INTRODUCTION

All human effort strives to achieve better. This quest for going a step higher and achieving quality has been a marked feature of human evolution. Educational programs that strive to innovate and revitalise the existing systems often find it difficult to achieve the desired results, because the teachers are often incompetent and ill-suited to do their tasks effectively. Teacher quality which is closely associated with teacher attitude, teaching aptitude and teaching effectiveness is then at the very heart of all educational advancements.

Teaching is a series of events through which a teacher attempts to bring desired behavioural changes in students. Through teaching, manner of thinking, feeling and acting of students is changed. Burton has aptly defined teaching as ‘the stimulation, guidance, direction and encouragement of learning.’ Thus, teaching is a matter of helping the child to respond to his environment in an effective manner. Teaching widens the adaptability of students to complex environments. It imparts useful information to the students and develops harmonious relationship among the teacher, the students and the subject. It causes the student to learn. It guides the student’s activities and trains his emotions.

Teachers are the ones who nurture young minds and therefore shape our very future. It is in classrooms that the ideas to improve and make our world a better place to live in are disseminated. Teaching is the
mother of all professions. Therefore, teaching aptitude and effective teachers remain critical to make this world full of enlightened brains and rich thought. For learning to occur, the teacher needs to get the student involved in identifying his learning needs and outcomes and help him to develop attainable objectives. As the teaching process continues, the teacher can further engage him or her by selecting teaching strategies and materials that require the student's direct involvement. So aptitude and attitude of the prospective teachers play an important role in making the teaching more effective.

**Importance of Education in Human Life**

According to Swami Vivekananda, Education is defined as: ‘education is the manifestation of divine perfection already existing in man.’ Pestalozzi opines ‘education is natural, harmonious and progressive development of man’s innate powers.’ In the words of Nunn, ‘education is the complete development of the individuality of the child so that he can make an original contribution to human life according to the best of his capacity.’ According to Ravindranath Tagore, ‘education means enabling the mind to find out the ultimate truth which emancipates us from the bondage of dust.’ Locke rightly said that ‘plants are developed by cultivation and man by education.’

It is evident from all these definitions that no definition is complete in itself. Education is a complex affair and rich in its implications. Moreover, education being a dynamic process is not limited to a particular definition or meaning. The process of education is continuous and will never come to
an end. Education deals with a growing man in ever growing society and therefore to say something final on the subject is not possible.

Education means a process in a formal or informal way, which helps to develop the potentialities of human beings including their knowledge, understanding, capabilities, attitudes and values. Mahatma Gandhi (1937) explained education in these words: ‘by education I mean an all-round drawing out of the best in the child and man in body, mind and spirit’. Hence, the essence of education lies in stimulating the growing generation with consistent, compelling and creative system of values, promoting cultural heritage, both spiritual and material aspects of the community, to the tender souls so as to develop them into civilised, creative, emotionally balanced and productive members of a progressive society. The children learn many things when they grow up and they teach many things to others. This process of learning and teaching begins with the creation of the world and it will go on till the end of the world. The progress, welfare and prosperity of a nation mainly depend on a rapid, planned and sustained growth in the quality and extent of education.

The process and pace of development are determined by disciplined citizens who are suitably educated and properly trained. It enables an individual to move towards the goal set. It also forms the basis for civilization and cultural behaviour. Education is viewed as an instrument to develop the cognitive qualities, intelligence, tolerance and understanding of people. It should prepare the younger generation to understand and face the hard realities of the world. In this context, teachers have more responsibilities in moulding and building the characters of students.
Education is a never ending process intricately interwoven with human life, enriching the individual with a variety of experiences, kindling the flames of knowledge through constant probing into the mysteries of life. Education plays an important role in the economic and social development of the country, in the building of a truly democratic country, in the development of a truly democratic society, in the development of a truly democratic citizen, in the promotion of national integration and unity and above all in the transformation of the individual for the endless pursuit of excellence and perfection.

Education plays an important role in shaping the future of a nation. Education has an immense effect on the political, economic and social development with the increasing recognition by all the countries. Humayun Kabir (1959) rightly emphasised that ‘a nation, however rich in national resources, cannot prosper unless its human resources are properly developed.’ and such a development is essentially, a function of education.

I. Teaching

When one person imparts information or skill to another, it is common to describe the action as teaching, but not every way of bringing about learning in other counts is teaching, and not every act of teaching has a place within a program of education. Teaching is a complex art and is dependent on method of teaching, curricula, infrastructure, technology, etc. It is a demanding job that requires in-depth knowledge of subject matter and age-specific pedagogy. It also requires divergent skills such as creativity, leadership, organising ability, patience, administration, and counseling.
A. Concept of Teaching

The concept of teaching has undergone a number of changes during the last few decades. Teaching is not an easy task. It is not every body’s tea cup to sip. It is an art and skill to be learnt. Teaching is a complex set of attitudes, knowledge, skills, motivation and values. It requires the thorough knowledge of subject matter, familiarity with methods of teaching, teaching aptitude, favourable attitude towards teaching, interest in teaching, etc. The success in teaching mainly depends on two things, one is mastery over the content to be taught and the second one is skill in teaching. To make the teaching more effective, the teacher has to select suitable methods and techniques in a given situation. The selection of these methods and techniques depends on learning objectives, nature of the content, nature of the learners and the facilities available in the class room. In the words of Fillai (1985) ‘teaching is one of the oldest professions, and it is an art, a science and a skill.’

Teaching is neither easy nor monotonous. Artists and craftsmen manipulate tangible and inert things. The teacher manipulates the living mind, with its ever-changing and ever- surprising responses and attitudes. Teaching is never static. It is a living process that is coloured by the past experience as well as by the present mood and purpose of the learner. It requires blood, sweat, and tears.

Teaching is more than standing before a class and applying a few specific techniques. It is not merely presenting information and then testing the student’s ability to repeat it. There is no magic formula for transforming knowledge from the teacher’s mind to align the pupils. Teaching is not a
mechanical process. It is an intricate, exacting, challenging job. According to Mann (1953) ‘teaching is the most difficult of all arts and profound of all sciences.’

Teaching is not a monologue but a dialogue; a dialogue in which one partner is vocal, but the other partner may, by simple expressions on the face, by some gesture of exclamation or by brief participation in the form of a query, take part in the dialogue.

Teaching is a purposeful behaviour. In the words of Smith ‘teaching is a system of actions intended to induce learning. There is no teaching where there is no learning, where there is learning, there must be teaching.’ It is a system that is primarily verbal in nature even though several types of teaching acts may be performed by the teacher.

According to Braskamp, Bromdenburg and Gery (1989), good teaching means more than entertaining in front of the class. Teaching is varied in style, tempo and strategies with an order of logical operations involved in it (Krishnan, 1992).

Good teaching develops the mutual respect between the teacher and the taught and instills intellectual integrity and independent judgment among the pupils. The teacher has to realise the activities he provides and the knowledge and know-how he imparts goes a long way in preparing the child to be a life-time learner. The mutual respect between the teacher and the students is an important factor in determining the effectiveness of teaching. The mutual respect should be cordial and brotherly.

The term ‘teaching’ clearly implies that the person who is engaged in the activity intends the students to learn something. The term ‘teaching’
also includes ‘tasks’ and ‘achievement’. Thus ‘teaching’ can be defined as an activity aimed at the achievement of learning. Teaching is a complex activity comprising many teaching acts. These acts can be easily divided into three categories. First, those acts which arise before teaching, secondly those acts that arise during teaching and thirdly those acts which are to be taken into consideration after teaching.

B. Nature of Teaching

Teaching is an important part of the process of education. There are three focal points in education – the teacher, child and the subject matter. Teaching is a relationship which is established among these three or teaching brings teacher, child and subject matter in to a relationship. Teaching is the process by which the teacher brings the student and the subject matter together.

C. Teaching as a Profession

Teaching is not considered as a full-fledged profession like that of medicine, engineering and law etc. Nevertheless, teaching stands in a way at the apex of all professions and is considered as the noblest of all professions since it deals with the subjects, which are regarded as intellectually healthy.

Some of the common components of profession summerised by Leiberman (1956) are given below:

- Unique, definite and essential social service.
- An emphasis on intellectual techniques in performing this service.
- A long period of specialised training.
• A broad range of autonomy for both the individual practitioner and for the occupational group as a whole.

• An acceptance by the practitioner of broad personal responsibilities for judgements made and acts performed within the scope of professional autonomy.

• An emphasis upon the service rendered rather than the economic gain to practitioners.

• A comprehensive self-governing organisation of practitioners.

Where teaching is matched against these criteria, it is usually held to fulfill most of the criteria to some degree but to a lesser extent than, say medicine, law and engineering, therefore falling into the category of quasi or semi-professions. It is such an occupation, which is waiting to get the status of full-fledged profession.

D. Characteristics of Teaching

Teaching is a set of acts, designed and organized to induce learning.

• Teaching is a rational process.

• Teaching is behaviour and is subject to observation, analysis, improvement and change.

• Teacher can learn to observe, analyse, control and improve his “teaching behaviours”.

• Teaching is an intended interaction between the teacher and the learners to help them to achieve their potential.

• Teaching involves proper planning, effective approaches, relevant content and evaluation procedure.
Teaching is an interactive process and demands mastery over teaching skills.

Teaching includes pre-interactive phase, interactive phase and post interactive phase.

**E. Different Phases of Teaching**

Teaching is a complex task. For performing this task, a systematic planning is needed. Teaching is to be considered in terms of various steps and the different steps constituting the teaching process are called the phases of teaching. Class room teaching has two phases that is, interactive and non-interactive. In the interactive phase, the teacher is engaged in social interaction. In this situation, teacher provides stimulus to get response from the students. Thus, there is give and take of social interaction when the teacher is actually face to face with his students. In the non-interactive phase, teacher works alone or in teams to prepare for the interactive phase. In this phase teachers do planning and preparation for teaching. Thus it is useful to divide teaching into three phases which are as follows (J.C. Aggarwal, 1999).

**Pre-interactive phase** : This phase is generally utilized on lesson planning, collecting and preparing teaching aids, preparing tests for evaluation and preparing assignments, etc.

**The interactive phase** : This phase is related directly to the interaction between teacher and students in the class room. It includes the acts of teaching which are essential for generating learning as well as for controlling the class. It is related to the desirable teacher behaviour in the class room which influences imitation, organisation, teacher directions or
teacher talk. It is also related to teacher questions, student responses and providing positive reinforcement.

