CHAPTER I : INTRODUCTION

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INTRODUCTION

1.1 Introduction

Proficiency in languages, science, and mathematics is seen as an essential precursor to success in modern society. Among the above, mathematics is increasingly becoming key factor that is influencing the careers. Mathematics is the abstract science which investigates deductively the conclusion implicit in the elementary conceptions of numerical and spatial relations. It is a systematized and organized science. It is a science of logical reasoning. It enables to understand and appreciate precision, brevity, sharpness, logic, beauty of numbers. Mathematics is the study of abstractions and their relationship in which the only technique of reasoning that may be used to confirm any relationship. The place of mathematics in modern education system is determined by an analysis of the culture of the modern society. The Kothari commission (1964) rightly emphasized that the study of mathematics plays a prominent part in modern education.

The importance of mathematics in modern education has been recognized across the world. According to Roger Bacon "Mathematics is a gate way and key of all the sciences". Hence in all the sciences and information technology the knowledge of mathematics is very much essential and useful. Mathematics helps to develop soft skills, like self confidence, logical and critical thinking, self- reliance, sense of appreciation, scientific attitude, problem solving etc. Therefore, the research on mathematics had made it evident that society, community and parents are much keener than before to impart better mathematical abilities among their children. It is also very pertinent for every mathematics teacher to develop positive attitude towards learning mathematics among students. The positive attitude is helpful in improving up the thinking level of the students and plays a significant role in the development of different mental abilities.

According to Baroody (1987), the knowledge of mathematics is an essential tool in our society. Mathematics is a tool that can be used in our daily life to overcome difficulties faced (Bishop, 1996). Due to this mathematics has been considered as one of the most important core subject in a school curriculum, more mathematics lesson are likely to be taught in schools and colleges throughout the world than any other subject (A. Orton, D. Orton & Frobisher, 2004). However, research around mathematics education reveals that the students do not perform to the expected level, and the students under achievement in mathematics, is not just a concern over the year (Pisa, 2003), hence it has been a matter of academic inquiry, research, curriculum designing, pedagogical shifts and enhancing the achievement.

Several studies and researches have been done in many countries to find the factors that influence the students' performance in mathematics. Among these factors, students' attitude towards mathematics is one important factor, among many, that has been consistently studied. It is often found that the studies on relationship between students' attitude and the students' academic performance show a positive relationship (Mohd., Mahmood, & Ismail, 2011; Bramelet & Herron, 2009; Nicolaidou & Philippou, 2003; Papanas tasiou, 2000; Ma & Kisher, 1997). Hence students' attitude towards mathematics is a major factor that might influence the performance of the students in mathematics and overall performance in school and college education. Therefore, across the globe, several studies has been conducted in different countries in order to find out the students' attitude towards mathematics (Tahar, Ismail, Zamani & Adnan, 2010; Bramlett & Herron, 2009; Kogce, Yidiz Aydm, & Altinday, 2009; Tapia & Marsh, 2004; Fennema & Sherman, 1996) and relate the attitude towards mathematics with their performance in mathematics as well as over all academic achievement.

1.2 Mathematics

Carl friedrich Gauss (1777-1855) referred to mathematics "the Queen of the Sciences".

Benjamin Peirce (1809-1880) called mathematics "the science that draws necessary conclusions".

Mathematics is the study of topics such as quantity, structure, space and change. Mathematics is an important subject in school curriculum if any subject area of study evokes wide emotional comment it is mathematics. For the school going children there is a general opinion in our society that those students who score poor marks in mathematics are dull students, even if they score good marks in other subject. The term mathematics may be defined in a number of ways. It is an exact science that is related to measurement, calculation, discovering relationship and dealing with the problem of space.

According to new English dictionary "mathematics is a strict sense is the abstract science which investigates deductively the conclusions implicit in the elementary conception of spatial and numerical relations."

According to Locke, "mathematics is a way to settle in mind a habit of reasoning."

Mathematics is considered one of the important subjects in primary school curriculum. It is more closely related to one daily life as compared to other subjects. It is also highlighted in National Policy of Education 1986 as follows "mathematics should be visualised as the vehicle to train a child to think reason, analyse articulate logically". Apart from being specific subjects it should be treated as a concomitant to any subject involving analysis and meaning.

