CHAPTER - I

INTRODUCTION

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1.1 INTRODUCTION

Education may be considered as a life long process. It begins at birth and continues throughout life. The child learns through his experience. He gains experience when he comes in contact with different social institutions, persons, places and things. Education may also be considered as a product. A person is said to be educated, when he acquires knowledge, skills, attitudes etc.

Education is an integral part of human life. It is the basic condition for the development of a ‘whole man’ and vital instrument for accelerating the well-being and prosperity of all, in every direction. Without education man would still be living just like a splendid slave or like reasoning savage. Therefore, it is one of those subjects, which are talked about by all.

Education is the transmission of civilization. It is the chief defense of a country. Educationalists around the globe have defined education in different ways at different times in human history. Aristotle “defined education as the creation of a sound mind in a sound body”. Nothing can be as important as the children because they are the future of the world. How they grow up will depend on the basic education they get from the elementary school. Teaching and learning process is no more confined to the four walls of a classroom. As the great thinker Walter Dill Scott says once people were driven – now they are inspired”. So learning is gaining knowledge through experience.
The prime duty of the teacher is not to impart textual information but to sensitize child and kindle the curiosity of the child. Therefore, it is imperative on the part of the teacher to divest the conventional method of imparting the textual content in a classroom. Further, it limits the students, inquisitiveness and prevents them from go beyond the text, which is the ultimate goal of learning process.

1.2. ELEMENTARY EDUCATION

India is one of the largest democratic countries in the world. For the effective functioning of democracy, Literacy is a significant contributing factor. The Government of India attaches great importance to the elementary education and has accepted the UEE as the national goal. The NPE 1968 and NPE 1986 as revised in 1992 states in aggregate that free and compulsory education of satisfactory quality should be provided to all children up to the age of 14 years, besides ensuring higher Government and non-Government expenditure on education that should constitute 6 percent of GDP before the commencement of twenty-first century. It develops some of the most basic capabilities for human development and creates a base of numeric and literacy that enables people to be more innovative and productive. It was an unfinished dream of the Government of India by the end of 2000 AD and could not practically be provided till today. Hence, a new scheme, Sarva Shiksha Abhiyan (SSA) has been evolved to pursue the UEE in a mission mode. The central and State Government has over a period of time evolved strategies to improve the levels of achievements in the schools.
The national system of education has ensured every child a minimum standard of education through a built-in flexibility for the teacher, school and local educational authority. Keeping this in view the national curriculum framework has visualized a change in the teacher’s role from that of a mere transmitter of information to that of a facilitator of learning. National Policy on Education (NPE) 1986 has recommended ‘interactive teaching’ based on teacher-student dialogue.

The qualitative improvement of general education depends on teacher education. The progress of nation, the attitude and achievement of the individual, teacher competence and performance are closely interlinked. The basis for derived output in all there an area lies in the quality of teacher education imported to the teachers. Teacher education, therefore, has to change, adopt and adapt new techniques and methods to keep pace with the changing concepts of learning and education.

1.3 BASIC PRINCIPLES OF TEACHER EDUCATION

The progress of a country depends upon the quality of its teachers and for this reason teaching is the noblest among all professions. The irony of fate, however, is that teaching is the most unattractive profession and teacher no longer occupies an honorable position in the society, teaching can regain its earlier noble status in case the quality of teacher education in our country is improved. It is probably for this reason that the education commission recommends the introduction of “a sound programmed of professional education of teachers”.
The commission further remarks that investment in teacher education can yield very rich dividends because the resources required are small when measured against the resulting improvements in the education of millions. In the absence of other influences, a teacher tries to teach in the way in which he himself was taught by his favorite teacher and this tends to perpetuate the traditional methods of teaching in a situation like the present when new and dynamic method of instruction are needed such an attitude becomes an obstacle in progress. He can be modified only by effective professional education which will initiate the teacher to the needed revolution in teaching and lay the foundation for their future professional growth.

“Teacher education refers to the totality of educative experiences which contribute to the preparation of a person for a teaching position in schools”. The term is commonly employed to refer to the programme of courses and other experiences offered by an educational institution for the specific purpose of enhancing the competence and performance of persons who choose teaching profession.