*The post-interactive phase:* In this phase the teacher tries to get feedback about his teaching which helps him to re-plan and re-teach effectively. This is the phase when a teacher can review his teaching, evaluate his teaching and can improve.

**F. Levels of Teaching**

*Autonomous level of teaching:* This level of teaching is based on the educational philosophy which believes that human beings are inherently active. They generate ideas from within themselves. Education should not be imposed by outside agent, but on the other hand it should be child-centered. The main responsibility of the teacher is to awaken awareness, freedom and responsibility in his students, but these qualities are not to be awakened at the cost of personal freedom of the student. Teaching should proceed in a highly permissive way within which each individual student develops largely on his own through the exercise of his feelings. The teaching is completely student-centred. In this type of teaching, the role of the teacher is more negative than positive in the sense that there is leadership, direction, prescription or imposition of student thought. Students are permitted; even encouraged to live close to nature so that they may indulge freely in their natural feelings. Each student is permitted to choose his activities throughout the day. Indian educationists have great faith in the capacity of the individual to develop his potentialities to the maximum, if appropriate facilities are provided to him.
**Memory level of Teaching**: Memory level of teaching means committing factual information to memory and nothing else. The teacher gives factual material which the students memorise without understanding it. This type of teaching seems to be based on mental discipline theory which emphasises the importance of vigorous exercise for the development of mental faculties. To provide instruction at memory level is not of great use for the development of intelligence. But most of the teaching at the primary stage is carried at the memory level to teach fundamental skills such as spelling, rules of arithmetic, etc.

**Understanding level of Teaching**: The term ‘to understand’ conveys different meanings as for example, to perceive the meaning of, grasp the idea, to be thoroughly familiar with. The description of the five steps to be followed is given below.

*Exploration*

- Knowing what the students already know about the unit.
- Testing, questioning and discussion.
- It is an economical step - what to teach and not to teach.
- It is a sequence giving step.
- It is psychological in nature.
- Orientation of the teacher: it gives direction to teaching.

*Presentation*

- New material is presented in brief: continuous rapport with the class
- Detailed content is ignored.
• The teacher after presentation tests the students if they have followed the subject matter. New material is not presented until all students grasp the subject matter taught.

**Assimilation**

• The learner incorporates the new unit into his intellectual self. He makes thorough study of the topic.
• Much work is done at desk library. A class room is well equipped as a laboratory with necessary study material.
• The work is highly individualised.
• Those who achieve mastery earlier are asked to do their individual project.
• Teacher goes on his rounds in the class and clarifies doubts of the students.
• Interaction between teacher and students should be high.
• Guide sheets are given to the students in which problems are posed.
• Mastery that is possessed at the end of the assimilation period is not a test of factual knowledge, but the use of principle.
• Those who pass the test are promoted and those who fail restart.

**Organisation**

The next step is to see whether students can reproduce essential of the unit without the help of books and notes, etc. This is called period of organisation. This process is withheld up to junior high school. It is useful
for subjects of extensive contents. There are subjects which do not require this step such as arithmetic and grammar.

Recitation

Oral presentation of the unit to the teacher or classmates is known as recitation. In recitation, full understanding and permanent insight are essential. They may use notes and black board. They may use demonstration apparatus. Demonstration may also take the form of written paper.

Reflective level of teaching: Reflective level of teaching is at the highest in the hierarchical order of mental process. It is not an isolated and unitary process of memorizing factual information for future recall, but it seeks to know how knowledge changes, grows and is interpreted. Students, at this level, develop curiosity, interest, inquiry and persistence which culminate in a scientifically determined conclusion or solution of a problem. We can say that teaching-learning at the reflective level involves careful critical examination of an idea or problem in the light of the empirical or testable evidence that supports it and the further conclusions towards which it points. Reflective level of teaching involves the process of problem solving. Reflective learning occurs only when there is a problematic situation. The student examines the facts and generalises them to solve the problem. The class room teaching at this level requires the student’s active participation, critical thinking, creativeness and imagination. The students and the teacher cooperatively work to find out the solution of a problem which they face.
Advantages of Levels of Teaching:

- The concept of level of teaching provides awareness in the student as well as the teacher that teaching is a continuous process from thoughtless to thoughtful.
- Teaching activities can be performed in relation to these levels of teaching.
- The organisation of teaching in terms of these levels helps in relating learning to testing.
- The same content is taught at different levels. This concept helps in realising different types of objectives.
- The knowledge and skill levels of teaching are essential to become an effective teacher.
- The in-service teachers can also develop skills by the awareness of levels of teaching.
- The knowledge of teaching variables and operations to levels of teaching provide the nature of teaching. It may be useful in developing a theory of teaching.
- It provides the scientific basis to organise teaching from primary to university classes and to develop a curriculum for teaching courses.

G. Psychological Principles of Teaching

There are certain principles of teaching emphasised by educators and psychologists which the teachers are expected to bear in mind for making their teaching effective and efficient. J.C. Aggarwal, 1999, listed 16 psychological and 12 general principles of teaching.
1. Principle of activity: children are active by nature and any process that is not based upon the student activity is not in accord with recent educational theories. Rousseau considers the child as a ‘hero’ in the drama of education and as such he must play the dominant role. So the first principle of teaching is to keep the children active in the class. Children are endowed, by nature with tremendous vitality. In the words of T.S. Avinasalingam, “the great Ganga of life flows majestically on. But if any one tries to retain and dam it, the dam will break unless attempts are simultaneously made to divert it into other channels. The great vitality of our children cannot be permanently restrained without providing a positive purpose. Thus, providing for various types of activities which will interest the children and give them opportunities for observation and the use of their hands is to offer them the fulfillment and satisfaction which nothing else confers.”

2. Principle of play way: This principle is closely related to the principle of activity i.e. learning by doing. According to Froebel ‘play is the chief activity of childhood’. It gives joy, contentment, freedom, and inner and outer peace. It holds the source of all that is good. But ‘without rational conscious guidance’, says Froebel, ‘childish activity degenerates into aimless play instead of preparing for those tasks of life for which it is designed.’ Activity does not mean mere physical activity. If a pupil is to develop all sides of his personality, then it is necessary for him to be active in all ways to exercise all the powers he has.

3. Principle of motivation: The teacher will do his best to motivate all children in the class. Motivation arouses the interest of children and
once they become interested, they are willing to concentrate and work. Motivation is developed by the following techniques.

- Satisfying the curiosity of children
- Utilising all the senses of children
- Relating closely body and mind
- Linking teaching-learning with life

4. **Principle of self education**: Best teaching is enables the child to learn by his own efforts. Teachers must fire the imagination of their students. Children, we are told, must be left free to express themselves, for the only education is self-education. Teachers, we are told, must stand aside. They must talk less, explain less, direct less and correct less.

5. **Principle of individual differences**: No two children are alike. Teaching to be effective must cater to individual differences of children.

6. **Principle of goal setting**: A definite goal must be set before each child according to the standards expected of him. Short term or immediate goals should be set before small children and distant goals for older ones. It must be remembered that goals should be very clear and definite and the children must understand these goals.

7. **Principle of stimulation**: Burton has said, ‘teaching is the stimulation, guidance, direction and encouragement of learning.’ Reburn emphasises this aspect in these words, ‘the guidance of the teacher is mainly a matter of giving the right kind of stimulus to help him to learn the right things in the right way.’
8. *Principle of association*: Thorndike points out that things we want to go together should be put together. Many different things or ideas which we want to go together should be associated with each other. They should form a part of one process. Then it becomes easier to make the students understand their relationship. We have discussed at various places that ideas and things can be associated in a number of ways.

9. *Principle of readiness*: This principle is indicative of learner’s state of mind to participate in the teaching-learning process. Readiness means preparation for action. A teacher must be alive to this principle.

10. *Principle of effect*: This principle states that a response is strengthened if it is followed by pleasure and weakened if it is followed by displeasure.

11. *Principle of exercise or repetition*: According to it, the more a stimulus induced response is repeated, the longer it will be retained. Other things being equal, exercise strengthens the bond between situation and response. Conversely, a bond is weakened through failure to exercise it. Thus, the principle has two sub-parts, namely, principle of use and principle of disuse.

12. *Principle of change and rest*: Psychological experiments in learning have demonstrated that fatigue, lack of attention and monotony can be overcome by making appropriate provision for change, rest and recreation. While framing the time table, it is kept in view that subjects and activities are provided in such a way that the students do not experience boredom and fatigue. Usually two consecutive periods of a subject are not provided in a class.
13. Principle of feed-back and reinforcement: Learning theories point out that the immediate knowledge of the results and positive reinforcers in the form of praise, grade, certificates, token money and other incentives can contribute to make the task of learning enjoyable.

14. Principle of training of senses: Senses are said to be the gateways of knowledge. The power of observation, discrimination, identification, generalization and application can only be appropriately developed through the effective functioning of senses.

15. Principle of group dynamics: Under the influence of group behaviour, appropriate changes in the behaviour of the members of the group may takes place. Individuals composing the group think and feel as the group feels and do as the group does. A suitable climate for group is to be created in the class room environment.

16. Principle of creativity: Opportunities should be provided to the students to explore things and events and find cause-effect relationships. This principle envisages that every student possesses some element of creativity which must be explored and developed to the maximum extent.

II. Effective Teaching

Teaching is a dynamic and complex phenomenon, involving teachers, pupils and subject matter. Studies on teaching effectiveness have failed to identify a single pattern of effective teaching. Although certain teaching patterns are better than others, there is no kind of good teaching that fits universally to all teaching situations, all teachers and all pupils. Effective teaching cannot be defined accurately, because the criteria differ
for every instructional situation and for every teacher. Good teaching is so complex and creative that it defies analysis (Evans 1976).

A. Concept of Effective Teaching

Effective teaching leads to engaged and intelligent learning. It may be defined as showing or helping students to learn how to do something, providing with knowledge, besides causing to know and understand. It is also guiding and facilitating learning, enabling the learner to learn, setting the conditions for learning. Effective teaching consists of those teaching decisions about actions, routines and techniques that increase the decision making capabilities of students. Effective teaching is much more than the intuitive process. Holistic appreciation, active knowledge, teamwork, critical thinking, creative thinking, and problem solving are major outcomes of effective teaching. Teaching which produces maximum learning outcome may be considered as effective teaching. It aims to achieve the goals of education. It may be stated that ‘the pupil is the most relevant criterion for teacher effectiveness.’ Educationists, administrators and psychologists know well about the importance of effective teaching. The effectiveness could be achieved with the help of skillful and efficient teachers, well planned syllabus, necessary infrastructure facilities and good library system.