Mathematics is a subject which deals with all subjects; knowledge of mathematics is logical and conceptual. It does not vary with the time and place. Once mathematics concepts are created they are as it is for always nobody can change it. For example $(a+b)^2= a^2 + b^2 +2ab$, it always used as same, no variations be made in it , on the basis of this identity many new identity has been created. New theory and new concepts can be added to the body of the knowledge of the Mathematics by the time but previous one is concrete. Mathematics knowledge is inductive knowledge, general to particular.

Mathematics is used throughout the world as an essential tool in many fields, including natural science, engineering, medicine, finance and the social sciences. Applied mathematics, the branch of mathematics concerned with application of mathematical knowledge to other fields, inspires and makes use of new mathematical discoveries.

1.3 Mathematics: Indian context

Indian mathematicians have made a number of contributions to mathematics that has significantly influenced scientists and mathematicians in the modern era. These include place-value arithmetical notations, the ruler, the concept of zero, and, most important, the Arabic-Hindu numerals predominantly used today and which can be used in the future also.

Indian mathematics emerged in the Indian subcontinent from 1200 BCE until the end of the 18th century. In the classical period of Indian mathematics (400 CE to 1600 CE), important contributions were made by scholars like Aryabhata, Brahmagupta, Mahavira Bhaskara II, Madhava of Sangamagrama and Nilakantha Somayaji. The decimal number system in use today was first recorded in Indian mathematics. Indian mathematicians made early contributions to the study of the concept of zero as a number, negative numbers, arithmetic, and algebra In addition, trigonometry was further advanced in India, and, in particular, the modern definitions of sine and cosine were developed there. These mathematical concepts were transmitted to the Middle East, China, and Europe and led to further developments that now form the foundations of many areas of mathematics.

Vedic period

The religious texts of the Vedic Period provide evidence for the use of large numbers. By the time of the Yajurvedasaṃhita- (1200–900 BCE), numbers as high as 10^{12} were being included in the texts. For example, the mantra (sacrificial formula) at the end of the annahoma ("food-oblation rite") performed during the

asvamedha, and uttered just before-, during-, and just after sunrise, invokes powers of ten from a hundred to a trillion

Sulba Sutras

The Sulba Sutras (literally, "Aphorisms of the Chords" in Vedic Sanskrit) (700–400 BC) list rules for the construction of sacrificial fire altars. Most mathematical problems considered in the Sulba Sutras spring from "a single theological requirement," that of constructing fire altars which have different shapes but occupy the same area. The altars were required to be constructed of five layers of burnt brick, with the further condition that each layer consist of 200 bricks and that no two adjacent layers have congruent arrangements of bricks.

According to (Hayashi 2005, p. 363), the Sulba Sutras contain "the earliest extant verbal expression of the Pythagorean Theorem in the world, although it had already been known to the Old Babylonians."

The diagonal rope (aksnaya-rajju) of an oblong (rectangle) produces both which the flank (parsvamani) and the horizontal (tiryanmani) <ropes> produce separately."

Pingala

Among the scholars of the post-Vedic period who contributed to mathematics, the most notable is Pingala (300–200 BC), a musical theorist who authored the Chhandas Shastra (chandah-sastra, also Chhandas Sutra chhandaḥ-sutra), a Sanskrit treatise on prosody. There is evidence that in his work on the enumeration of syllabic combinations, Pingala stumbled upon both the Pascal triangle and Binomial coefficients, although he did not have knowledge of the Binomial theorem itself. Pingala' work also contains the basic ideas of Fibonacci numbers (called maatraameru). Although the Chandah sutra hasn't survived in its entirety, a 10th-century commentary on it by Halayudha has. Halayudha, who refers to the Pascal triangle as Meru-prastara (literally "the staircase to Mount Meru").

Jain Mathematics (400 BCE – 200 CE)

Although Jainism as a religion and philosophy predates its most famous exponent, the great Mahavira (6th century BCE), most Jain texts on mathematical topics were composed after the 6th century BCE. Jain mathematicians are important historically as crucial links between the mathematics of the Vedic period and that of the "Classical period."

