CHAPTER I

INTRODUCTION

Education plays a crucial role in a child's holistic development, shaping cognitive capabilities, enhancing emotional intelligence and developing practical skills. A child's individuality, which makes them unique, is nurtured and strengthened through continuous interaction with their surroundings. This interaction helps them learn, adapt, and grow, allowing them to develop a strong sense of self and independence.

A well-designed education system aims to foster these abilities in children, empowering them to become self-reliant individuals. It should provide opportunities for students to explore and express themselves, thereby cultivating their talents and interests. Through education, children learn to think critically, solve problems, and make informed decisions, all of which contribute to their personal growth and autonomy.

The National Education Policy (NEP) 2020 of India recognizes the importance of mathematics as a foundational skill that is essential for logical reasoning, problem-solving, and the development of scientific temper. NEP 2020 stresses the importance of understanding mathematical concepts rather than memorizing procedures or formulas. The policy advocates for a shift from rote learning to a more conceptual and application-based understanding of mathematics, encouraging students to grasp the 'why' and 'how' behind mathematical operations and theories.

Mathematics acts as a strong agent for the overall development of the child. If the participation of the students is ensured in learning, then learning mathematics becomes much more interesting. Mathematics involves mental computation that helps students understand several key concepts. Firstly, it enables them to grasp how numbers work. Secondly, it guides them in making decisions about which procedures to use. Finally, it encourages the development of various strategies for solving mathematical problems.

The teaching of mathematics can help to develop the intellect to a larger extent and keep the brains of the students active. Problem-solving enhances the development of mental faculties; mental work is required for solving mathematical problems. Confrontation with a mathematical problem makes the brain of the child active in solving that problem. Every mathematical problem has its sequence, and this is needed for the constructive as well as creative process.

Mathematics is also a very important subject and it may be defined as the science of space, numbers, measurement, magnitude, and direction. It is from the number system; the other branches of mathematics have sprouted. It deals with quantity, measurement, and magnitude. The language of mathematics is unique and acts an important role in fostering self-assurance, enhancing reasoning and abstract thinking, promoting a mentality of appreciation, and developing a scientific attitude. It also develops the abilities of induction, deduction, analysis, synthesis, and generalization. It helps to achieve and develop different values in the child.

Boyer (1968) states that "Neglect of mathematics works injury to all knowledge since he who is ignorant of it cannot know the other sciences or the things of the world". In this world of science and Technology, Mathematics has pierced into human life and it has become an integral part of the day-to-day life of humans. It has a great potential to offer true enjoyment to the students of mathematics. The opulence and progress of a state are in correlation with the progress of mathematics and hence many researchers try to reconnoiter the significance of mental computation and how it affects student's success in Mathematics.

Improving the mathematical skills of learners has always been a great concern of educators. Computational skill is acquired at its best when learned from a real-life situation. Otherwise, if the foundation stone is not understood clearly, it is difficult for anyone to do the computations easily and properly. Mathematics is an essential discipline that contributes significantly to numerous activities encountered in everyday life. It can also be used as a powerful wheel of communication that can represent, describe, and interpret as well as predict situations in real-life scenarios. Mathematics is indispensable as it is the foundation stone of everyone's life. It is the principal vehicle for the development of students' logical thought processes and the capacity for analyzing complex problems. In the professional field as well as in many other areas like physics, engineering, and statistics there is a great place for mathematics.

A common belief of students' dislike of mathematics is prevailing here. A multitude of factors, including pedagogical approaches, cognitive, affective, and psychomotor characteristics of the learners are recognized as the underlying causes of their low engagement in the subject. In light of the analysis performed by Scarpello (2007), "about 75 percent of students from America quit studying mathematics and also

stayed far away from mathematics-related careers." Mathematics anxiety is identified as the major reason for this.