Effective teaching helps children recognise, expand and act upon their purposes. Good teachers create their own methods according to the situation in which they are placed. Their teaching is creative and is characterised by individuality, originality and spontaneity. The process of effective teaching is a cooperative endeavour. It is a tri-polar activity i.e., teacher, pupil and content. It is a stimulating, specific, purposeful activity.
The successful and effective teaching of any subject is to be assessed not so much in terms of the syllabus covered, nor examination scores, or in terms of what insights, appreciations and attitudes it helps to cultivate in the learner, that is, how far it affects the thought, life and personality of the pupils.

Effective teaching is associated with a seemingly endless series of tasks. The teacher is ever involved in planning learning experiences for children, choosing instructional materials, gathering supplies, instructing, evaluating, having parent conferences and participating in staff meetings and professional associations.

A theory of effective teaching is perspective. It is perspective in the sense it sets forth rules concerning the most effective ways of helping learners to achieve knowledge and skills. Rabindranath Tagore said that ‘The main objective of teaching is not to explain the meaning, but to knock at the door of the mind.’ From this point of view, teaching should not be regarded as merely a job or even a profession. The teaching-learning process implies the process of educating the child.

The effective teaching is mainly concerned with how best to bring about the desired pupil learning by some educational activity. Over the years thinking about effective teaching can be approached in different ways. Until 1960’s, research on effective teaching was largely dominated by attempts to identify attributes of teachers, such as personality traits, sex, age, knowledge and training which have a bearing on their effectiveness.
B. Principles of Effective Teaching

- Maintaining active engagement and sustained focus on the content, largely through good organisation and management.
- Using tasks and questions that are sufficiently clear and easy for brisk pace to be maintained, yet with high success rates.
- Providing frequent opportunities for reading and responding to questions followed by clear feedback about correctness.
- Mastering skills to an over learning level
- Closely monitoring progress and providing whatever instruction is required for learning.

C. Aspects of Effective Teaching

- having a positive attitude
- the development of psychological climate in the classroom
- having high expectations of what pupils can achieve
- lesson clarity
- effective time management
- strong lesson structuring
- the use of a variety of teaching methods
- using and incorporating pupil ideas
- Using appropriate and varied questioning.

D. Measures to make teaching more effective

- To make use of proper instructional materials like audiovisual aids, books etc.
• To use suitable teaching methods like conducting small group activities, peer tutoring and cooperative teaching, brain storming, active participation of students, etc.
• To develop own instructional materials.
• To be democratic as well as assertive.
• To create an open organisational climate.
• To make use of library regularly.
• To adjust teaching to suit the classroom factors.
• To be receptive to new ideas and practices.
• To develop healthy attitudes towards profession.
• To be realistic in ambitions and aspirations.
• To maintain good interpersonal relationship.
• To avoid acting out of emotions.
• To help students to resolve their problems.
• To experiment new methods of teaching.
• To cultivate intellectual capabilities.
• To involve in academic and professional discussion and programme.
• To improve study habits related to profession.
• To improve educational and professional qualifications.
• To develop liking for students.
• To understand the student’s misconceptions of what one is teaching.
• To perform action research on own teaching problems.

E. Factors that were theorised to be associated with effective teaching
• The knowledge, beliefs, understandings and practices of teachers.
• Teacher qualifications and educational background.
• The extent and quality of professional development experienced by the teachers.

Finally the quality of school is linked to the quality of teachers. There lies the significance of effective teaching.

III. Distinction between Teaching Effectiveness and Teacher Effectiveness

One of the most difficult problems in educational research is that of recognising teaching effectiveness and discrimination between the more and less effective teachers. The impact of any educational programme or innovation on the pupil operates through the teacher. It is therefore quite pertinent to say that a school’s effectiveness depends directly on the effectiveness of its teachers. So, maximising teacher effectiveness is a major goal of education.

To quote Krishnan (1992) ‘the more efficiency the teacher has, the more efficient the teacher is’. It is the origin of the effective teaching.

Despite an enormous amount of available literature on the subject of teaching effectiveness, no universally acceptable formula can be given to define an ‘effective teacher’, however the following definitions provide a distinction between teacher effectiveness and teaching effectiveness.

According to Remmers (1952), ‘effectiveness is a degree to which an agent produces effects.’ The question immediately arises what effects and on what. Usually, these categories of effects in terms of the object affected are (i) pupil (ii) school operation and (iii) the school community.
According to the study reported by Stern, Stein, and Bloom (1956), effectiveness is rather a standard of performance in a specific work situation that some individuals are said to manifest.

In the dictionary of Education, Harold Benjamin, defined teacher effectiveness as ‘the degree of success of a teacher in performing instructional and other duties specified in his contract and demanded by the nature of his position.’

Barr (1952) explains teacher effectiveness as a relationship between teachers, pupils and other persons concerned with the educational undertaking, all effected by limiting and facilitating aspects of the immediate situations.

Flanders and Simon (1969) observed that teacher effectiveness is an area of research which is concerned with the relationship between the characteristics of the teacher, teaching acts and their effects on the educational outcomes of classroom teaching.

According to Mishra (1980), attributes like motivating students, interesting methods of presentation of course content, clear explanation and the accomplishment of stated course objectives are involved in the concept of teacher effectiveness.

Gupta and Kapoor have derived the term ‘Teacher Effectiveness’ as a repertoire of efficacy exhibited by a teacher in (i) instructional strategies (ii) classroom management (iii) personal disposition, temperament and tendencies (iv) evaluation and feedback (v) interpersonal relations (vi) job involvement (vii) initiativeness and enthusiasm (viii) professional values
and (ix) innovativeness respectively in the everyday teaching-learning situations.

According to Ryans (1950), ‘teaching is effective to the extent that the teacher acts in ways that are favourable to the development of basic skills, understanding work habits, desirable attitudes, value judgements and adequate personal adjustment of the pupils.’

In the dictionary of Education, Good (1959) defined teaching effectiveness as ‘the ability and the interaction between the physical, intellectual and psychological interests of the student and some given subject content, the ability of the teacher to relate the learning activities to the development process of the learners and to their current and immediate interests and needs.’

According to Dickson (1980), ‘teaching effectiveness is a demonstrated repertoire of competencies involved with teaching plans and materials, classroom procedure, inter-personal skills, and the learner’s reinforcement and involvement reflected in the teacher behaviour’.

Although there is a little agreement in the above definitions, yet they do point out that ‘teaching effectiveness is concerned with teacher-pupil relationships in the classroom. So, knowledge about teaching consists of relationships between what a teacher does while teacher and the effect of their actions on the growth and development of his pupils’ as Flanders (1970) puts it.

Teaching effectiveness for our purpose is ‘concerned with what a teacher is and what he does in the classroom in order to induce the pupil’s learning. Thus, teaching effectiveness includes such characteristic qualities
of a teacher as he exhibits in the classroom with the intention that his pupils learn what he teaches, such actions of a teacher which he performs in the classroom as have the intention that his pupils learnt what he teaches.

Therefore, we summarise that ‘teaching effectiveness is limited to classroom activities, whereas teacher effectiveness is not limited to classroom. It is also a overall effectiveness of a teacher in other areas.’

The teaching effectiveness or teaching success or teacher effectiveness or teacher efficiency is the terms usually used synonymously to refer to the concept. But, in defining the terms, as already pointed out, there is great variation from one another and similarly there is no total agreement upon the dimensions of the characteristics or the factors which are associated with teaching effectiveness.

IV. Mathematics

A. Definitions of Mathematics

Gauss stated, ‘mathematics is the queen of all sciences and arithmetic is the queen of all branches of mathematics.’

Bacon said, ‘mathematics is the gate and key of all sciences.’

In the words of John Locke, ‘mathematics is a way to settle in the mind the habit of reasoning.’

According to Kant, ‘mathematics is the indispensible instrument of all physical researches.’

Courant and Robin gave a more comprehensive definition of mathematics. They said, ‘mathematics is an expression of human mind which reflects the active will, the contemplative reason and the desire for
aesthetic perfection. Its basic elements are construction, generality and individuality.’

**B. Meaning of Mathematics**

The dictionary meaning of mathematics is that ‘it is either the science of number and space or the science of measurement, quantity and magnitude.’ Mathematics thus defined as the science of quantity, measurement and spatial relations. It is a systematised, organised and exact branch of science. It deals with quantitative facts, relationships as well as problems involving space and form. It is the numerical and calculation part of man’s life. It enables man to study various phenomena in space and establish various relationships between them. It explains that this science is a by-product of our empirical knowledge. From our observations of physical and social environment, we form certain intuitive ideas or notions called postulates and axioms. By the process of reasoning, we move upwards and work our mathematical results at the abstract form. Mathematics is defined in different ways by different authors.

Mathematics, therefore, is not only ‘number work’ or ‘computation’, but is more about forming generalisations, seeing relationships and developing logical thinking and reasoning. The national policy on Education (NPE 1986) stated ‘mathematics should be visualised as the vehicle to train a child to think, reason, analyse, and to articulate logically.’ Mathematics should be shown as a way of thinking, an art of beauty, and as human achievement.
C. Significance of Mathematics

The world of today, which leans more and more heavily on science and technology, demands more mathematical knowledge on the part of more people. The world of tomorrow will make still greater demands on a person to be well educated in the technological society of today, and as such he should have some degree of mathematical literacy. Mathematics is the subject which has extensive applications in our day to day situations. It has an important bearing on various aspects of life. A fundamental knowledge of basic mathematical concepts is valuable even for a lay man.

What we enjoy in our lives as a result of scientific inventions has only been possible with the aid of mathematics. Therefore, there is a great weight in Young’s saying ‘whenever we turn in these days of iron, steam and electricity, we find that mathematics has been the pioneer. Were the backbone removed, our material civilisation would inevitably collapse.’ So, those who understand and are proficient in mathematics have significantly enhanced opportunities and options that open doors to productivity. Those who lack mathematical competence will find such doors and options closed.