A significant historical contribution of Jain mathematicians lay in their freeing Indian mathematics from its religious and ritualistic constraints. In particular, their fascination with the enumeration of very large numbers and infinities led them to classify numbers into three classes: enumerable, innumerable and infinite. Not content with a simple notion of infinity, they went on to define five different types of infinity: the infinite in one direction, the infinite in two directions, the infinite in area, the infinite everywhere, and the infinite perpetually. In addition, Jain mathematicians devised notations for simple powers (and exponents) of numbers like squares and cubes, which enabled them to define simple algebraic equations (beejganita samikaran). Jain mathematicians were apparently also the first to use the word shunya (literally *void* in Sanskrit) to refer to zero. More than a millennium later, their appellation became the English word "zero" after a tortuous journey of translations and transliterations from India to Europe

Classical Period (400–1600)

This period is often known as the golden age of Indian Mathematics. This period saw mathematicians such as Aryabhata, Varahamihira, Brahmagupta, Bhaskara-I, Mahavira, Bhaskara-II, Madhava of Sangamagrama and Nilakantha Somayaji give broader and clearer shape to many branches of mathematics. Their contributions would spread to Asia, the Middle East, and eventually to Europe. Unlike Vedic mathematics, their works included both astronomical and mathematical contributions. In fact, mathematics of that period was included in the 'astral science' (jyotiḥsastra) and consisted of three sub-disciplines: mathematical sciences (gaṇita or tantra), horoscope astrology (hora or jataka) and divination

(saṃhita). This tripartite division is seen in Varāhamihira's 6th century compilation—Pancasiddhantika (literally panca, "five," siddhanta, "conclusion of deliberation", dated 575 CE)—of five earlier works, Surya Siddhanta, Romaka Siddhanta, Paulisa Siddhanta, Vasishtha Siddhanta and Paitamaha Siddhanta, which were adaptations of still earlier works of Mesopotamian, Greek, Egyptian, Roman and Indian astronomy. As explained earlier, the main texts were composed in Sanskrit verse, and were followed by prose commentaries.

Fifth and sixth centuries

Surya Siddhanta

Though its authorship is unknown, the Surya Siddhanta (c. 400) contains the roots of modern trigonometry. Because it contains many words of foreign origin, some authors consider that it was written under the influence of Mesopotamia and Greece.

This ancient text uses the following as trigonometric functions for the first time:

- Sine (Jya).
- Cosine (Kojya).
- Inverse sine (Otkram jya).

It also contains the earliest uses of:

- Tangent.
- Secant.

Aryabhata I

Aryabhata (476–550) wrote the Aryabhatiya. He described the important fundamental principles of mathematics in 332 shlokas. The treatise contained:

- Quadratic equations
- Trigonometry
- The value of π, correct to 4 decimal places.

Aryabhata also wrote the Arya Siddhanta, which is now lost. Aryabhata's contributions include:

Trigonometry

- Introduced the trigonometric functions.
- Defined the sine (jya) as the modern relationship between half an angle and half a chord.
- Defined the cosine (kojya).
- Defined the versine (utkrama-jya).
- Defined the inverse sine (otkram jya).
- Gave methods of calculating their approximate numerical values.
- Contains the earliest tables of sine, cosine and versine values, in 3.75° intervals from 0° to 90°, to 4 decimal places of accuracy.
- Contains the trigonometric formula $\sin(n + 1)x - \sin nx = \sin nx - \sin(n - 1)x - (1/225)\sin nx$.
- Spherical trigonometry.

Arithmetic

- Continued fractions.

Algebra

- Solutions of simultaneous quadratic equations.
- Whole number solutions of linear equations by a method equivalent to the modern method.
- General solution of the indeterminate linear equation .

Mathematical astronomy

- Accurate calculations for astronomical constants, such as the:
- Solar eclipse.
- Lunar eclipse.
- The formula for the sum of the cubes, which was an important step in the development of integral calculus.

Varahamihira

Varahamihira (505–587) produced the Pancha Siddhanta (The Five Astronomical Canons). He made important contributions to trigonometry, including sine and cosine tables to 4 decimal places of accuracy and the following formulas relating sine and cosine functions:

$$\sin^2(x) + \cos^2(x) = 1$$

Brahmagupta

Brahmagupta's theorem: If a cyclic quadrilateral has diagonals that are perpendicular to each other, then the perpendicular line drawn from the point of intersection of the diagonals to any side of the quadrilateral always bisects the opposite side.