Teacher education programmes equip the teacher in educational psychology, methodology of teaching and techniques of evaluation. Teacher education is concerned with equipping the future teachers. The term “teacher education” is more comprehensive and has deeper implications. It includes theoretical instruction and practice teaching in order to develop the skills needed for teaching effectively.
1.4 THE SCOPE OF TEACHER EDUCATION

The schools of today generally lay emphasis on an integrated and balanced personality of the teacher as a whole man. The teacher of today must be the teacher of a whole man, and he can never be this unless he himself is a complete man. We teach more by our actions than by our preaching.

The teacher – education system as it exists today may succeed in the training of teachers, but it has entirely failed to educate the human beings. This is what we have tended to do. The trained teacher has been too often the untrained human being. This process, therefore, must be reversed. Our aim must be the education of the right human beings, for work in our schools. If we can succeed in this, the trained teachers will follow. An era of the training of teachers is past; our concern “today” is with the education of the educators.

There is anything in him, must be wholeness of personality, mind and wholeness of experience. With proper type of education to the prospective teacher, he will be in a more, favorable position to correlate his knowledge with experience, to see life steadily and to see it as a whole. His mature study of child’s growth process will strengthen his intellect. Te only means of strengthening one’s intellect keats said, is to let the mind be a thoroughfare for all thoughts, not a selected party. From this open mindedness, sympathy, tolerance, intellectual adaptability and that width of interest will spring the attributes which are essential for successful living and to deal with children.
But this requires, a comprehensive goal to deal with. This implies a philosophy of life and education, a map by which the future teacher may see himself in relation to other teachers as well as other human beings activities. It means that he must be given time an opportunity during his training course to think about education because he will have little time to think about education after completing his training. After the completion of his teacher education course, he will be engaged in the all absorbing tasks of the classroom and the common life.

The prospective teacher, therefore, must be offered opportunities frequently to associate with the best minds and there by to develop a disciplined intellect as well as the quality of appreciation of culture into all forms. This implies that he will have an emotional life developed to a fine sensitivity but help in a strict control.

1.5 IMPORTANCE OF TEACHER EDUCATION

Education helps in the development of individuals cognitive, and affective abilities. Teacher – education programmes are designed to prepare effective teachers by providing theoretical awareness of teaching and developing teaching competency and teaching ability. The present level of performance of an individual on the test will indicate the growth of his ability.

All those activities, operations even through which the prospective teachers are to be made aware to the latest trends of subjects and teaching as well as pertaining to the theory related to learner’s behavioural changes and
behavioural management as well as subjecting them to situations – formal, and informal dealing to the developing of communication of teaching skills. Finally teacher – education is provided to prospective teacher’s consequent to which they develop interest in teaching.

Now –a-days a teacher is in the urgent need of certain skills and competencies to develop and he is also in need of a new type of development in knowledge and attitude, atmosphere and facility so that he is in a position to make this task easy, fruitful and confirming for the demands of the students. The aim of teacher-education is to develop the competencies in the prospective teachers which are useful for them to become a successful teacher.

The teacher of tomorrow should he one who can design a teaching situation which is conducive for the growth of pupils mental health and develops in them a commitment to a set of values that is creativity and enquiry skill.

1.6 OBJECTIVES OF TEACHER EDUCATION

1. Develops competency to teaching, on the basis of accepted principles of learning and teaching.

2. Develops an understanding of the objectives of student teaching in the Indian context and awareness of the role played by school in achieving the goals of developing a democratic, secular and socialistic society
3. Develops understandings, interests, attitudes and skills which will enable him to foster the all-round growth and development of the children under his care.

4. Develops communication, psychomotor skills are abilities conductive for human relations who will enable him to promote learning inside and outside the classroom.

5. Develops a warm and positive attitude towards the growing children and their academic, socio-emotional and personal problems.

6. Keeps abreast with the latest trends in the knowledge of the subject he teaches and the techniques of teaching the same.

7. Undertakes investigations and action research projects.

8. Teacher education has the general objectives of developing Gandian values of Non-violence, truthfulness, self-discipline, self-reliance and dignity of labour.

9. Establishes a liaison between the school and the community by employing ways and means integrating the resources, as a life of the community with school life.

10. Perceives the role as an agent of social changes in the community.

11. Not only acts as a leader of the student community but also as guide to the wider community.
12. Not only uses but also helps in the conservation of environmental resources and life and preservation of historical emoluments and other cultural heritage.

1.7 BASIC ASSUMPTIONS FOR THE OBJECTIVES OF TEACHER – EDUCATION

1. The diversity aspect of teacher – education programme implies that teacher – education programme for each needs stage be designed in the context of children’s developmental and national goals.