Mathematics is considered a subject that causes many negative emotions. Most of the learners look at it as a difficult subject for so many reasons like the aversive style of teaching, troubles they face while following the instructions, and problems with remembering the mathematical equations. They also found themselves perplexed by the various approaches to solving a single problem. The word math often evokes a sense of fear with fear among a large segment of learners. The theoretical constructs within mathematics do not resonate positively with numerous learners. For many, particularly those who have not developed a strong grasp of basic mathematical concepts the pursuit of mathematical learning can be perceived as a herculean task. As it demands mental exercise, math learning is not a pleasing experience for many students.

NEP 2020 encourages pedagogies that foster active learning, critical thinking, and problem-solving skills. This entails involving students in activities that require them to think critically, analyze problems, and apply mathematical principles to practical scenarios. The aim is to make learning mathematics more interactive and enjoyable, moving away from conventional lecture-based teaching. The NEP 2020 aims to revolutionize the teaching and learning of mathematics in India, making it more learner-centric, enjoyable, and effective. By focusing on understanding, application, and critical thinking, the policy seeks to build a strong mathematical foundation for all students, preparing them for a variety of careers and life challenges.

Many kinds of research are being carried out to free the students from mathematics anxiety and also to facilitate them to learn mathematics interestingly. India has a very old method of teaching mathematics, Vedic Mathematics. To enhance speedy computational skill and also perform mental calculations, Vedic Mathematics is an apt practice that can be adopted. Vedic Mathematics has explored the properties of numbers extensively, especially in the computational field. The rich mathematical cultural heritage is reflected in this system of practice. If taught by applying the Vedic mathematics approach, it can reduce mathematical anxiety and make them interested in math learning thus helping them to acquire good computational skills as well as decision-making skills (Venkatraman 2017).

1.1 VEDIC MATHEMATICS

Vedic mathematics refers to the mathematics system that prevailed in the ancient period. Sri Bharati Krishna Tirthaji (1884-1960) rediscovered Vedic mathematics during 1911-1918. The term Veda is a Sanskrit word that has its root in the term 'Vid' (which means "*to know without limit"*). The exploration done by Sri Bharati Krishna Tirthaji concluded that all mathematical calculations are based on 16 sutras (word formulae). The sutras explain how the mind works naturally and help the learners to select the appropriate method for reaching the solution.

Various techniques were incorporated by Tirthaji for detailing the principles in the aphorisms and their corollaries and were termed Vedic mathematics. It was claimed to be derived from the Vedas, particularly a text known as the "Śulba Sūtras," which is part of the Kalpa Sūtras. However, the modern concept of Vedic Mathematics as we know it was popularized by Swami Bharati Krishna Tirtha in the early 20th century.

Vedic mathematics makes mathematics easy, enjoyable, and satisfying as well as encourages innovation in this field. Sutras cover every branch of mathematics. It can be applied even to complex problems which need many mathematical operations. In comparison with the present formal methods, the Vedic method takes less time and effort to solve any complicated problems. Coherence is the most important characteristic of the Vedic system and the whole system is interrelated and unified.

1.2 IMPORTANCE OF VEDIC MATHEMATICS

Vedic Mathematics is a simpler approach to calculations that allows calculations to be performed mentally. Since there is no single correct method, learners are encouraged to find ways to solve problems, fostering creativity, innovation, and intelligence while sparking an interest in learning mathematics. Rediscovered through sixteen sutras, Vedic Mathematics encompasses all branches of mathematics. Its remarkable simplicity, ease of use, and the cohesive nature of the system set it apart from conventional methods. Vedic Mathematics provides a unique and rapid method for solving problems, enhancing efficiency in mathematical calculations.

Vedic Mathematics is much easier and simpler to understand than conventional mathematics. It is effective for solving even complex problems mentally, enhancing confidence in rapid mathematical computations and intellectual problem-solving. The

Vedic system transforms challenging subjects into engaging ones that students can enjoy learning. It introduces a novel approach based on pattern recognition, providing learners with continuous opportunities to showcase their creativity.

The flexibility and freedom to choose their methods keep learners' minds active, enhancing their clarity of thought and intuition. This approach also helps reduce mathematics anxiety in students. Teaching Vedic Mathematics is likely to result in a high level of mathematical ability in children. Vedic Mathematics improves learners' mental abilities, enabling them to approach problems, solve them quickly, and achieve accurate results.