D. Importance of Mathematics in Human Life

Every teacher of mathematics needs to be informed and convinced about the importance of mathematics in human life. There are a number of basic questions which need to be answered. Why should mathematics be taught to everybody? Why should everybody learn mathematics? What is the importance of mathematics in human life? How does it make any contribution in the development of an individual? etc. A committed teacher
of mathematics will be interested in finding out the answers to these questions. He must feel convinced about the use of this subject in human life so that he may be able to convince his students like wise. One cannot do anything without the knowledge of fundamental processes of mathematics in daily life. A person who is ignorant of mathematics will be at the mercy of others and will be cheated easily. The knowledge of its fundamental processes and the skills to use them are the primary requirements of human beings these days. A person may belong to highest or lowest class of society, but he uses knowledge of mathematics in one form or another.

The history of human civilisation reveals the necessity of counting, measuring, weighing and drawing in all aspects of environment. Qualitative sciences soon became quantitative with phenomenal advancement. The basic necessities, means of comfort, convenience and progress require mathematical knowledge. Mathematics is an integral part of the universe whose every aspect is quantitative. In the computer conscious world of today, mathematics is playing an important role and the future is going to be more mathematically inclined. The basic knowledge of modern mathematics is vital in day to day life. It should not consist of formulae and theorems merely as a rigid discipline. It should compete its mission as a basic science, with a large variety of applications. In every profession connected with applied sciences, a working knowledge of mathematical concepts is a necessity to understand the deep foundations which carry the various subjects upon them.

Four fundamental operations, fraction, ratio, percentage, simple interest, compound interest, profit and loss and many more fundamental
concepts of mathematics are very useful in our life. In many occupations such as tailoring, carpentry, insurance, banking, business, shop keeping, by which the needs of human beings are fulfilled, indirect or direct use of mathematics is made. Mathematics has become the backbone of the world’s entire business and commercial applications. Ignorance of mathematics in the masses is an obstacle in the way of a country’s progress. Napoleon said, ‘The progress and the improvement of mathematics are linked to the prosperity of the state.’ Thus mathematics will continue to occupy a prominent place in man’s life.

According to John Locke, ‘mathematics is a way to settle in the mind the habit of reasoning.’ It trains the minds of the learners. If mathematics is taught in the right sense, it develops reasoning and thinking powers more and demands less from memory. The understanding of the world in which man lives, of the civilisation to which he belongs and of the culture of which he is very proud, requires the understanding of scientific and social principles the development of which depends, in turn, upon mathematical principles. It has been rightly said that ‘mathematics is the mirror of civilisation.’ The prosperity of the man and his cultural advancement has depended considerably upon the advancement of mathematics. Modern civilisation owes its advancement to the progress of various occupations such as agriculture, industry, medicine, engineering, surveying, etc. but one should not forget that mathematics contributes and has contributed extensively to the advancement of these occupations. Mathematics is also a pivot for cultural arts such as music, sculpture, poetry and painting. It might not be altogether a matter of chance that the Greeks, the greatest geometers were also very successful in fine arts.
Mathematics plays an important role in the organisation and maintenance of our social structure. Society is the result of inter-relations of individuals. Mathematics enables us to understand the inter-relations of individuals and the possibilities of various groups. Society is phenomena of balancing and counter-balancing of various social forces. Mathematics helps in creating a social order in this phenomenon. History of mathematics reveals that whenever a society gave due weightage to the knowledge of mathematics, it made a tremendous progress. When mathematics makes its contribution in the advancement of science and technology, society draws huge benefits. Its contribution is evident in the field of atomic energy, space research, space travel and man-made satellites.

The study of mathematics helps in character formation and moral development. The qualities like honesty, truthfulness, punctuality, self-confidence are indirectly inculcated through the study of mathematics. It is the only subject which helps in objective analysis, correct reasoning, valid conclusions and impartial judgment. The Greek philosopher Dutton has rightly remarked that ‘gossip, flattery, slander, deceit all speak for a slovenly mind that has not been trained by mathematics.’ what we enjoy and appreciate in the arts like drawing, painting, architecture, music, dance etc bears a semblance of mathematics. Music is nothing but the mathematically organised sound. Leibnitz has rightly said, ‘music is a hidden exercise in arithmetic of a mind unconscious of dealing with numbers.’ Apart from giving pleasure through its application to various arts, it also provides entertainment through its own puzzles, riddles and games.
The study of mathematics helps us to develop many intellectual qualities like power of thinking and reasoning, analysis, synthesis, originality, discovery, generalisation, etc. Mathematics develops our powers of acquiring knowledge, thinking, reasoning, judgment and generalisation. Concentration is also a habit of mind and can be acquired through persistent practice. Every problem of life demands concentration. Mathematics develops it best. The person who can concentrate in his work is likely to be a successful person throughout his career. According to Hamilton, the study of mathematics cures the vice of mental distraction and cultivates the habit of continuous attention.

Mathematics is a universal subject and it helps in promoting international understanding among the people. What we possess in the form of mathematical knowledge today is the result of the combined efforts of all human beings, the people of all the corners of the world, the scholars of all ages, the followers of all religions and members of all the races. Mathematics is the common heritage of mankind and it is not the exclusive property of any particular nation, race or country. Mathematics is a symbol of agreement all over the world. Mathematical measurements and their latest modifications towards decimal system are bringing the regions of the world closer and establishing universal agreement. The study of mathematics prepares us for various occupations like accountancy, auditing, banking, surveying, engineering, trade, planning, designing, financing, budgeting, construction, computer applications, etc. These occupations have immensely benefited from mathematics in their development. The knowledge of mathematics is helpful in achieving vocational efficiency in many spheres of human life.
In this world of today, nobody can live without mathematics for a single day. Mathematics is intimately involved in every moment of everyone’s life. Right from the human existence on this earth, it has been a faithful companion. When man first wanted to answer the questions: How many? How much? How big? How long? etc., he invented arithmetic. Algebra was invented to simplify arithmetical calculations. Algebra is nothing but generalised arithmetic. Geometry was invented for measurement and form. The knowledge of this subject was born out of felt needs of human beings.

E. Importance of Mathematics in School Curriculum

Mathematics is the mainstay in today’s systematic life. Without numerical and mathematical evidence, one cannot decide many issues in our day-to-day life. Mathematics is a living and flourishing branch of our culture. It is both a discipline in its own right and a service subject used in all facets of human life. The impulse for the advancement of mathematical knowledge, which is both most fundamental and most far reaching in its practical and ideal effects, is growing out of the pursuit of truth for the sake of truth. The way in which mathematics has interacted usefully with other elements in the progress of thought justifies the methods of abstractions as profitable. It is a discipline that seeks understanding of the patterns and structures of the constructs of the human mind. There is no end to its depth. It seeks the highest standards of understanding by demanding rigour in its foundation and developments.

Mathematics has played a key role not only in the advancement of civilisation in general, but also in the development of physical science in
particular, and has now wider applications in other subjects as well. Mathematics has been an inseparable part of school curriculum ever since the beginning of formal education and it continuous to be so. The mathematics curriculum has undergone various changes from time to time in accordance with changing needs of the society. Teaching of mathematics has been a challenge to the teachers since the origin of human race. Mathematics is a self contained mental discipline, with its own language and structure. Besides being an independent subject of study, it has its applications in other branches of knowledge. It is a mental tool for the training and exercise of intellectual functions. Owing to its unique role in solving everyday problems, it has occupied a significant position in the school curriculum.

Mathematics is a sequenced subject, in the sense that it is slightly different from other subjects. It has its own language and symbolism. Unlike some of the other subjects, learning of any new topic in mathematics depends on some previous related topic. To learn and perform well in mathematics, a perfect understanding of the underlying principles is essential. In the case of other subjects, the child can make up the previous portion if he was absent at the time of teaching of that portion. But this is not possible in the case of mathematics, because it is a sequence subject. It is difficult to follow a topic when the topic that has been dealt with earlier is not properly understood. One cannot follow division unless one knows multiplication also.

Mathematics is not a tough and boring subject. In fact, it is an easy and interesting subject. If the concepts at the foundation level are clear, interest and enjoyment become automatic in mathematics. The clarity of
fundamental concepts and procedures also helps the learner to master
difficult concepts of higher level. Since quantitative treatment including
measurement, analysis and reasoning is being increasingly involved in
many other subjects, the relevance of mathematics should be seen not only
as a specific subject area, but also as a concomitant to other subject areas
concerned. The applications of mathematics in daily life cannot be ignored.

Plato advocated the inclusion of mathematics in the school
education, because mathematical reasoning disciplines the minds of the
learners. He wrote over the portals of his academy ‘let no one ignorant of
gonetry enters here’. In the present school curriculum, mathematics is a
compulsory subject for the following reasons.

• Mathematics is the subject that encourages and develops logical
  thinking and analytical reasoning among the students. It fosters higher
cognitive abilities and skills.
• Mathematics is immensely useful for an individual in his daily life. It
  provides sufficient mathematical skills to meet the demands of modern
life.
• Mathematics is an essential part of our culture and deserves a place in
  the curriculum for its own sake.
• Mathematics provides a better understanding of laws of nature and
  world around.
• Mathematics develops the ability to make independent decisions in
  social sciences.
• Mathematics is an essential element for better communication.
• Mathematics provides ability to think alternative methods of solving
  problems.
Mathematics is a very useful subject for most vocations and higher specialized courses of learning. At the college and university stages, most of the physical and social sciences require the application of mathematics.

The Kothari commission (1964-66) emphasised the significance of mathematics in the school curriculum by stating that ‘one of the outstanding characteristics of scientific culture is qualification. Mathematics, therefore assumes a prominent position in modern education. The advent of automation and cybernetics in this century marks the beginning of the scientific industrial revolution and makes it all the more imperative to devote special attention to the study of mathematics. Proper foundation in the knowledge of the subject should be laid at school.’ Thus mathematics has now become a compulsory subject in the school curriculum, because of its manifold value to the individual as well as to the society. The place of mathematics is thus clearly a central one.

According to Howard F. Fehr (1966), ‘if mathematics had not been useful, it would long ago have disappeared from our school curriculum as required study.’