2. Teacher – education programme for each stage should merge into a teacher – education programme of higher stage in the progressive orders.

3. All teachers – education programmes irrespective of difference teacher – education levels should have the following three integral components.

- Pedagogical course
- Working with the community
- Content – cum-methodology course and practice teaching course.

4. The pedagogical components working with community component and content of methodology component will vary in their proportionate weight age from state to state in the total teacher – education programme.
5. The prospective teacher must be familiarized with the work why and how of teacher behaviour, the answer to these questions have to be supplied to him on the basis of accept principles of pedagogy, psychology and sociology.

6. The prospective teacher must be an agent of social change leader of the students and guide to the society.

7. The prospective teacher will have to be a master over the subject and an expert in the teaching technology of the subjects of his teaching.

8. Consequent to the integral components of teacher education the prospective teacher will act inside and outside the classroom situation on the basis of scientific knowledge, positive attitude and convictions.

9. To be effective, a teacher needs to have a close understanding of the characteristics of the society in which he lives and also be equipped with social skills through which he may help in community development.

1.8 NEED TO IMPROVE TEACHER EDUCATION

The teacher education programmes are subjected to serious criticisms, the main criticism is regarding the wide gap between theory and teaching, unrealistic curriculum and defective teaching. Precisely, what is taught in that classrooms of teacher training institutes are not practiced in the actual school classroom?
Development in other cognate disciplines such as psychology, sociology and communication has had their impact on education; the teacher education curriculum should be updated incorporating the developments in different areas.

As the present teacher education programmes are traditional rigid and outdated, they should be updated and innovative approaches should be introduced so as to meet the challenges posed by the unprecedented quantitative expanses of education.

The Education commission observes (1964-66) “A sound programme of professional education of teacher is essential for the qualitative improvement of education”. To achieve the aim of educating millions, particularly those who belong to the socially and economically deprived communities, a drastic change in the entire system of teacher education is absolutely necessary.

The term “training” is outdated and has been replaced by the term “Education”. After the completion of the training course, “Diploma in Teacher Education (D.T.Ed)” is awarded to the trainees ‘student teacher’ replaces the word ‘the trainee’. Similarly ‘teacher training’ is replaced by ‘teacher education’.

The ultimate aim of any Teacher education programme is to develop general competencies and specific competencies related to the discipline concerned.
The main object of education is to prepare the youth for future life considering the importance of science, due place is given to science education in school curriculum. According to Alexander Smith (1973), “The purpose of scientific education is the application and higher cultivation of the critical powers by comparison, discrimination and reasoning.

Science forms the very basis of the development of personality. The contribution of science towards the development and the building up of the personality on the one hand, science has changed the quality of life and on the other, it has helped the development of the personality. Thus science plays an important role in human life.

1.9. NATURE OF SCIENCE

Science is a dynamic, expanding body of knowledge covering ever new domains of experience. Broadly speaking it involves several inter connected steps. Observation, looking for regularities and patterns making hypotheses, devising qualitative or mathematical models, deducing their consequences, verification or falsification of theories through observation and controlled experiments and thus arriving at the principles, theories and laws governing the physical world. There is no strict order in these various steps. The laws of science or never viewed as fixed eternal truths. Ashcroft et al (2001) discusses the nature and purpose of science as provision for practical experiences in science enable the learners to extend and enrich their learning and existing knowledge so, that they can construct concepts from their experiences.
The misconceptions possessed by students originate from their attempt to deal with incompatible pieces of information from school social, culture, TV, Video personal experiences and even from lack of personal experience.

Even the most established and universal laws of science are always regarded as provisional, subject to modification in the light of new observations, experiments and analysis. While science is at its best in understanding simple linear systems of nature, its predictive or explanatory power is limited, when it comes to dealing with non-linear complex systems of nature. Yet, with all its limitations and failings, science is unquestionably the most reliable and powerful knowledge system about the physical world known to humans (NCFR 2005).

1.10. DEFINING SCIENCE

- The word science originates from the Latin word “Scientia” meaning “Knowledge” as in processing knowledge instead of misunderstanding or being ignorant.

- The education commission 1964-66 states, “We lay great emphasis on making science an important element in school curriculum”. We, therefore, recommend that science and mathematics should be taught on a compulsory basis to all pupils as a part of general education during the first ten years on schooling.
• In the words of Jawaharlal Nehru “Science is not simply to sit down and pray for things to happen, but seeks to find out why thinks happen. It experiments and tries again and again and same times succeed – and so bit by bit it adds to human.