1.3 VEDIC SUTRAS

The sutras of Swami Bharati Krishna Tirthaji assist learners in solving math problems across various fields, including algebra, geometry, arithmetic, and mental calculations. The sutras of Vedic Mathematics are more coherent and unique than conventional methods. Sixteen main sutras and thirteen sub-sutras form the foundation of the Vedic approach to teaching mathematics. At a basic level, these sutras describe specific computational methods, but a deeper understanding enables rapid and accurate results by engaging higher-order brain function.

The main features of Vedic Mathematics include its coherence and flexibility, making it easy to understand and adaptable to different problems. It enhances mental calculation skills, creates a positive attitude toward learning mathematics, and improves memory, while also fostering creativity. Vedic Mathematics is appealing to a wide audience and enhances mental abilities, making mathematical problem-solving both effective and fast. It is enjoyable to learn and provides both specific and general methods for solving problems, based on Vedic sutras.

A detailed understanding of Vedic mathematics will be obtained by the primary sources namely books authored by Sri Bharathi Krishna Tirthaji, Sri. S. Haridas who was capable to find the 251^{st} root of a 794-digit number within 100 seconds, Vedic mathematics for schools by J.T. Clover, Vedic mathematics sutra by Dr. A. Kumar, and internet sources also clearly explain Vedic mathematics sutras and its applications.

1.4 ACHIEVEMENT IN MATHEMATICS

Achievement in mathematics denotes proficient acquisition and implementation of skills, knowledge, and understanding in the field of mathematics. It encompasses many competencies, from basic arithmetic to advanced mathematical concepts such as algebra, geometry, calculus, and statistics. Mathematical achievement is not only about solving equations or performing calculations but also about developing logical reasoning, critical thinking, and problem-solving skills.

A strong grasp of fundamental mathematical concepts is essential for achievement. This includes understanding the principles behind mathematical operations and the ability to apply these principles to different problems. High achievement in mathematics is often linked to overall academic success. It opens up opportunities for further study in fields such as science, engineering, economics, and technology.

Achievement in mathematics is a multifaceted goal that involves the development of various skills and attitudes. It is influenced by factors such as understanding, practice, motivation, teaching methods, and support. Achieving success in mathematics not only contributes to academic and professional advancement but also fosters essential life skills, and cognitive abilities and creates a positive attitude towards learning mathematics**.**

1.5 ATTITUDE

"The greatest discovery of any generation is that a human being can alter his life by altering his attitude."— William James, 1902.

Attitude plays a critical role in shaping a person’s behavior, decision-making, and perception of the world. It is a learned tendency that reflects how individuals think, feel, and act toward certain situations, people, or ideas. Attitudes can be ‘positive, negative, or neutral’ and are shaped by various factors, including ‘personal experiences, cultural influences, and external stimuli’. Psychologically, attitude is deeply ingrained in an individual's mental framework and often determines how they respond to challenges and opportunities. Whether consciously or subconsciously, our attitudes influence everything from mundane daily choices to major life decisions.

Attitude is also dynamic-it evolves as people encounter new experiences, face challenges, and broaden their understanding of the world. A positive attitude may lead to

success and satisfaction, while a negative attitude can hinder personal growth and progress. Importantly, as William James (1902) suggested, altering one's attitude can have a transformative effect on one's life. By changing how we approach situations, we can change the outcomes we experience, which is especially relevant in the context of education and learning.

1.5.1 NATURE AND CHARACTERISTICS OF ATTITUDE

G.W. Allport (1935) says "Attitude is a mental or neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related". Understanding the nature of attitude involves exploring many fundamental characteristics. Firstly, attitudes are not inherent; they are learned and acquired over time through experiences and interactions with the environment. Attitudes have both motivational and affective characteristics, meaning they are influenced by emotions and can drive behavior. They represent a complex combination of personality, beliefs, behaviors, values, and other personal traits, reflecting a broad spectrum of influences on an individual's outlook and actions.