F. Problems of Students in Learning Mathematics

Many pupils perform poorly in mathematics and find the subject very difficult and uninteresting. The probable reasons may be existing school conditions and ineffective teaching of their teachers. Many changes are being made in the mathematics curriculum. There may be certain new topics which have been included in the present curriculum with which the teachers are not familiar. Even in other topics there could be some points
about which the teachers have some doubts. There are no charts, models and other teaching-learning material for illustrating mathematical concepts. Apart from these problems, heavy syllabus is one of the major problems of students to understand the subject without any logic. Some secondary school students lack even the basic knowledge of fundamental concepts in mathematics, as their teachers did not give good orientation at primary school stage.

Barting’s (1981) study of pupil’s difficulties in problem solving reveals the following causes of inability to solve problems.

- Lack of ability to perform the fundamental operations.
- Failure to understand the problem as a whole or in part.
- Lack of knowledge of facts essential to the solution of a problem.
- Lack of sufficient interest in the problem to inspire the required mental efforts.
- Lack of ability to identify proper processes with the situations indicated in the problem.
- Failure to form the habit of verifying the result.
- The habit of being guided by some verbal sign instead of making an analysis of the problem.
- Lack of ability or care to properly arrange the written work in orderly, logical form.
- Habit of focusing the attention upon the numbers and being guided by them instead of by the conditions of the problem.
- The pupil may fail because the problem requires exertion beyond the span of attention.
• The pupil may fail because of absolute inability to do reflective thinking.

The origin of mathematics is hidden in the evolution of nature. Creation of nature and mathematics is closely related. Mathematics is an exact science and involves high cognitive abilities and powers. National Policy on Education (1986) considered the importance of mathematics in general education and suggested that, ‘mathematics should be visualised as the vehicle to train a child to think, reason, analyse and to articulate logically. It enters every walk of life. As is the case in the past, most people today still believe that mathematics is all about computation. However, computation, for mathematicians, is merely a tool for comprehending structures, relationships and patterns of mathematical concepts, and therefore producing solutions for complex real life problems. This perspective of mathematicians has gained more attention and importance with rapid advancements in information and communication technologies.

It has become a necessity for people of all ages to reach, analyse, and apply the mathematical knowledge effectively and efficiently to be successful citizens in our information age. In particular, students need to be well-equipped with higher-order mathematical knowledge. Techniques should be developed to ensure that students become successful learners. The quality of teaching and learning in mathematics is a major challenge to educators. General concern about mathematics achievement has been evident for the last 20 years. The current debate among scholars is what students should learn to be successful in mathematics. The discussion emphasises new instructional design techniques to produce individuals who can understand and apply fundamental mathematic concepts. A central
and persisting issue is how to provide instructional environments, conditions, methods, and solutions that achieve learning goals for students with different skill and ability levels.

V. Effective Mathematics Teaching

There are different views about the effective mathematics teaching of student teachers. Platonic view emphasises very much the abstract structure of mathematical knowledge in their teaching practice, which plays a central role in their lessons, and memorisation can come before or after understanding. According to Functional view, mathematics is a useful way to solve everyday problems, the teacher’s memorisation is reasonable only after understanding. They emphasise flexibility so that their teaching fits the individual student’s needs in contrast emphasising mathematical structure and logic as principal element. Certain teaching methods are effective or ineffective. More likely, the effectiveness or ineffectiveness of a certain method depends on how teachers use that method and what kind of learning goal is set. When discussing effective mathematics teaching, it is reasonable to separate the development of the basic skills and problem solving competence.

Reynolds & Muijs (1999) have stated the characteristics of the effective mathematics teaching, as follows:

• A clear structure for lessons is provided when the teacher includes sessions of direct teaching, is involved pro-actively and not just when pupils are stuck.
• Involves regular interaction with pupils, using perceptive questioning, giving careful attention to misconceptions, and providing help and constructive responses.
• Rehearse existing knowledge and skills in order to enhance them and encourage quick recall of as many number facts as possible.
• Use a variety of activities on a topic in order to consolidate and extend understanding.

If our goal is to teach conceptual understanding, the characteristics of effective teaching are different than when teaching basic skills. Two features of instruction that can help students develop conceptual understanding are: (i) explicitly attending to connections among facts, procedures, and ideas, and (ii) Encouraging students to wrestle with important mathematical ideas in an intentional and conscious way.

Teaching practices are central to understanding what makes for effective mathematics teaching. Peterson’s (1988) list of effective teaching practices included: (i) A focus on meaning and understanding of the mathematics subject and on the learning task (ii) Encouragement of student autonomy, independence, self-direction and persistence in learning (iii) Teaching of higher-level cognitive processes and strategies.

The student teachers emphasised a lot that teaching must be goal-oriented. Teachers must figure out what their goals are in teaching. In order for mathematics teaching to be effective, teachers’ main goals should be to develop pupils’ understanding, application and calculation skills. The goals should direct all of the teachers’ actions: their planning of mathematics lessons, their practice of teaching, and the ways they are assessing
teaching. A student teacher has internalised this goal-orientedness if he or she, in the self-evaluation, always reflects his or her implementation of the lesson to the goals of the lesson. Cognitive objectives are connected to the development of conceptual and procedural knowledge. In mathematics, affective objectives are also very central.

Student teachers should focus on their pupils’ thinking and actions. It is important to listen to pupils in order to understand their ideas. To listen to pupils is an attitude that can be influenced during teacher pre-service and in-service training. Additionally, the teacher needs information on his or her pupils’ beliefs, on strategies they are mainly using, and on their systematic errors in order to make pupils’ listening as effective as possible. If the teacher doesn’t have this information, there is a danger that he or she cannot correctly understand pupils’ utterances.

Flexibility is a useful feature when analysing the teacher’s classroom teaching effectiveness. Many prospective teachers do not have the courage (flexibility) to change their lesson plan in order to adapt it according to what is happening in the class. An aspect of a teacher’s flexibility is individualisation in teaching. According to constructivism, knowledge-building is a personal process, and knowledge cannot be given from outside. Every pupil has his or her own way of understanding and building knowledge. Therefore, one key idea is the individualisation of learning. This is a very demanding task for the teacher.

In teaching, there should be a mixture of constructivist and behaviouristic elements. Therefore, it is important that teachers master different kinds of teaching methods. What is the most effective method in a
specific situation is very situation-dependent. Among others, it depends on the objectives of teaching, on the attitude of the teacher, and on the facilities available in the classroom. If the teaching goal is that pupils understand mathematical concepts and rules, the constructivist approach might be the most effective way. If the goal is that pupils master calculation skills, the behaviouristic approach is flexible and partly critical.

In mathematics teaching, the problem solving approach is emphasised in teacher education. Teaching should be organised as problem-centered whenever possible and sensible. This means that a problem or a problem situation is in the center of the teaching unit. Especially, a teacher should use open problems and even complex situations. In problem centered learning or teaching, pupils are conducted towards a new mathematical content by solving one or more key problems in which the main characters of the new content are represented. When pupils solved these key problems in groups or alone, they presented their solutions to their classmates, and compared these and the strategies they used. Teachers have an important role in problem-centered teaching: they organise a proper problem environment - i.e. they select or construct problems and guide pupils’ discovery process - by giving hints how to solve problems and directing the phase of a lesson in which pupils are presenting their solutions.

Connections between mathematics and everyday experiences were emphasised in student teachers’ conceptions. This means that to connect pupils’ informal experiences to more formal mathematical ideas, the world around them would be used as a context for the problems and tasks dealt
with in the class recognises that these connections are also an important way to add all pupils’ motivation towards learning mathematics.

VI. Aptitude

Aptitude is an important characteristic of an individual, which can predict the future success or failure of an individual in a particular occupation or profession.

A. Meaning of Aptitude

Jones was of the view that, ‘aptitude is more than potential ability or ability expectancy.’ It implies fitness for job; one may call it as success expectancy. Basically, it includes intelligence, ability of various kinds and personality factors necessary for success. It is a combination of all these aspects.

While concluding, we may observe that while one has mechanical aptitude others may have musical, scientific, legal, medical and other professional scholastic or artistic aptitudes. There may be commonalities with regard to the possession of one or the other type i.e. a group of students seeking admission to a particular course of instruction or professional study may be found to have a high degree of aptitude for that course or profession within themselves. We may find a distinct range of diversities and variations when we take notice of the evaluation records of the aptitude tests. Some of them may be found to have very high aptitude compared to average or low aptitude possessed by others. Similarly we may also find that many of them do well in a particular aptitude test, but they show a little or almost no aptitude for other subjects, activities or areas, that is why it has been observed that while one gets success after
entering and getting required training in one area, the other does make a little or no progress. It is, therefore, essential that we must pay due regard to the aptitude possessed by them for guiding them about their educational and vocational choices.

In many spheres of human life we come across individuals who excel over others, under similar conditions, in acquiring certain knowledge or skills and prove more suitable and efficient than their peers in certain specific fields. Such persons are said to possess a certain specific ability or aptitude in addition to intellectual abilities or intelligence, which helps them to achieve success in some specific occupations or activities. Therefore, aptitude may be described as a special ability of specific capacity distinct from the general intellectual ability which helps an individual to acquire the required degree of proficiency or achievement in a specific field.

Warren defines aptitudes as “a condition or set of characteristics regarded as symptomatic of an individual’s ability to acquire with training some knowledge, skill or set of responses such as the ability to speak a language, to produce music and the like.” when we refer to a person’s aptitude for something, say art or carpentry, we generally look to the future. Aptitude is present pattern of traits, but it always refers to future potentialities. The above definition does not say whether aptitude is inborn or acquired. It is certainly a product of the two.

Aptitudes do indicate potentialities. But they are something more than this. They imply fitness and suitability, a readiness to acquire proficiency in a given field or job. The concept of aptitude is thus very useful. The concept of aptitude would be clearer when we defined other related terms as explained by Bingham:
**Ability** : the power to perform responsive acts which may be complex movements, solutions of problems, discrimination, etc.

**Capacity** : potential ability.

**Genius** : ability for fruitful achievement leading to exceptional eminence in art, religion, drama, science, strategy, poetry, exploration or any other field. Genius is superlative ability.

**Proficiency** : degree of ability already acquired.

**Skill** : ease of precision in performing complex tasks.

**Talent** : relatively high order of aptitude.

In order to have a clear understanding of the term aptitude, a few expert views may be considered here.

The Dictionary of Education defines aptitude as described as ‘a pronounced innate capacity for, or ability in a given line of endeavour, such as a particular art, school subject or vocation.’