In past independent India, great emphasis has been placed on mathematics teaching and learning, the education commission (1964-66) recommended mathematics as a compulsory subject for students at school level. The commission seemed to have been influenced by international opinion at that particular time and favoured new mathematics which later pervaded secondary education. That was the era of sets and the algebra of sets.

Hence India can be always considered as a centre of mathematics enquiry and excellence.

The NPE (1986) has also considered the important of mathematics in general education and suggestions that mathematics should be visualised as the vehicle to train a child to think, reason, analyse and to articulate logically apart from being .....a specific subject it should be treated as concomitant to any subject involving analysis and reasoning. In the recent past there have been tremendous development in theories of learning and the science of teaching of maths occupied a place of important, the researches in this area have been scarcity.

According to **NATIONAL CURRICULUM FRAMEWORK NCF (2005)** school mathematics takes place in a situation where:

- Children learn to enjoy mathematics rather than fear it.
- Children learn important mathematics; mathematics is more than formulas and mechanical procedure.
- Mathematics is a part of children's life experience which they talk about.
- Children pose and solve meaningful problem.
- Children use abstraction to perceive relationship and structure.
- Children understand basic structure of mathematics.
- Teacher expects to engage every child in class.

In the teaching of mathematics emphasis should be more or the understanding of basic principles than one the mechanical teaching of basic principles than one the mechanical teaching of mathematical computation, commenting on the prevailing situation in school, today instruction still conform to a mechanical routine continue to be dominated by the old be setting evil of verbalism and therefore remains as dull and uninspiring as before.

1.4 Importance of mathematics: NCERT position paper on mathematical education

The main goal of mathematics education in schools is the mathematisation of the child's thinking. Clarity of thought and pursuing assumptions to logical conclusions is central to the mathematical enterprise. There are many ways of thinking, and the kind of thinking one learns in mathematics is an ability to handle abstractions, and an approach to problem solving. Universalisation of schooling has important implications for mathematics curriculum. Mathematics being a compulsory subject of study, access to quality mathematics education is every child's right. We want mathematics education that is affordable to every child, and at the same time, enjoyable. With many children exiting the system after Class VIII, mathematics education at the elementary stage should help children prepare for the challenges they face further in life.

In our vision, school mathematics takes place in a situation where:

(1) Children learn to enjoy mathematics,

(2) Children learn important mathematics,

(3) Mathematics is a part of children's life experience which they talk about,

(4) Children pose and solve meaningful problems,

(5) Children use abstractions to perceive relationships and structure,

(6) Children understand the basic structure of mathematics and

(7) Teachers expect to engage every child in class.

On the other hand, mathematics education in our schools is beset with problems. We identify the following core areas of concern:

(a) A sense of fear and failure regarding mathematics among a majority of children,

(b) A curriculum that disappoints both a talented minority as well as the non-participating majority at the same time,

(c) Crude methods of assessment that encourage perception of mathematics as mechanical computation, and

(d) Lack of teacher preparation and support in the teaching of mathematics. Systemic problems further aggravate the situation, in the sense that structures of social discrimination get reflected in mathematics education as well. Especially worth mentioning in this regard is the gender dimension, leading to a stereotype that boys are better at mathematics than girls.

The analysis of above problems lead us to recommend:

(a) Shifting the focus of mathematics education from achieving 'narrow' goals to 'higher' goals,

(b) Engaging every student with a sense of success, while at the same time offering conceptual challenges to the emerging mathematician,

(c) Changing modes of assessment to examine students' mathematization abilities rather than procedural knowledge, and

(d) Enriching teachers with a variety of mathematical resources.

The shift in focus we propose is from mathematical content to mathematical learning environments, where a whole range of processes take precedence: formal problem solving, use of heuristics, estimation and approximation, optimisation, use of patterns, visualisation, representation, reasoning and proof, making connections, mathematical communication. Giving importance to these processes also helps in removing fear of mathematics from children's minds.

