that:

For me, to successfully implement Cauchy-Vedic mathematics in the curriculum and ensure its relevance to learners' numeracy skills, several types of support and resources are necessary such as comprehensive training for teachers, development of curriculum and instructional materials, availability of textbooks and resources and collaboration and sharing of best practices (T6).

Lesson plan, workbooks and enrichment activity books could be the materials to implement Cauchy-Vedic mathematics to pursue more its implementation, seminar, training or workshops could also be the type of support to implement it. Teacher in the Philippines must conduct like the mentioned forum to successfully implement it (T4).

Despite the development of new teaching strategies and techniques, there is often a tendency for teachers to revert back to traditional methods. This can be attributed to lack of ongoing practice and implementation of the new strategies, the time and effort required to master this strategy, resistance to change, lack of supportive educational environment and lack of professional development. Ultimately, the successful integration of new teaching strategy, like Cauchy-Vedic mathematics, requires collective effort from educators, administrators and policy makers thereby benefits the learning experiences of learners.

In summary, the participants have varying levels of familiarity with Cauchy-Vedic mathematics. They believe that Cauchy-Vedic mathematics has a positive impact on learners' numeracy skills, particularly in mental calculations, speed, and problem-solving. Cauchy-Vedic mathematics is seen as beneficial in areas such as algebra, fractions, and shortcuts in solving. Participants believe that Cauchy-Vedic mathematics has the potential to improve learners' speed and accuracy in numerical calculations, although some feel that it may not be suitable for all learners. They also believe that exposing learners to diverse mathematical approaches, such as Cauchy-Vedic mathematics, is important for developing their understanding and numeracy skills. However, there are limitations to the adoption of Cauchy-Vedic mathematics, such as the need for teacher training and compatibility with existing curricula. Challenges in integrating Cauchy-Vedic mathematics into the classroom

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include unfamiliarity, learner resistance, and time constraints. Participants perceive the relevance of Cauchy-Vedic mathematics in enhancing learners' numeracy skills, but they acknowledge the need for support and resources, such as teacher training, textbooks, and collaboration, to successfully implement Cauchy-Vedic mathematics in the curriculum.

This suggests that educational institutions should consider incorporating various methods to enhance learners' numeracy skills, acknowledging that different learners may benefit from different approaches. Educators might explore incorporating elements of Cauchy-Vedic mathematics to improve learners' numeracy skills within their teaching strategies and consider integrating Cauchy-Vedic mathematics techniques into these specific topics to potentially enhance learners' understanding and performance of the learners. Furthermore, schools and educational authorities should provide necessary support to teachers interested in incorporating Cauchy-Vedic mathematics into their teaching methods and invest resources to support teachers in successfully implementing Cauchy-Vedic mathematics in the curriculum.

CONCLUSION

In conclusion, this study shed light on the potential benefits of incorporating Cauchy-Vedic Mathematics techniques to enhance learners' numeracy skills. Through this qualitative research, there is an in-depth understanding on the potential efficacy of Cauchy-Vedic mathematics as a teaching strategy. The perspectives of the both the learners and teachers provide a valuable insight for educators seeking to enhance their instructional practices and engage learners in mathematics learning. Moreover, this provides evidences, potentially informing educational policy makers, curriculum developers and educators regarding the integration of Cauchy-Vedic mathematics in mathematics education. Expanding the usage of Cauchy-Vedic mathematics in teaching mathematics can provide transformative approach in learning. Emphasizing the principles and techniques in Cauchy-Vedic mathematics will not only enhance learners' understanding and computational abilities but also foster creativity, problem-solving skills and deeper appreciation for mathematics.

RECOMMENDATIONS

With the results presented, the following are the research recommendation:

1. Providing training and support for educators to effectively integrate Cauchy-Vedic Mathematics into their teaching methodologies could enhance the delivery of this alternative approach in classrooms.
2. Integrate the use of Cauchy-Vedic mathematics to teaching mathematics to topics in which it is applicable.
3. Make resources available to teachers like lesson plan, workbooks, and enrichment activity books and other related resources to implement Cauchy-Vedic mathematics in the classroom.
4. Future research could extend the study's duration and study on the efficacy of Cauchy-Vedic Mathematics on learners' numeracy skills over an extended period, providing insights into the sustainability of the observed improvements.
5. Conducting the research with a larger and more diverse sample could provide more robust and generalizable findings about the effectiveness of Cauchy-Vedic Mathematics in enhancing numeracy skills.
6. Comparing the effectiveness of Cauchy-Vedic Mathematics with other alternative teaching methods could offer a comprehensive overview of the most effective strategies to enhance numeracy skills among learners.
7. Combining quantitative data with qualitative insights from learners' experiences and perceptions of Cauchy-Vedic Mathematics could provide a comprehensive understanding of its impact on both performance and attitudes towards mathematics.

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Declaration on Interest

The authors declared no conflict of interest. The research was conducted independently and the results presented in this article have not been influenced by any financial or non-financial relationships.

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