In the Dictionary of Education, Derek Rowntree described aptitude as ‘an individual’s ability to acquire particular or general skills which he has not yet acquired’, e.g., mathematical aptitude indicates the potential level of achievement in mathematics, rather than present achievement.

According to Bingham (1937) ‘aptitude refers to those qualities characterising a person’s way of behaviour which serves to indicate how well he can learn to meet and solve a certain specified kinds of problems.’

According to Traxler (1957), ‘aptitude is a condition, a quality or a set of qualities in an individual which is indicative of the probable extent to which he will be able to acquire under suitable training some knowledge,
skill or composite of knowledge, understanding and skill such as ability to contribute to art or music, mechanical ability, mathematical ability or ability to read and speak a foreign language.’ In other words, the most important factor in an aptitude is the capacity to acquire proficiency. On the other hand, if an individual has no aptitude for a particular type of task, he will not be skilled or proficient in that task in spite of training given to him.

Freeman (1971) defined aptitude as a combination of characteristics indicative of an individual’s capacity to acquire (with training) some specific knowledge, skill or set of organised responses such as the ability to speak a language, to become a musician, or to do mechanical work.

The above definition reveals that aptitude is

• a present condition having something to do with the future.

• a capacity or an ability which is sharpened by training.

• symptomatic or indicative of one’s ability for a particular work or job.

• of predictive value.

According to Jones, an aptitude is a measure of probability of the success of an individual with training in certain type of situation, a job in school, or in such activities as playing the violin or learning a language.

According to Bennett, Seashore and Weisman, ‘aptitude embraces any characteristic which predisposes to learning including intelligence, achievement, personality, interests and special skills.’

According to Hann and Macheam, ‘aptitudes are correctly referred to as latent potentialities and undeveloped capacities to acquire abilities
and skills and to demonstrate achievements.’ In the words of Van Dusen, ‘aptitude is a measure of the probable rate of learning which results in interest, satisfaction and is relatively specific and narrow.’

B. Characteristics of Aptitudes

1. Aptitude is an abstract noun. It is not a quality possessed by the individual, but is an integrative part of his personality.

2. Aptitude is a present condition with a future reference. It is symptomatic or indicative of potentialities. Understanding of an individual’s aptitudes helps us to know what he shall do in future.

3. Any measure of aptitudes would only be in terms of probabilities.

4. An individual may have many aptitudes or potentialities, but these are not equally strong. Even an extremely versatile engineer, musician, painter or designer was not equally gifted in all these fields.

5. There are individual differences in potentialities. People do not inherit the same endowments, nor do they develop equally.

6. Potentialities of an individual are fairly stable. But it does not mean that they are perfectly constant and do not alter. It means that changes are not sudden and take years.

C. How aptitude differs from Ability and Achievement

Jones says that an aptitude is not inborn; it is a combination of inborn capacities and developed abilities, skills, etc., that makes the person what he is at any given point of time and predicts what he becomes. Jones further distinguishes among the terms achievement, ability and aptitude as given below.
Achievement looks to the past; it indicates what has been done. Ability is concerned with the present; it indicates the combination of skills, habits and powers which an individual now has had and which enables him to do something. Aptitude looks to the future and on the basis of the abilities and skills that an individual now has, predicts what he, with training, may become and what success he may have in a given occupation or field. William Cooley and Paul Lohnes argued that ‘yesterday’s achievement is today’s ability and tomorrow’s aptitude.’

**D. Difference between Aptitude and Intelligence**

Intelligence is concerned with general mental ability, but aptitudes with specific sensory, motor, mechanical, artistic or professional ability. They also refer to specific aspects of intelligence. Two persons may have the same score in general mental ability test. Their abilities, however, be different. They would react to different jobs differently. In spite of their similar I.Q.s, they might differ in perception, judgement, reasoning, word-fluency, vocabulary, special orientation, etc.

If we know a person’s intellectual level on the basis of intelligence tests or school progress, we may tell the likelihood of the branch of occupation more suitable for that individual. Many tests have indicated that a particular level of intelligence is required for a given branch of occupation. In ascertaining a person’s aptitude, it is useful to know whether he shows equal intelligence in dealing a variety of problems, or he shows special excellence in some definite type of problems, say artistic, linguistic, mechanical, legal, medical, mathematical, etc.
E. Difference between Aptitude and Interest

In order to succeed in a given activity, a person must have both aptitude for the activity and interest in it. This does not mean that interest and attitude are one and the same thing. A person may be interested in a particular activity, job or training, but may not have the aptitude for it. In such cases, the interest shown in a particular occupation or course of study is often not the result of personal aptitude, but of some other outside influence or reason.

F. Measurement of Aptitude

Aptitudes can be measured through tests. An aptitude test is a device or a technique designed to indicate a person’s potential ability for performance of a certain type of activity of a special kind. An aptitude test measures the present performance which is symptomatic or indicative of one’s ability for future accomplishment in a particular work or job.

Aptitude test attempts to predict the capacities or the degree of achievement that may be expected from individuals in a particular activity. Aptitude tests measure and describe special abilities, capacities or talents which are supposed to determine the level of achievement that can be expected from individuals in specific fields of study and activity. Aptitude, like intelligence, falls under the domain of mental measurement, but it is less confused and more specific in its nature.

*Intelligence Test versus Aptitude Test*: The distinction between intelligence test and aptitude test is that whether the test measures general or multiple or specific factors. If the measure that we obtain is general, the
test is frequently called an intelligence test. If the test measures multiple or specific factors, then it is termed as aptitude test.

Aptitude Test versus Achievement Test: The distinction between an aptitude test and an achievement test is quite ceremonious. That is why it is sometimes said that there really ‘is no hard-and–fast rule to distinguish an achievement test from an aptitude test by a cursory examination of the test format.’ The distinction between the two tests is made by some people in terms of the amount or degree of the specific influence of past learning, that is, an achievement test measures the effects of specialised or formal instruction whereas an aptitude test measures the cumulative impact of all kinds of learning. Although one is hard-pressed to present definitions of achievement and aptitude, Profs. Mehrens and Leemann provided the following definitions which are acceptable to all people, ‘an achievement test is used to measure an individual’s present level of knowledge or skills or performance’. An aptitude test is used to predict how well an individual may learn.

Aptitude tests can be divided into two broad categories: (i) Specialised Aptitude Tests. (ii) General Aptitude Tests.

Specialised Aptitude Tests: These aptitude tests have been devised to measure the aptitudes of individuals in various specific fields or activities. Generally, these tests can be divided into the following sub-types according to the specific aptitude tested by them.

- Mechanical Aptitude Tests
- Musical Aptitude Tests
- Art judgement Tests
• Professional Aptitude Tests i.e. Tests to measure the aptitude for professions like Teaching, Clerical duties, Medicine, Law, Engineering, Salesmanship, Research, etc.

General Aptitude Tests: Instead of employing specialised aptitude tests for measuring specific aptitudes, the present trend is to use multiple test batteries to assess the suitability of persons for different professions on the basis of scores in the relevant aptitude tests in the battery.

VII. Teaching Aptitude

Teaching aptitude is the capacity to acquire proficiency with a given amount of training in teacher education. It refers to the capacity of an individual to be skilled in teaching by receiving formal or informal training. Teaching aptitude is a person’s potential for teaching which is the sum total of all the traits and abilities that are needed for successful teaching. A person may be said to possess an aptitude for teaching if he possesses good proportion of the traits and abilities required for becoming a successful and effective teacher like high level of mental caliber, creativity, real interest in the teaching profession, an adequate grounding in the subject matter, skill in experimentation, skill in problem solving, willingness to improve professionally, love for children, love and thirst for knowledge, interest in reading, etc.

Actually the term ‘teaching aptitude’ is used in two ways – when we say a man has a great deal of aptitude for teaching, it means that he has many of the characteristics which make for success in teaching activities or a person lacks this teaching aptitude he is deemed to be lacking in those specialised abilities.
The report of the committee for Review of National Policy on Education (1986) (Popularly known as Acharya Ramamurthy Committee) recommended that selection of students should be regulated through stringent aptitude, and attainment criteria and merely on University grade or marks. Effective steps have to be taken so as to develop student qualities such as empathy, an attitude towards teaching profession and society and other cherished values.

Therefore, in the interest of a successful, meaningful and developing educational system for the country, it is absolutely essential that the selection of the teachers should be made properly, scientifically and objectively. Even after the selection is made, if the ability of the teaching class as a whole is to be improved, then there should be a standardised system to assess their effectiveness and to suggest ways and means of better performance. If the desirable characteristics are to be developed in prospective teachers, they need to have aptitude for these characteristics. In the absence of the aptitude, these characteristics may not be developed to the required levels.

Teaching aptitude is the aptitude concerned with teaching having all the above explained aspects of aptitude.

VIII. Attitude

Attitude is such a complex affair that it cannot be completely described. Thurstone has used the concept of attitude to denote ‘the sum total of a man’s inclinations and feelings, prejudice or bias, pre-conceived notions, ideas and convictions about any specific topic.’ Thus, a man’s
attitude about teaching means all that he feels about teaching. It is obviously a subjective and personal affair.

A. Meaning of Attitude

The term Attitude has been defined and described in various ways by different educationists.

Baldwin (1905) defined attitude as ‘readiness of attention or action of a definite sort’.

According to Allport (1929) attitude is ‘a mental and neutral state of readiness, organised through experience, exerting a directive or dynamic influence upon the individual’s response to all objects and situations with which it is related’.

Warren (1934) defined attitude as ‘the specific mental disposition towards an incoming (or arising) experience, whereby that experience is modified, or a condition of readiness for a certain type of activity’.

According to Bogurdus (1941) attitude is ‘a tendency to act towards or against something in the environment which becomes thereby a positive or negative value’.

According to Good (1945) attitude is ‘a state of mental and emotional readiness to react to situations, persons or things in a manner in harmony with a habitual pattern of response previously conditioned to or associated with these stimuli’.

Thurstone (1946) defined attitude as ‘the degree of positive or negative affect associated with some psychological object’.

According to Guilford (1954) attitude is ‘a personal disposition common to individuals, but possessed to different degrees, which impels
them to react to objects, situations, or propositions in ways that can be called favourable or unfavourable’.

According to Freeman (1962) attitude is ‘a dispositional readiness to respond to certain situations, persons, or objects, in a consistent manner which has been learned and has become one’s typical mode of response’.

According to the Advanced Learners Dictionary of Current English, attitude means ‘way of feeling, thinking or believing’ (Hornby, et al., 1968).