• According to W.Puli, “The aim of science teaching is not the acquisition of information and a few skills but to attain the understanding of the relationship which connects the answer to the problem”.

• According to John Woodburn and E.O. Obourn, “Science is that human endeavor that seeks to describe with ever increasing accuracy, the events and circumstances that occur or exist within our natural environment.

• The Columbia Encyclopedia defines science as an accumulated and systematized learning in general usage restricted to natural phenomena.

• The association for science Education has defined, science should be recognized and the taught as a major human activity which explores the realms of human experience. Maps it methodologically but also imaginatively and by disciplined speculation, creates a coherent system of knowledge.

• The report on policies for the science education says, Science is a cumulative and endless series of empirical observations which result in the formation of concepts and theories; with both concepts and theories being subject to modification in the light of further empirical
observations. Science is both a body of knowledge and the process of acquiring and refining knowledge.

1.1 SCIENCE EDUCATION

Science is a continuing process of seeking new knowledge, new explanations and deeper understanding. New discoveries tend to generate new questions. Which call for further observations and more experimentation?

Science Education forms vital part of education in general. The most essential thing for the development of a country is the knowledge in science. Science education will help a person to understand and function effectively in a world dominated by science and technology which are contributing new discoveries and innovations. It presents logical explanation for the behavior of the objects in nature and dispels. Suspicious and fear, if offers the individual opportunities to observe the biological and physical phenomena. It also develops rational thought. Processes of individuals based on the values of objectivity and rationality.

Science Education is not just only for those who have the potential to become scientists but for all who have the right to understand and involve themselves more in problem-solving especially those who face problems in day-to-day living. But the growth of scientific activity in our schools during this century has not been matched by the enormous growth of science education. Every individual should have at least an elementary knowledge of the scientific principles involved in every day life.
Therefore, it is our primary duty to see that science teaching makes its-
contribution in helping all pupils to become carrying members of society.
Science education is an integral component of the total educational programme.

Lucas (1991) gives a preview of the various informal sources for science
learning. School science classes are not the only places where people can learn
scientific concepts, nature of science and the associated intellectual activities.
The many sources from which members of the public can gain some science
knowledge are only one manifestation of the current boom in the provision of
entertainment and leisure activities with information content.

Science is an accumulated and systematized learning in general usage,
restricted to natural phenomena. The progress of science is not made only by
the accumulation of facts, but by emergence of scientific method. Science is
one of those human activities that man has created to gratify certain human
needs and desires. Science is a search through inquiry. It is not a completed
body of knowledge and not a bad arm to be analyzed and examined but rather
an instrument which cannot be completely mastered without practice in its use.

1.12 RECOMMENDATIONS OF EDUCATIONAL COMMISSIONS ON
SCIENCE EDUCATION

The education commission (1964-66) entitled its report as “Education
and National Development” and in its opening sentence, “The destiny of India
is being shaped in her class rooms “express then faith that the school has a
direct developmental function. Unfortunately much of educational transaction seems to have taken the sentence in a literal sense.

Much of school routine is verbal and confined to the four walls of the classrooms, measure of the broad message of the commission conceiving of the school, especially with its instrumentality for promoting science and technology, as the means of development of science education as innovative, development in tune with growing technologies has yet to take shape in the vast majority of schools.

The Scientific Policy Resolution of Government of India (1958) stated that the dominating feature of contemporary world is the intense cultivation of science on large scale and its application to meet the country’s requirements. Scientific education is best fostered as a part of general emphasis on intellectual activity right from cradle to grave, all our activities are controlled and fashioned by science. It also stated that the key to the national prosperity lies in the effective combination of three factors – Technology, raw materials and capital. Of the three factors, Technology brings scientific revolution.

The Indian Educational Commission (1964-1965) said, ‘Science is liberating and enriching of the mind and enlarging of human spirit. Its fundamental characteristic turned out to be possibility of unlimited growth. It is very essential to have some elementary knowledge of science at least for becoming a useful member society of nation depend critically as rapid planned and sustained growth, quality and extent of education and research Science and Technology.
Secondary Education Commission (1960) reports, if Science is to be pursued with full vigour and zest, and is to be mighty force in Indian renaissance; it must derive its nourishment form cultural and spiritual heritage and not by pass it. Science must become an integral part of our cultural fabric.