Attitudes significantly affect the behavior and actions of individuals. They involve a subject-object relationship, meaning they encompass the connection between the learner and the object of their attitude. Everyone possesses attitudes, which are evident in their behaviors, even though the underlying feelings and beliefs are internal and not directly observable. The visible expressions of a person's attitude often come through in their actions and decisions.

Additionally, attitudes are not static; they can vary depending on the stimuli or situations a person encounters. The development of attitudes begins in childhood and is shaped by conditioning, imitation, and instruction. These early influences play a crucial role in forming a person's attitudes as they grow. Finally, attitudes are relatively enduring states of readiness, meaning they persist over time, although they can change with new experiences or information.

1.5.2 Attitude Toward Learning Mathematics

In the field of education, a student's attitude toward learning a subject, especially mathematics, is a strong predictor of academic success. Mathematics is perceived by

numerous learners as a difficult and abstract discipline, which can evoke strong emotions and attitudes, both favourable and unfavourable. Those with a favourable attitude toward mathematics tend to approach the subject with curiosity and resilience, leading to higher achievement. In contrast, students with negative attitudes may experience anxiety, avoidance, and lower performance. Research by Xin & Jianyamin (2004) and Thomas (2006) has shown that attitude toward mathematics is significantly correlated with performance in the subject. The more confident and motivated students feel about learning math, the better they perform.

Students who adopt a growth mindset and believe that they can improve their mathematical abilities through effort and practice tend to develop a more favorable attitude toward the subject. Such a mindset can lead to profound involvement with mathematical principles and techniques for solving problems. On the other hand, a fixed mindset, where students believe their ability to learn math is static, can lead to frustration and lower achievement. Developing a favorable perspective on mathematics is vital, as it not only impacts academic success but also influences students' aspirations to enter the professions in the "Science, Technology, Engineering, and Mathematics (STEM)" disciplines.

1.5.3 The Role of Educational Systems in Shaping Attitude Toward Mathematics

Educational systems and teaching methods also play a key role in shaping students' attitudes toward mathematics. Studies, such as those by Saha (2007), have demonstrated that an integrated and interactive approach to learning mathematics, which connects mathematical concepts to real-life applications, enhances students' interest and confidence. When students recognize the applicability of mathematics to their everyday experiences or prospective professions, they are more inclined to cultivate a positive disposition towards its study. On the contrary, conventional rote learning methods, which focus solely on memorization without contextual understanding, often reinforce negative attitudes by making the subject feel disconnected and overly challenging.

In conclusion, attitude is a powerful factor in the process acquiring a skill, particularly in mathematics. Learners with positive dispositions are more likely to excel, while those with negative attitudes may struggle. Shifting the focus toward positive reinforcement, real-life applications, and a growth mindset in education can transform

students' perceptions and success in mathematics, ultimately opening doors to further opportunities in both academic and professional spheres.

1.6 LEARNING STYLE

"The only person who is educated is the one who has learned how to learn and change." Carl Rogers(1961).

The process of Learning is that which brings change in individuals. It is understanding something in a new way through experience and these experiences increase their potential to excel in their future progress. Learning brings modifications in the level of knowledge, attitude, or behavior. As a consequence of this modification, learners understand the concepts, ideas, and world differently.

Learning cannot be imparted to students, rather learning is what they do to themselves to understand a particular thing. Learning some information constitutes only one part of learning but, students should be availed opportunities to develop skills like problem-solving, scientific inquiry, etc. Learning is the frequently used word in the field of education in which the students are learners and teachers become facilitators of learning.

Theories on learning propose that according to the learning style, every person can be categorized under different groups. Learning is a process that is beyond our control and dominated by the environment we inhabit and our relationships with people around us. Researchers have widely accepted that there is a drastic change in academic achievement due to the mode in which the students approach learning.

1.6.1 Learning Style Preference

Learning style denotes the capability of learners to understand and process the information they get through learning. To rephrase it, learning is the mitigation and collaboration of the response of the organisms. The ability to learn is a vital characteristic of humans, when a suitable condition is met to comprehend and understand an individual might increase the ability to learn.