A crucial implication of such a shift lies in offering a multiplicity of approaches, procedures, solutions. We see this as crucial for liberating school mathematics from the tyranny of the one right answer, found by applying the one algorithm taught. Such learning environments invite participation, engage children, and offer a sense of success. In terms of assessment, we recommend that Board examinations be restructured, so that the minimum eligibility for a State certificate be numeracy, reducing the instance of failure in mathematics.

On the other hand, at the higher end, we recommend that examinations be more challenging, evaluating conceptual understanding and competence.

We note that a great deal needs to be done towards preparing teachers for mathematics education. A large treasury of resource material, which teachers can access freely as well as contribute to, is badly needed. Networking of school teachers among themselves as well as with university teachers will help. When it comes to curricular choices, we recommend moving away from the current structure of tall and spindly education (where one concept builds on another, culminating in university mathematics), to a broader and well-rounded structure, with many topics "closer to the ground".

If accommodating processes like geometric visualisation can only be done by reducing content, we suggest that content be reduced rather than compromise on the former. Moreover, we suggest a principle of postponement: in general, if a theme can be offered with better motivation and applications at a later stage, wait for introducing it at that stage, rather than go for technical preparation without due motivation.

Our vision of excellent mathematical education is based on the twin premises that all students can learn mathematics and that all students need to learn mathematics. It is therefore imperative that we offer mathematics education of the very highest quality to all children.

1.5 Content of mathematics text book

Generally, content of mathematics text book for class 9^{th} is all over the same across the India. In the present study two types of the school based on the board, one is central board for education and other one Madhya Pradesh secondary board had been selected. The content of the text book of mathematics of this school had been given below:

Content for mathematics textbook for CBSE (NCERT TEXT BOOK)

Chapter 1: Number System

Chapter 2: Polynomials

Chapter 3: Coordinate Geometry

Chapter 4: Linear Equations in Two Variables

Chapter 5: Introduction to Euclid's Geometry

Chapter 6: Lines and Angles

Chapter 7: Triangles

Chapter 8: Quadrilaterals

Chapter 9: Areas of Parallelograms and Triangles

Chapter 10: Circles

Chapter 11: Constructions

Chapter 12: Heron's Formula

Chapter 13: Surface Area and Volumes

Chapter 14: Statistics

Chapter 15: Probability

Content of mathematics textbook for State board (M.P. board text book)

Chapter 1: History of Mathematics

Chapter 2: Sets, Number System and Surds

Chapter 3: Functions

Chapter 4: Polynomial And Remainder Theorem

Chapter 5: Logarithm

Chapter 6: Linear Equation for One Variable

Chapter 7: Trigonometry

Chapter 8: Commercial Mathematics

Chapter 9: Congruency

Chapter 10: Parallelogram

Chapter 11: Geometrical Construction

Chapter 12: i) Statistics

ii) Probability

There are many similarities between the both the board, and in the text book. Objective of the both textbooks are to develop logical thinking, mastery over the problem solving, enhance reasoning skills.

1.6 Aims and objectives of teaching mathematics in school

The general objectives and teaching mathematics at primary stage are to help the learners to:-

1. Consolidate the mathematical knowledge and skills acquired earlier.
2. Acquire knowledge and understanding of the terms and symbols, concept, principle, process, proof etc.
3. Develop mastery of basic algebraic skills.
4. Develop drawing skills.
5. Apply mathematical knowledge and skills to solve real life problems.
6. Develop the ability to articulate logically.

7. Develop necessary skills with modern technological devices such as calculators & computer etc.

8. Develop positive thinking.

9. Develop awareness of the need for national unity and develop confidence for the competitive examination.

10. Develop reverence and respect towards great mathematics particularity Indian Mathematicians for their contribution to the field of mathematics.

Keeping the above objectives in view, it becomes very pertinent to understand the importance of attitude of school children pertaining to mathematics

1.7 Attitude

An attitude is a hypothetical construct that represents an individual's degree of likes or dislike for something. Attitudes are generally positive or negative views for a person, place, things or events. This is often referred to as the attitude object; people can also be conflicted or ambivalent towards an object, meaning that they simultaneously possess both positive and negative attitudes towards the item in question.