National Council for Education Research and Training (1963) observed that Science is not just the accumulation of facts which must be committed to memory. It is an active growing body of knowledge. It is a method of approach to Knowledge. Science affords knowledge and facts and laws and an insight into methods and data peculiar to domain of Science.

1.13 STUDENTS ATTITUDE TOWARDS SCIENCE EDUCATION

Evolution of scientific concepts during the process of science education, starts with what children have acquired even before they start a formal study of their physical and biological surroundings and the world: they have conceptions about their world independently of formal science teaching; naive conceptions remarkably consistent across different countries; coherent within their limited range of experience; move away from being egocentric to attributing causal influences to physical systems outside them; and the conception persist and continue to be used in adulthood, despite formal instructions. The ideas emerge from

- Active schemes
- Coherent within away of thinking
• Context specific reasoning
• Use undifferentiated notions
• Proceed from perceptual to conceptual thinking
• Focus on properties rather than interactions
• Deviate from causal reasoning

Lederman (1996) describes the seemingly unending crises in science education and argues that as the art of science education consists in the removal of the strong misconceptions of children, they need the same intuitive modifying experiences as those experienced by the scientists. Even though the interaction with hands-on experiments is a time-consuming process, such opportunities will provide the conviction to science learners that science is a way of thinking and will lead to the ‘intuitive modifying experience’. Change in the student’s way of thinking is an outcome of the change in the teacher’s way of thinking. The misconception held by the student about the material they are studying and the appropriate ways of describing students’ cognitive structures have important implications for teaching science (Shuel, 1987).

1.14. DOMAINS IN SCIENCE TEACHING

Yeager and McCormack (1989) identified five domains that are important for science teaching.
i) CONCEPT DOMAINS

Science aims to categorize the observable universe into manageable units for study and to describe physical and biological relationships. Ultimately science aims to provide reasonable explanations for observed relationships. The concept domains include: facts, concept Laws (Principles) existing hypotheses and theories being used by scientists.

ii) PROCESS DOMAIN

Scientists use certain processes (Skills), being familiar with these processes concerning how scientists think and work is an important part of learning science. Some processes of science are observing and describing, Classifying and organizing, measuring and charting, communicating and understanding with other’s predicting and fearing, hypothesizing and hypothesis testing, identifying and controlling variables, interpreting data and construction instruments, simple devices and physical models.

iii) CREATIVITY DOMAIN

Most science programmers see science as something to be done to students to help them learn a given body of information. Little formal attention has been given in science programmers for the development of student’s imagination and creative thinking. Some of the specific human abilities important in this domain are:
i) Visualizing – producing mental images

ii) Questioning

iii) Producing alternate (or) unusual uses for objects

iv) Solving problems and puzzles

v) Designing devices and machines

vi) Producing unusual ideas

vii) Devising tests for explanations.

iv) ATTITUDINAL DOMAIN

This domain includes,

1. Developing positive attitudes towards science in general, science in school.

2. Developing positive attitude towards oneself

3. Exploring human emotions

4. Developing sensitivity to and respect for the feelings of other people.

5. Expressing personal feelings in a constructive way.

6. Making decisions about personal values

7. Making decisions about social and environmental issues.
v) APPLICATION AND CONNECTION DOMAIN

It includes,

1. Seeing instances of scientific concepts in every day life

2. Applying learned science concepts and skills to every day technological problems.

3. Understanding scientific and technological principles involved in household technological devices.

4. Using scientific processes in solving problems that occur in every day life.

5. Making decisions related to personal health, nutrition and lifestyle based on knowledge of scientific concepts rather, than on ‘hearsay’ or emotions.

6. Integrating science with other subjects.

1.15 OBJECTIVES OF TEACHING SCIENCE

The purpose of teaching science is to direct the students towards some specific objectives accordingly the science curriculum is designed to achieve the objectives. Some of the objectives are as follows:

• To develop the power of observation.

• To know about the relationship between physical and social environment.
• To develop certain qualities of character and behaviour.

• To develop the habits of personal, family and community cleanliness.

• To know about the utility of science in life.

• To develop knowledge of causal relationship (cause and effect)

• To develop practical outlook

• To make use of the theoretical knowledge.

• To develop objectivity in thinking and to inculcate scientific approach to problems.