Anderson and Bruce (1979) put forward that "matching students with selected learning environments is an efficacious means of increasing student achievement, particularly when the matching is conducted based on a student's learning style". For the past years, researchers have been enormously interested in academic achievement. As we

are always looking for better success, it is essential to explore the learning style and understand the ways they are inclined to learn and this may help them to achieve best.

Each person is unique in his/ her behavior, talents, aspirations, etc. Likewise, each learner will have his mode of learning known as learning style. Understanding learning styles is very important for identifying an individual's learning style and locating the most appropriate way to present knowledge to the learner (Montgomery & Groat, 1998).

The pre-service teachers should have an awareness of their learning style and then only they can choose the appropriate decision of selecting method of teaching (Cavas,2010). Depending on their perceptive skills, the teachers can determine the exact way to teach students. This study aims to examine the relationship between Learning style preference, Academic Achievement, Attitude toward learning mathematics, and Vedic mathematics. In the learning style inventory, four learning dimensions are used which comprise the eight distinct styles namely, 'active, reflective, visual, verbal, sensing, intuitive, sequential, and global.'

An active learner gains most of the information through active interaction with the course material, generally through knowledge application in a practical sense. On the contrary, a reflective learner is found more successful as they reflect on the knowledge they have. Visual learners acquire knowledge from what they witness like 'pictures', 'diagrams', etc. Verbal learners thrive well with what they have learned through written and spoken explanations. Sensing learners tend to learn facts on concrete learning material whereas intuitive learners are abstract thinkers. They prefer to learn abstract ideas such as theories and their underlying truths. They try to interpret the materials creatively and try to establish novel connections in the content. Sequential learners have linear learning progress. They find solutions following logical steps and methods, but global learners use a totalitarian thinking process and learn in large leaps. They are usually concerned with views and broad knowledge.

1.7 COMPUTATIONAL SPEED

Computational speed in mathematics refers to the ability to perform calculations quickly and efficiently, especially when dealing with complex problems. At the school level, computational speed in mathematics is an important skill that helps students efficiently solve arithmetic and algebraic problems. Mastering basic operations like

addition, subtraction, multiplication, and division is foundational, and students are often encouraged to develop fluency through repetitive practice. This fluency allows students to quickly handle more complex problems in subjects such as algebra, geometry, and calculus without getting bogged down by simple calculations. Speed in mental math, estimation, and the use of mathematical shortcuts can greatly enhance problem-solving abilities, especially in timed tests and competitive exams.

Achieving computational speed requires consistent practice. Students are often encouraged to develop fluency through repetitive exercises and timed drills, which help in building both speed and accuracy. This regular practice reinforces their understanding of basic operations and improves their ability to perform calculations mentally. With strong foundational skills, students can avoid being slowed down by simple computations, allowing them to focus on higher-level concepts in subjects like algebra, geometry, and calculus. Fluency in basic operations thus serves as a gateway to mastering more complex mathematical topics.

Computational speed is particularly advantageous in timed tests and competitive exams, where students must balance accuracy with speed to achieve high scores. In these settings, the ability to quickly perform mental math, make estimates, and apply shortcuts can greatly enhance their efficiency in solving complex problems.

1.8 STATEMENT OF THE PROBLEM

The cognizance of the importance of teaching mathematics in a trouble-free path has accelerated the investigator to take the investigation entitled “Effectiveness of Vedic mathematics-based instruction on achievement in mathematics and attitude towards learning mathematics among primary and upper primary students.” This investigation is an endeavor to examine how Vedic mathematics enhances academic success in mathematics and shapes the attitude towards mathematics among students in VIII and III grades.

1.9 OPERATIONAL DEFINITION OF KEY TERMS

The fundamental terms explored in this investigation encompass Vedic mathematics, Attitude towards learning mathematics, Achievement in mathematics, and Primary and upper primary students.