Edwards (1969) defined attitude as ‘the degree of positive or negative affect associated with some psychological object’.

Good (1973) defined attitude as ‘the predisposition or tendency to react specifically towards an object, situation or value; usually accompanied by feelings and emotions’.

According to Taneja (1991) attitude is ‘a predisposition to perceive, feel or behave towards specific objects in a particular manner’.

‘An attitude is essentially a form of anticipatory response, a beginning of an action not necessarily be completed.’ - K. Young

‘An attitude is a mental and neutral state of readiness, exerting directive or dynamic influence upon the individual’s response to all subjects and situations with which it is related.’ - Britt

An attitude can be defined as an enduring organisation of motivational, emotional, perceptual and cognitive processes with respect to some aspect or individual’s world. – Krech and Crutchfield

An attitude is a tendency of an individual to react in a certain way towards a particular object, stimulus, situation, process or phenomenon.
Attitude is what a person feels or believes in. It is the inner feeling of an individual. It may be either positive or neutral or negative. It is often defined as a tendency to react favourably or unfavourably towards a designated class of stimuli.

Attitudes differ from person to person. Infact, attitudes are effective by-products of an individual’s experiences and are very much influenced by his environment. Attitudes are the result of one’s reaction pattern to his environment. They represent the way in which a person will react to a particular situation. Thus, attitudes operate in specific behaviour patterns.

Distinction between Opinion and Attitude

Opinion and attitude are used in a synonymous manner. But there is a subtle difference between the two. An opinion is just an expressed attitude. An opinion may not lead to any kind of activity in a particular direction. But an attitude compels the individuals to act either favourably or unfavourably according to what they perceive to be correct. How the people feel or what they believe is their attitude. But, it is difficult to specify and describe and ultimately measure the feeling or belief known as attitude. Researchers must depend upon what people say about their beliefs and feelings. This is the area of opinion. Through the use of questions or by getting people’s reactions to statements, a sample of their opinions is obtained. From this statement of opinion, one may infer or estimate their attitudes.

The process of inferring attitudes from expressed opinion has many limitations. People may conceal their attitude and express only socially
acceptable opinions. They may not really know how they feel about an issue; they may never have given the idea serious consideration.

**Distinction between Interest and Attitude**

Attitudes and interests are closely related to each other. Interest generally means a positive or a favourable feeling towards something, but attitudes may be positive as well as negative. Attitudes are not natural or innate, but they are learned and acquired tendencies. Moreover, attitudes are not permanent or stable. They may undergo a change on account of a number of reasons. But, they are not transitory even. They are reasonably stable. Attitudes determine the nature of individual behaviour, for example, a person will approach a task or a problem in a positive or a negative way according to his attitude. Attitudes, therefore, affect the actions or behaviour of a person to a great extent.

**B. Characteristics of Attitudes**

- They may be overt or covert.
- There is unlimited range of attitudes.
- Attitudes differ from culture to culture.
- There are individual differences in attitudes.
- They are integrated into an organised system.
- They always imply a subject-object relationship.
- Attitudes are the basis of behaviour as they lead to actions.
- They are more or less consistent. But they can be modified.
- Attitude towards an object is not necessarily based on its utility.
- They are acquired and not inborn. Nobody has favourable or unfavourable attitude towards teaching by birth.
C. Components of Attitudes

Attitude is a multidimensional concept. Three of the generally accepted components of the term ‘attitude’ (Aiken, 1980; Auzmendi, 1991; Olson and Zanna, 1993; Gomez Chacon, 2000) are: (i) Affective: feelings about the object in question, (ii) Cognitive: the person’s self perception as regards the object, and (iii) Behavioural: the person’s inclination to act towards the attitude object in a particular way. Schau, Stevens, Dauphine, and Del Vecchio (1995) assumed four dimensions: (i) Affect: feelings concerning the subject; (ii) Cognitive competence: perception of self-competence, knowledge and intellectual skills when applied to subject; (iii) Value: appreciation of the usefulness, relevance and worth of the subject in personal and professional life, and (iv) Difficulty: perceived difficulty of the subject.

Thus, attitudes consist of three elementary components: (i) the cognitive components (ii) the feeling components (iii) the action or behavioural components. The three are interrelated.

D. Significance of Attitudes in Education

One of the important functions of education is to develop positive attitudes in pupils for desirable things in general, and for studies in particular. Attitudes are of great importance from the standpoint of academic achievement of pupils. Teachers and educators are becoming progressively more aware of the importance of attitudes in the process of education. Attitudes, along with interests, are mainly responsible in deciding one’s achievement and progress in a field of study. Attitudes are
great motivators and help to make an individual keenly interested in his studies.

E. Attitude towards Teaching of Mathematics

Attitude of teachers towards teaching of mathematics plays an important role in shaping the attitude of students towards the learning of mathematics. The attitude of a teacher towards teaching could influence his actions in the classroom, which becomes critical to student learning. The teacher’s attitude regarding mathematics and students is relative to attitudes towards the teaching of mathematics, which in turn, has a powerful impact on the atmosphere within the mathematics classroom.

It is needless to mention that the attitude of a teacher towards his profession i.e. teaching mathematics is an important aspect that helps one to feel well in his job. A favourable attitude towards teaching mathematics is likely to prove helpful to mathematics teachers in maintaining harmonious relations with their pupils which is characterised by sympathetic understanding and affection.

Teaching requires intelligence, keenness, practical skills and a sense of duty and integrity. Therefore selecting the right type of persons for the teaching profession is of utmost importance for the progress of the educational system. Only right type of persons can perform the right type of work. Proper selection and training of teachers is now a universally accepted idea and is considered to be essential for improving teaching effectiveness (Adawal, S.B. 1973).

The Secondary Education Commission rightly remarked ‘the teacher training programme can engender the knowledge, skills and attitudes which
will enable the teacher to begin his task with a reasonable degree of confidence and with the minimum amount of experience.’ So, it is found necessary that at least the attitude of prospective teachers should be measured so that in cases where a negative attitude towards teaching has been found could be so modified that a positive attitude towards teaching profession can be cultivated in them.

**IX. The Mathematics Teacher**

The teachers in general and mathematics teachers in particular provide a leadership or guiding role in teaching and learning context and, therefore, are highly influential. Many things are expected of the teacher of Mathematics. His obligations not only are confined to the classroom, but extend in many other directions also. It must not be forgotten that, however, his first and foremost obligation is to teach his subject effectively. Teaching mathematics is a task which, if sincerely undertaken, will challenge the best efforts of the best teacher. No teacher can do a thoroughly good job of teaching mathematics unless he is willing to make a careful analysis of his job to be guided by that analysis. The development of logical thinking and reasoning ability among the students is a very essential function of any mathematics teacher.

An American Commission on Teacher Education has remarked that ‘the quality of a nation depends upon the quality of its citizens; the quality of its citizens depends – not exclusively, but in critical measure – upon the quality of their education. The quality of their education depends more than any other single factor, upon the quality of their teachers.’ Thereby
quality of mathematics education to a great extent will definitely be determined by the quality of mathematics teachers.

The mathematics teacher needs to be very effective to realise his teaching objectives.

X. Effective Teacher

It is generally agreed that the quality of any educational programme to a large extent is dependent on the quality of teachers available to implement it. A school may have excellent physical infrastructure like buildings, labs, library, equipment, etc., along with a good curriculum, but if the teachers are not capable to teach in an effective manner, the whole programme is likely to be ineffective and wasted. The problem of identification of effective teachers, is therefore, of prime importance for realising desirable educational goals. An effective teacher may be understood as one who helps development of basic skills, understanding, proper work habits, desirable attitudes, value judgement and adequate personal adjustment of the students (Ryan, 1969).

There is a saying that ‘an ordinary teacher tells, a good teacher demonstrates, the best teacher inspires.’ The teachers who inspire and motivate the students are included in the category of ‘Effective Teachers’. According to Kothari Commission, ‘the destiny of a nation is being shaped in the class rooms.’ So, the teacher has the responsibility to shape the destiny. The effective teacher is the educational leader and decision maker who directly affects and indirectly influences the students.

An effective teacher must consider the individual differences of his students and treat all of them in the same manner. Individuals differ in their
abilities, attitudes, aptitudes, interests, etc. Since students have varying capabilities, all of them cannot acquire mastery in equal measure. The effective teacher helps the students by applying novel methods in his teaching.

Teaching is not only the verbal transfer of information, but also creation of knowledge. An effective teacher enhances knowledge of his students. Each child has the ability to construct his own knowledge. The effective teacher acts as the facilitator in the construction of the knowledge of his students.

Effective teachers are very clear about their goals. They have their own objectives in teaching. They are also very clear about what they intend to accomplish through their instruction and they keep these goals in mind both in designing the instruction and in communicating its purposes to the students. They will succeed in creating suitable learning situations. These learning situations help students to organise information in new ways and analyse the problems effectively.

Effective teachers also create meta cognitive abilities among students. They can analyse the various learning styles followed by his students and give proper directions to modify their style of learning. An effective teacher can promote self-learning among the students. This is based on constructivism. According to constructivism theory, no one can teach anybody anything. What one has learned is what one has learnt by oneself.

Research suggests that the following characteristics are important for an effective teacher.
- Ask thought provoking questions.
- Provide congenial environment for learning.
- Know each pupil individually by name.
- Show the knowledge of pupil’s background.
- Be aware of social groupings in the class room.
- Be aware of individual learning needs.
- Admits his or her mistakes and learn from them.
- Encourage good relationships among pupils.
- Not be too dominant.

No teacher can possess all of the qualities of an effective teacher, but by birth or training, he may acquire some of these qualities.

XI. Recommendations of Commissions and Committees concerned to Teachers

The Government of India appointed many commissions and committees from time to time to examine the various aspects of teachers like their professional qualifications, professional competence, professional attitude, professional status, job security, salary, benefits, etc., and to make suitable recommendations. The opinions and suggestions given by some of the commissions are briefly given below.

A. University Education Commission (1948)

Dr. Sarvepalli Radhakrishnan, Chairman of the University Education Commission, emphasised the role and responsibility of the teacher in the development of the country. Since the success of any educational process depends so much on the character and ability of the teacher, the commission opined that in any plan of reform of University Education the
main concern must be in securing the required number of teachers with necessary ability, integrity and qualifications. Besides, the success of a teacher should be measured more by the quality and character of men and women he has taught than in terms of the percentage of passes he produces.