FISHBEIN and AJZEN (1975) define, attitude as "A learned predisposition to respond in a consistently favourable or unfavourable manners with respect to a given object."

With the above elements in mind, attitude towards mathematics can be defined as "A learned predisposition to respond consistently favourable or unfavourable manner with respect to the mathematics.

1.8 Attitude towards mathematics

An attitude is a favourable or unfavourable evaluation of something. Attitudes are generally positive or negative views of a person, place, thing, or event – this is often referred to as the attitude object. People can also be conflicted or ambivalent towards an object, meaning that they simultaneously possess both positive and negative attitudes towards the item in questions.

Attitude can be defined as "an accumulation of information ... a predisposition to act in a positive or negative way towards some object" (Littlejohn, 2008).

Attitude towards mathematics is whether the students are in favour of mathematics or in disfavour of it. Every child has different attitude towards mathematics, some enjoy it, some have phobia (fear) of it and some does not take any interest in it. This attitude can be in terms of positive, negative, neutral and may be indifferent. It is not necessary that each/every child has an interest in mathematics, this will happen with all subjects whether it is science , maths, social science, language etc. every student has different attitude towards different subjects. Mathematics is core subject of STEM (science, technology, engineering, mathematics). Most of the students have a kind of opinion or feeling /thoughts towards mathematics which is different from as compared to other subjects.

Attitude towards mathematics plays a crucial role in the teaching and learning processes of mathematics. It effects students' achievement in mathematics, the teaching methods, and the support of the structure of the school, the family and students' attitude towards school affect the attitude towards mathematics. Usually, the way that mathematics is represented in the classroom and perceived by students, even when teachers believe they are presenting it in authentic and context dependent way stands to alienate many students from mathematics. Researchers conclude that positive attitude towards mathematics leads students towards success in mathematics. Attempt to improve attitude towards mathematics at lower level provides base for higher studies in mathematics/ it causes effect in achievement in mathematics at higher secondary level.

Many studies concluded that positive attitude towards mathematics leads students towards success in mathematics. Attempt to improve attitude towards mathematics at lower level provides base for higher studies. Each student has a different attitude towards mathematics. It is difficult to say whether everyone have same attitude towards mathematics.

1.9 Definition of attitude towards mathematics

A 'simple' definition of attitude, that describes it as the positive or negative degree of affect associated with a certain subject. According to this point of view the attitude toward mathematics is just a positive or negative emotional disposition toward mathematics.

A multidimensional definition, which recognizes three components in the attitude: emotional response, beliefs regarding the subject, behaviour related to the subject. From this point of view, an individual's attitude toward mathematics is defined in a more complex way by the emotions that he/she associates with mathematics (which, however, have a positive or negative value), by the individual's beliefs towards mathematics, and by how he/she behaves.

Throughout the years there have been innumerable investigation on the attitude towards mathematics is related to students achievement and help in career options and it open the different dimension in career selection.

1.10 Parents' perception about attitude towards mathematics

Most of the parents think that their children should have the good knowledge of mathematics. Children have positive attitude towards mathematics. Having positive attitude towards mathematics will help them to lead in career. Positive attitude towards mathematics help their children to qualify many exams and provide them many career opportunity. Most of the parents emphasis on learning or teaching of mathematics, they are worried about their children's performance in mathematics. Good performance in mathematics helps children to think logically and in reasoning thinking. Achievement in mathematics depends upon the kind of attitude towards mathematics. Good academic record helpful for further studies.

1.11 Teachers' perception about attitude towards mathematics

Mathematics teachers' want their students have a good conceptual and logical knowledge. Each student must have basic knowledge of mathematics which helps in to develop a positive attitude towards mathematics. Positive attitude towards mathematics will improve the academic performance as well

logical thinking of the students. Good mathematics background is helpful in career decision making as well as in

1.12 Students' perception about attitude towards mathematics

Students know importance of mathematics in the schooling time. Low self-esteem and math phobia in mathematics learning seem to result in confused thinking, disorganization, avoidance behaviour, and passivity. Students' attitude towards math seems to be shaped by how students define mathematics, and what they consider the role of mathematics is in their life. For instance, a student considering mathematics as bunch of symbols and procedures tends to treat his/her mathematics concepts as a set of memorization facts. This student will not put any effort to understand "whys." If a student does not think mathematics is important then the student will not again consider his/her math course worthy enough to spend time on. Motivation of these students would be very low. Then it will be difficult to have students learn mathematics meaningfully and develop the understanding of the subject-matter of mathematics. This means one needs to address students' attitudes and behaviours before introducing mathematical concepts and expecting meaningful learning in his class.