1.9.1 Vedic Mathematics-based instruction

Vedic mathematics refers to the mathematics system that prevailed in the ancient period. Sri Bharati Krishna Tirthaji (1884-1960) rediscovered this system from the Vedas during 1911-1918, based on sixteen sutras and thirteen sub-sutras called word - formulae.

In this study, five Sutras and one Sub-sutra were used to teach arithmetic skills to the students.

The Sankalanam Sutra simplifies addition by aligning place values and calculating from left to right. For subtraction, the Nikhilam Navatashcaramam Dashatah Sutra ("All from 9 and the last from 10") streamlines subtraction from powers of 10. The Urdhva Tiryagbhyam Sutra ("Vertically and crosswise") offers a fast, structured method for multiplication by multiplying digits both vertically and crosswise. For division, the Nikhilam Sutra applies complementary subtraction for divisors near powers of 10, while the Paravarthya Sutra ("Transpose and apply") aids in simplifying more complex divisions. For squaring numbers, the Ekadhikena Purvena Sutra is used, and the Vilokanam Sub-Sutra helps in efficiently finding square and cube roots.

1.9.2 Attitude towards mathematics

Thurstone (1949) defines, “An attitude is the degree of positive or negative aspect associated with a psychological object.” According to Hart (1989), the “attitude of an individual towards mathematics is defined as the emotions that he/she associates with mathematics (either positive or negative) by the individual’s beliefs towards mathematics, and by how he/she behaves.” This study assesses how students demonstrate their enthusiasm and readiness to engage with mathematics. An effort was made to evaluate the attitudes of third-grade and eighth-grade students toward learning mathematics through an Attitude toward Learning Mathematics Scale.

1.9.3 Primary and Upper Primary Students

The terms Primary and Upper Primary refer to different stages of primary education, typically in the school system. Upper Primary includes Grades VI to VIII with students typically aged between 11 and 14 years and Primary includes grades from I to V and the age ranges from 6 to 10 (National Curriculum framework (2005)).

In the present study, VIII-grade and III-grade students were considered, as the basic mathematical operations like addition, subtraction, and multiplication are introduced in third grade, and eighth grade is taken in upper primary levels because the basics of all algebraic operations are made strong for further higher mathematical learning.

The study was initially designed for VIII-grade students and the results revealed that Vedic mathematics-based instruction was not significantly effective. This made the investigator to try the method on lower grade and hence III-grade students were selected and the method was employed. This is the reason for selecting primary and upper-primary students in the study.

1.9.4 Achievement in Mathematics

"Mathematics achievement refers to the extent to which a person has acquired certain mathematical skills or knowledge through instruction or practice." Lindquist (1967).

Here the achievement of students in basic arithmetic operations, square root, cube root, and squaring taught through conventional and Vedic methods is considered to be the achievement in mathematics of students belonging to third and eighth grade. In addition, two other variables, namely learning style and computational speed were taken into account for the study. Although these variables are not reflected in the title, they were taken based on the review of literature and investigators' interest.

1.9.5 Learning style

"The particular set of cognitive, affective, and psychological behaviors that determine how individuals perceive, interact with, and respond to the learning environment." Kolb (1984).

Learning style is a way that a person adopts to understand a particular situation, any concept, or a formula and it may differ from individual to individual. In this study, VAK model has been used, which includes the learning styles Visual, Auditory, and Kinesthetic

Visual learners

Visual learners are learners who learn through sight. This type of learner will understand the concepts better when taught in visual form and they are the learners who

learn by taking notes. Visual learners will understand better when shown things in maps, diagrams, and pictures. They are a good observer and will have a keen observation of the things that prevail around them.

Auditory learners

Auditory learners usually learn by the mode of hearing. They find learning better when they hear concepts either in the classroom or through gadgets. This type of learner will be more attentive in hearing the concepts taught or played and will find the learning process to be trouble-free in group discussions. They also will develop verbal explaining skills.

Kinesthetic learners

Kinesthetic learners experience and learn things by doing. This type of learner will feel free to learn through activities and they are likely to prefer more co-curricular activities like dance, sports, etc. They try to physically sense different concepts and enable playful learning and prefer learning things in reality by touching and feeling things.