Hence, the commission stressed the necessity for improving the status of the teacher, his salary, service conditions and also for providing him necessary facilities for the pursuit of knowledge and for performing his duties satisfactorily.

It emphasised the necessity of providing all amenities such as books, journals, laboratory equipment, etc., to the teachers, without which they cannot keep pace with the advancement of knowledge and carry out significant investigations.

The commission also emphasised the necessity of refresher courses for the teachers to help them keep themselves up-to-date in knowledge. Further, the commission also stated that the salaries of the teachers should be on par with central services. They also pointed out that regulations regarding provident fund, leave and hours of work should be laid down in definite terms.

It felt that the indifference with which the teachers are treated today by the public, and their participation in political campaigns for electing members to the different bodies as the basic cause for the present state of deteriorating standards of teaching and ever increasing indiscipline.
B. Secondary Education Commission (1954)

The Secondary Education Commission, under the chairmanship of Dr. A. Lakshmanaswamy Mudaliar, stressed the need for improving the status and general conditions of the teachers. The commission felt the need for ‘educational reconstruction of the teachers’ in terms of his professional training and his economic status in the school as well as in the community. The commission laid emphasis on providing in-service programmes for the teachers so that they can keep abreast of developments in subject knowledge and new techniques of teaching.

C. Education Commission (1964-66)

The Government of India appointed the Education Commission in 1966, under the chairmanship of Dr. D.S. Kothari.

The commission prepared its report with the apt remark ‘the future of India is now being shaped in her class rooms’ and opined that intensive and continued efforts be made to raise the economic, social and professional status of the teachers in order to attract young, energetic and dynamic persons to the profession and to retain them in it as dedicated, enthusiastic and contended workers.

Further, to encourage the teachers to do their job efficiently, they recommended the institution of state and national awards. They emphasised the need for introducing promotional opportunities within the profession, and the need for providing other fringe benefits to attract men of talent to the profession.
D. National Commission on Teachers (1985)

The Government of India appointed yet another commission called the ‘National commission on Teachers’, under the chairmanship of Prof. D.P. Chatopadhyaya in 1985. The committee examined various aspects related to teachers and made the following major recommendations.

• In the new system the teacher has to assume the role of a facilitator and guide. He should provide inspiration, motivation and support in effecting improvements in the quality of education.

• To recruit teachers more scientifically, the desirable competence of a teacher should be listed on the basis of practical and applied research. High proficiency in teaching the subject, good linguistic ability, efficiency in communication skills and love of children are some of the qualities that may be looked for in a teacher.

• The revival of Indian Education Service to enhance the status of the teaching profession, to promote national integration and to accelerate the pace of national development must not be postponed any further.


The parliament of India during the Budget session in 1986 discussed and adopted the ‘National Policy on Education’. The National Policy on Education (NPE) has rightly observed that ‘the status of the teacher reflects the socio-cultural ethos of a society. It is said that no nation can rise above the level of its teachers’. The NPE examined various aspects related to teachers and observed that:

• Substantial improvement is needed in the conditions of work and quality of Teacher Education. Emphasis should at the time be laid
on the teacher’s accountability – to the pupils, their parents, the community and to their own profession.

- The most important factor affecting the status of teachers is their living and working conditions. So there is a need to improve the living and working conditions of the teachers.

- Methods of recruitment of teachers will be reorganized to ensure objectivity, merit and conformity with spatial and functional requirements.

**STATEMENT OF THE PROBLEM**

The present study is aimed at analysing the teaching effectiveness, teaching aptitude and attitude towards teaching mathematics of prospective mathematics teachers in relation to certain variables, namely, locality, gender, educational qualification, academic achievement and community and also the association among them.

This study is designed to know the general level of teaching effectiveness, teaching aptitude and attitude towards teaching mathematics prevailing among the prospective mathematics teachers and to find out the influence of the selected variables on these three aspects. The present study is stated as follows:

“A Study of Teaching Effectiveness, Teaching Aptitude and Attitude towards Teaching Mathematics of Prospective Mathematics Teachers”
NEED OF THE STUDY

Teaching mathematics is a complex task. It has been a challenge to the teachers since the origin of human race due to its unique role in solving problems. It has occupied a significant position in the school curriculum. Effective teaching can be equated to the relationship of a teacher with the society and more particularly with his students whose growth and development are the major concern of a teacher.

The teaching effectiveness comprises one or more abilities of a teacher to produce educational effect in a situation or context (Mitzel, 1982). Maximising the effectiveness of a teacher in teaching is a major goal of education. The Secondary Education Commission, Indian Education Commission and National Policy on Education categorically pointed out the need for improving the teacher training programmes for increasing the teaching effectiveness of prospective teachers. Nothing is more important than serving a sufficient supply of high quality teachers to the teaching profession, providing them with possible preparation and creating satisfactory conditions of work in which they can be fully effective. Generally highly talented students in mathematics are not attracted to teaching profession and they prefer to join in other courses. Even the students who have joined in teacher training programmes are not having teaching aptitude and favourable attitude towards teaching which are essential for effective teaching. Is our teaching methodology and all the training not inspiring them to take up teaching profession seriously? To understand the intricacies of this problem and to estimate the teaching aptitude and attitude towards teaching mathematics of prospective teachers, this study has been taken up.
Attitude towards teaching mathematics plays a major role in predicting the teaching effectiveness of the student teachers. In order to improve the teaching effectiveness of student teachers, there is a need for the development of positive attitude towards teaching mathematics.

In the past five decades, however, research has begun to relate certain teacher behaviours to specific consequences in the climate of the class room and in the academic achievement of the pupils. Everyone agrees with the validity of the fact that some persons are endowed with certain characteristics which make them eminently filled to become teachers. In view of the rapid expansion of education, a large number of teachers is required. The success and failure of any school education’s endeavour rests largely with the class room teachers and there is no substitute for an effective teacher. Lack of effective teachers in present day schools is the major problem to achieve the objectives of education. The schools need to be staffed with effective teachers for the qualitative improvement of education. These teachers are the output of the teacher education programmes of the State. The present teacher education programme is criticised by many educationists for not meeting the quality. In teacher education programme, theory and practice play equal role in the development of their professionalism. The present teaching practice is not sufficient to mould the teaching behaviour of the prospective teachers.

The present teacher education system is utilising age-old tools to analyse the effectiveness of the prospective teachers. These tools failed to measure all the dimensions of teaching effectiveness. Teaching effectiveness, which eludes precise measurement and which is related to and dependent on teaching behaviour and a host of several other factors,
has always intrigued educationists. Hence, there is no consensus among teacher educators with regard to the measurement of the teaching effectiveness of pre-service teachers. So, there is a need for preparation of an effective teaching analysis tool to bring desired changes among prospective teachers. At present more than thirty thousand prospective teachers are undergoing teacher education programme for secondary level in Andhra Pradesh. Among these members, 30% belong to mathematics stream. There is a need for studying their effectiveness in teaching, because they have major responsibility in shaping the future of the nation.

Today we are living in the world of technology. Our present society needs more and more technical professionals. Sound mathematical knowledge is essential for any profession. So, effective mathematics teachers play a key role in the present society. However, the identification of effective teacher has been a problem that has challenged educational leaders for years and it has yet to be resolved. Attitude towards teaching and personality can be changed by experience. It is hoped that the results of the study would prove to be quite useful for the student teachers and the teachers working in different institutions in changing their attitude towards teaching for the better and developing inter personal skills.

The present study is an attempt to identify the teaching effectiveness, teaching aptitude and attitude towards teaching mathematics of the prospective mathematics teachers who will be the future teachers of our country. This study may also be helpful for teacher educators to improve their teacher training programs by making some innovations in their programmes.
SCOPE OF THE STUDY

The present study is confined to the prospective mathematics teachers undergoing teacher training for secondary school level. The study included 500 student teachers undergoing teacher training in various colleges of education in Acharya Nagarjuna University area in Andhra Pradesh. The study is confined to the measurement of three dependent variables, namely Teaching Effectiveness, Teaching Aptitude and Attitude towards Teaching Mathematics. The study is restricted to five independent variables, namely Gender, Locality, Educational qualification, Academic achievement and Community.

OBJECTIVES OF THE STUDY

The purpose of this study is to focus attention on teaching effectiveness, teaching aptitude and attitude towards teaching mathematics of prospective mathematics teachers.

The following objectives were proposed for the present research study which is entitled ‘A Study of Teaching Effectiveness, Teaching Aptitude and Attitude towards Teaching Mathematics of Prospective Mathematics Teachers.’

1. To study the teaching effectiveness of prospective mathematics teachers.
2. To find out the influence of the variables, viz., locality, gender, educational qualification, academic achievement and community on teaching effectiveness of prospective mathematics teachers.
3. To study the teaching aptitude of prospective mathematics teachers.
4. To find out the influence of the variables, viz., locality, gender, educational qualification, academic achievement and community on teaching aptitude of prospective mathematics teachers.

5. To study the attitude towards teaching mathematics of prospective mathematics teachers.

6. To find out the influence of the variables, viz., locality, gender, educational qualification, academic achievement and community on attitude towards teaching mathematics of prospective mathematics teachers.

7. To find out the association among teaching effectiveness, teaching aptitude and attitude towards teaching mathematics of prospective mathematics teachers.

8. To find out the association among teaching effectiveness, teaching aptitude and attitude towards teaching mathematics of rural and urban; men and women; graduate and post-graduate; low, average and high achievement group; and O.C., B.C. and S.C. prospective mathematics teachers.
EDUCATIONAL IMPLICATIONS OF THE STUDY

The major educational implications of the present study are:

Measures will be taken up to improve the teaching effectiveness of prospective mathematic teachers if it is found low.

The factors favourable for effective teaching will be extended to ineffective prospective mathematics teachers.

Measures will be taken up to encourage teacher educators of teacher training institutions, curriculum planners and even the textbook publishers to collaborate for the purpose of improving the teaching effectiveness of prospective teachers.

Aptitude of prospective teachers in teaching will be considered as a criterion for the selection of teachers.

Attitude of the prospective mathematic teachers may be suitably moulded depending on the level of attitude towards teaching possessed by them.

Besides regular teacher training programme, colleges of education should arrange guest lectures and orientation programs to develop positive attitude among the prospective teachers towards teaching.