1.13 CAREER

A career is an individual's journey through learning, work and other aspects of life. There are a number of ways to define a career and the term is used in a variety of ways.

Career is defined by the Oxford English Dictionary as a person's "course or progress through the life (or a distinct portion of life)". In this definition career is understood to relate to a range of aspects of an individual's life, learning and work. Career is also frequently understood to relate to the working aspects of individuals life. Moreover, it is seen as a progress and action taken by a person throughout a lifetime, especially those related to that person's occupations. A

career is often composed of the jobs held, titles earned and work accomplished over a long period of time, rather than just referring to one position.

The word career is more modern and inclusive than the vocation. Career is also broader than the occupation, which HERR and CRAMER define as "A group of similar jobs found in different industries or organisation," regardless term they use career counsellors clearly must take many factors into consideration when helping an individual make career decision.

Career is the course of events that constitutes a life, the sequence of occupations and other life roles which combine to express one's commitment to work in his or her total pattern of self- development, the series of remunerated and non-remunerated position. Occupied by a person from adolescence through retirement, of which occupation is only one.

A career includes work related roles such as that of students, employer, and pensioner together with complementary a vocational, familiar and civic roles. Careers exist only as people pursue them: they are person-cantered.

The term career information has been defines as the information related to the world of work that can be useful in the process of career development, including educational, occupational, and psycho-social information related to working.

1.14 Career in the context of India

Generally, Indian context the below careers are considered to be more prominent during the process of schooling, students get exposed to the idea of various careers.

1. Mathematician
2. University professor
3. Statistician
4. Dentist
5. Civil services
6. Educator

7. Engineering sciences
8. Medical sciences
9. Defence services
10. Computer system analyst
11. Dietician
12. Biomedical engineer
13. Human resource manager
14. Physical therapist
15. Financial planner
16. Medical laboratory technician
17. Economist
18. Politician
19. Artist
20. Dancer

Generally, career choices are influenced by certain conditions which are multi-dimensional in nature. Those are:

- Conditions of the family,
- Proclivities of the students,
- Passion towards some careers to which they are exposed to,
- Media/ social media
- Peer group
- School culture

Also, carrier choices are made based on the values as given below:

- High income;
- Emotional engagement («Work must captivate me emotionally»);
- Prestige (how others respect a job);
- Belonging to a group (the possibility of interacting with other people);
- Independence (the ability to manage one's own time);
- Secure environment (comfort and tranquillity);

1.15 Parents –Teachers opinion

Parents-teachers and teachers-educators have become increasingly interested in the area of relationship between attitude towards mathematics and perceived career choices. As they know in modern world mathematical knowledge play an important role to qualifying any kind of competitive exam and at least basic mathematical knowledge is essential for one self. If a teacher is capable to know attitude of students towards mathematics and also perceived career of students, than teacher can motivate students to improve their attitude towards mathematics that will save students from failure and build their confidence to that particular career option. There is growing awareness among all sections of educationists that the learning condition that provide optimum opportunity for one pupil may not prove conducive to another pupil with a different.

1.16 Need of the study

It is important for both parents, and educators, to understand why promoting and encouraging attitude towards mathematics from an early age is imperative. Attitude towards mathematics is crucial to a student's academic success at any age. Because students form self-concepts, values, and belief about their abilities at a young age, the development of attitude towards mathematics has significant implications for later in careers. A great deal of research has found that students with positive Attitude towards mathematics are more likely to have increased levels of academic achievement and have lower dropout rates.