1.10 COMPUTATIONAL SPEED

Computational Speed refers to "the time complexity of an algorithm, which is a measure of the time required to execute an algorithm as a function of the input size." Cormen et al. (2009).

In this study, computational speed refers to the speed involved in the calculation of mathematical problems using Vedic mathematics.

1.11 RESEARCH GAP

A notable deficiency is present in the existing literature concerning the impact of Vedic Mathematics across various educational levels, especially for primary and upper-primary students. Previous investigations into Vedic Mathematics predominantly focused on samples consisting of high school and secondary school students, revealing a significant lack of research involving primary-level participants. Initially, the research concentrated on upper primary school students, but it later expanded to encompass primary students. Although some studies have examined mathematical achievement, there has been inadequate exploration of how Vedic Mathematics affects students' attitudes towards learning mathematics.

This gap in comprehensive analysis prompted the researcher to undertake a study aimed at enhancing the understanding of the effectiveness of Vedic Mathematics-based instruction, particularly concerning improving mathematics achievement, computational speed and fostering positive attitudes towards mathematics learning among primary and upper-primary students.

1.12 NEED AND SIGNIFICANCE OF THE STUDY

Mathematics is considered to be the queen of all science and it involves numbers and symbols following certain mathematical regulations. If a child finds the solution for a problem himself for the first time independently it creates a great pleasure in them. But at present the methodology used in teaching mathematical concepts does not create a conducive environment for the students and it leads to a kind of fear towards the subject of Mathematics. These students are facing tough competition in both curricular and non-curricular activities. The students are pressured by their teachers to score high marks, especially in mathematics, because mathematics is the base for all subjects.

In the conventional method, the children are finding difficult and vague to memorize formulas and they feel a burden to retain it in memory. Students are psychologically affected due to their anxiety towards the subject of mathematics and this can be reduced by giving an alternative way by which they can understand and solve problems in trouble-free methods.

Our ancient history had many eminent mathematicians like Brahmagupta, Aryabhata, and many others. They have contributed a lot to the world, they have given the value of zero, trigonometry, algebra, and most importantly the decimal system. Ancient mathematics includes Vedic mathematics, which evolved in the Vedic period and involves sixteen sutras and thirteen sub-sutras. The sutras of Vedic mathematics enable the children to think naturally and direct them to arrive at an appropriate solution and this improves the creativity of the students, equipping them to solve even complex problems.

Nowadays students don’t calculate mentally, they are always dependent on gadgets and software for calculations even for simple problems. The ancient system of teaching mathematics in the easiest method is Vedic mathematics. It is an eccentric system as it facilitates the learners to find solutions for any problems in mathematics. Expanding research in the fields of Vedic mathematics has provided much-needed information for classroom teachers and also the students benefitted. Therefore, it was decided to undertake

a study to assess the efficacy of Vedic mathematics relative to conventional methods of teaching mathematics.

1.13 OBJECTIVES OF THE STUDY

Objectives are categorized under three heads:

Development and Validation

- To construct and validate a package for Vedic Mathematics-based instruction (VMPBMO).
- To develop and validate a previous knowledge test and Achievement test in Mathematics.
- To develop a rating scale that measures attitudes toward learning Mathematics.
- To develop and validate a Learning Style Inventory.

Relationship Analysis

- To explore the relationship of Achievement in Mathematics and Attitude towards learning Mathematics among both the Eighth and Third graders.

Comparative Analysis

- To assess how the instruction based on Vedic Mathematics affects the mathematical achievement and attitudes towards learning mathematics among eighth-grade and third-grade students, while also considering variables such as gender and type of school attended.
- To identify which type of learners, benefit the most from Vedic Mathematics Instruction.
- To compare the computing speed of students taught by Vedic Mathematics-based instruction and conventional methods of teaching.

1.14 HYPOTHESES

- No significant difference will exist in the Achievement in Mathematics and Attitude towards learning Mathematics of Eighth-grade students taught by Vedic Mathematics-based instruction and the conventional method of teaching.