At this point, the significance of Attitude towards mathematics to future academic success should be clear. However, different types of attitude towards mathematics have different implications for academic achievement. If a student has positive attitude towards mathematics, knowing his abilities and performance in mathematics, may be important in making predictions about those students career. Moreover, many of the contemporary careers have linkages with the mathematical abilities and many of the competitive exams have arthematic questions that are solved to clear the entrance examination. Careers which are not

directly related to mathematics have problem solving as a source and logical thinking that individual has to apply to process in their careers. Therefore, it is very pertinent to study the attitude of students toward mathematics and its linkages with career choice that students make.

1.17 Significant of the study

It is observed that students having positive attitude towards mathematics would get more benefits of it, when compared to those who lacked the positive attitude towards mathematics. The positive attitude towards mathematics helps in acquisition of desirable skills, so it is the duty of the mathematics teacher to nourish positive attitude towards of students learning mathematics.

A teacher who has taught even one day in a classroom realizes that a positive attitude towards learning is essential to be successful (Sliva, 2004,p 73). The successful experiences lead to better achievement.

The quality of mathematics can be maintained only when it ensured that students are achieving marks in mathematics due to their understanding of concepts and not due to rote of learning of formula or steps. As mathematics is a subject of sequence in which to understand the concept of higher level, all the concept of lower level are equally significant one cannot escape from any concept of lower level. Henceforth, it becomes immensely important to shape desirable attitude toward mathematics. This study is an attempt to inform the teachers' teacher educators and policy makers to be vigilant about the attitude of school students towards mathematics as it is discussed elsewhere in this chapter as how the attitude towards mathematics may influence the choices that students make about their future careers.

1.18 Statement of the problem

The present research is undertaken to study

Attitude towards Mathematics and Its Relationship with Perceived Career Choices among 9th Class Students.

1.19 Definition of key terms

Attitude : An attitude is an organized and consistent manner of thinking, feelings and reacting with regard to people, social issues , groups, or , more generally, any event in one's environment. Its essential components are thoughts and beliefs, feelings (or emotions), and tendencies to react.

After going through a representative's selection of definition Alport (1935-1967) presents his definition of an attitude as follows: "An attitude is a mental and neural state of readiness, organised through experience, a directive or dynamic influence upon the individual's response to all objects and situations with which it is related".

Attitude is define as opinion, thinking, feelings, thoughts, view, position, approach, belief, mood, perspective, point of view. (the freedictionary.com/attitude).

Mathematics: mathematics is an important discipline for school children at primary level. It paves way of improving reasoning and logical thinking. It is bases for intuitively knowledge and insightful ideas. Through mathematics one can develop rational, critical and reflective thought. It is root for scientific inquiry (Wilson, 2008 & mazzocco 2005).

Perceived: become aware or conscious of (something); come to realize or understand. Or become aware of (something) by the use of one of the senses, especially that of sight. Interpret or regard (someone or something) in a particular way.

Career: A **career** is an individual's journey through learning, work and other aspects of life. A student has a various option to choose from, a career through own interested field or a career guidance and suggestions.

1.20 Objectives of the study

1. To study students attitude towards mathematics.

2. To compare the attitude towards mathematics of boys and girls.
3. To study various career choice of students.
4. To study the influence of school on attitude towards mathematics.
5. To study the influence of gender, school and their interaction on attitude towards mathematics.
6. To study the relationship between attitude towards mathematics and career choices.

1.21 Hypotheses

1. There is no significant difference between attitude towards mathematics of boys and girls.
2. There is no significant influence of school on attitude towards mathematics.
3. There is no significant influence of gender, school and their interaction on attitude towards mathematics.

1.22 Research question

Does interest towards mathematics has any influence on career choices of 9^{th} standard students?

1.23 Delimitations

Following were the delimitations of the study

1. The study was limited to the attitude towards mathematics and its relation with perceived career choices.
2. The researcher has delimited her study to a CBSE SCHOOL (D.M.S.) and a STATE BOARD school (I.P.S.) of Bhopal areas due to time constraints and lack of resources.
3. The sample of 90 students was taken due to limited scope of time of the study.
4. The study was conducted on one class i.e. class IX, of each school in Bhopal area.

1.24 Conclusion

In the first chapter, researcher presented with an introduction to the problem, stated the problem and brought out the rationale of the study. Further researcher formulated objectives of the study and also framed research question that guided the research work. At the end researcher has mentioned limitations of the study.