- No significant difference will be there in the Achievement in Mathematics and Attitude towards learning Mathematics of Third-grade students taught by Vedic Mathematics-based instruction and the Conventional method of teaching.
- No significant relation will exist between Achievement in Mathematics and Attitude towards learning Mathematics of eighth-grade students taught by Vedic Mathematics-based instruction.
- No significant relation will be there between Achievement in Mathematics and Attitude towards learning Mathematics of third-grade students taught by Vedic Mathematics-based instruction.
- No significant difference will be there in the Achievement in Mathematics and Attitude towards learning Mathematics of eighth-grade students taught by Vedic mathematics-based instruction regardless of their Gender and Type of school.
- No significant difference will exist in the Achievement in Mathematics and Attitude towards learning Mathematics of third-grade students taught by Vedic Mathematics-based instruction irrespective of their Gender and Type of school.
- There is no significant difference in the Achievement in Mathematics of Eighth - grade students taught by Vedic Mathematics-based instruction based on their Learning style
- There is no significant difference in the Achievement in Mathematics of Third - grade students taught by Vedic Mathematics-based instruction based on their Learning style
- There will not be any significant difference in the computing speed of students taught by Vedic Mathematics-based instruction and conventional methods of teaching.

1.15 LIMITATION OF THE STUDY

This research presents limitations that may hinder the broader applicability of its findings. The identified limitations are outlined as follows:

- The area from which the samples were selected was confined to Gudalur, Nilgiris district, Tamilnadu.
- The sample selected for the study was only 320 in number.
- Only eighth-grade and third-grade students were taken to the study

- The study was focused only on Basic arithmetic, Square, Square Root, Cube, Cube Root, and solving linear algebraic equations for eighth grade and only basic arithmetic for the third grade. So, in this study, only a few Vedic mathematics sutras were used.

1.16 DELIMITATION OF THE STUDY

- This investigation was restricted to the area of Gudalur in Nilgiris district.
- The study was confined to basic concepts in mathematics.
- The study was delimited to eighth and third grade only.
- The study was delimited to schools that receive government assistance as well as private schools.
- The study was restricted to a total of 320 students.
- Out of sixteen sutras and thirteen sub-sutras of Vedic mathematics, only five sutras and one sub sutra were taken under study.
- The variables were delimited to only three variables such as achievement in mathematics, attitude towards learning mathematics, and learning style.
- The sub-variables considered were delimited to gender and school type.

1.17 ORGANIZATION OF THE THESIS

Chapter I: Introduction.

This chapter elucidates the origin of Vedic mathematics, the importance of Vedic mathematics, Vedic sutras, and the main features of Vedic mathematics. It explains the variable Attitude, its nature, and its characteristics, learning style detailing the various types followed by the problem statement and the operational definition of significant terms. It also deals with the need for and significance of the investigation, outlines the objectives and hypothesis, acknowledges the limitations faced, and describes the outline of the thesis.

Chapter II: Review of related literature

This chapter furnish a theoretical framework for Vedic mathematics, exploring its implications for mathematical achievement, attitudes towards mathematics learning, learning styles, and computational speed. It presents research pertinent to the study's

focus. Organized into distinct sections the chapter begins with studies concerning Vedic mathematics; examines research on mathematical achievement; discusses studies related to attitudes towards learning mathematics and learning styles; and the final section reviews studies on computational speed.

Chapter III: Methodology

The structural framework of the research is presented in this chapter. The methodology is delineated in this chapter and it displays the research design, locale of the study, population, and samples. Additionally, it elaborates on the development and validation of modules, tools, data collection procedures, and analysis conducted.

Chapter IV: Results and Discussion

This chapter focuses on both inferential and descriptive statistics, employing a range of statistical methods to assess the effectiveness of Vedic mathematics. The analysis is based on several variables, including attitudes toward learning mathematics, mathematical achievement, learning styles, and computational speed, and it presents the findings along with their interpretations.

Chapter V: Summary and Conclusion

Reports the findings, discusses the educational implications, and provides recommendations, and suggestions for subsequent research.