The primary objectives of science teaching are to give knowledge and information about the world to live as an efficient member in the modern society, each citizen needs to know the facts of natural phenomena (living and non-living), laws and properties of matter and the application of the knowledge of science and the scientific principles.

The science teacher should inculcate scientific outlook and objective thinking. In a democratic society, each individual is responsible for shaping the public policy of a country. Naturally, everyone needs to understand the relation between science and men and the interplay of scientific and technological innovations and human affairs.
The “All India Seminar on Teaching of science in secondary schools” organized by All India Council for Secondary Education, (1956) identifies the aims of science teaching at different stages of education as follows:-

At the primary level of school education, the aims of science teaching should be to arouse and sustain the learners’ interest in nature and in their physical and social environment. Through learning science, the pupils should develop love for nature and observe the things in nature. Science teaching should inculcate the habits of healthy living. It should arouse and develop, in the pupils, habit of observation, exploration and systematic thinking. Science learning should also develop their manipulative and creative abilities.

The NCERT suggested the objectives of teaching general science at the elementary state of education in the age group of 6-14 thus (General science syllabus, NCERT, 1963)

- Acquire knowledge of biological, physical and material environment.
- Develop skills of solving problems and their application to life. To locate problems as well as to design procedure to solve them, collected proper data and methodically organize them observe accurately and interpret the results logically.
- Develop scientific attitude and inculcate good personal and social habits such as objective and unbiased outlook love for truth, inquisitiveness, accuracy and precision, right health habits, habits of enquiry, initiative and logical thinking.
- Develop interest such as interest in scientific phenomena and scientific activities as well as scientific literature and habits; understand the impact of science on everyday life.

According to the Indian Education Commission (1964-66), the objectives of teaching science at the primary level should be to develop proper understanding of the main facts concepts.

A) ACQUISITION OF KNOWLEDGE AND INFORMATION

The students studying science should acquire knowledge of scientific facts, principles and events of nature, living and non-living things, rules of health and sanitation and other kinds of knowledge of science that will help the learner to live an intelligent and efficient life in a modern society. Such knowledge must be appropriate to age, stage and ability level of learners and knowledge of science should enable the learner to understand adjust and if necessary, change his immediate environment as required.

B) DEVELOPMENT OF INTEREST AND APPRECIATION

The teacher should conduct his teaching in such a way as to stimulate interest of learners in the subject. They should motivate the learners to pursue scientific facts, principles and events of nature, living and non living things, rules of health and sanitation and other kinds of knowledge of science that will help the learner to live an intelligent and efficient life in a modern society.
Such knowledge must be appropriate to go age. State and ability level of learner’s knowledge of science should enable the learner to understand adjust and it necessary; change his immediate environment as required.

B) DEVELOPMENT OF INTEREST AND APPRECIATION

The teacher should conduct his teaching in such a way as to stimulate interest of learners in the subject. They should motivate the learners to pursue scientific activities within and outside the school read scientific news and literature, organize science. Clubs and science exhibitions, science competitions and are try to apply scientific knowledge in everyday activities. They should take interest in the environment too.

C) DEVELOPMENT OF FAVORABLE HABITS

The teacher should make the learners understand the need for learning science and that such qualities are reflected in their everyday habits for instance, science is a pursuit of truth and its pursuit demands intellectual honesty, diligence, perseverance, tenacity, patience, concentration of mind, unbiased judgment and objective observation. These qualities also help the learners to become self-confident.

D) TRAINING IN SCIENTIFIC METHOD

Through teaching of science the students should be trained to follow scientific approach while solving problems. It involves sequential and logical steps it is in fact the problem solving method which involves application of critical thinking and systematic procedure. The scientific method means
following certain steps of scientific procedure in sequential order which lead to the solution of the problem. Generally it involves steps such as sensing a problem, defining the problem, analysis, organization, experimentation, collection of data, processing and calculating, formulation of hypotheses, and testing correct interpretation conclusion and generalization. The teacher should focus the learners’ attention of these processes and train them to follow scientific method to solve problems not only in the area of science but also social problems.

1.16. TEACHING SCIENCE IN SCHOOLS

The objectives for the science curriculum should be determined by the needs of people. Thurber and Collette have rightly stated that science can justify its place in the curriculum only when it produces important changes in young people changes in their ways of thinking, in their habits of action and in the values they assign to what they have and what they do.

The objectives for teaching science in the school curriculum are;

(i) TOWARDS BETTER UNDERSTANDING OF THE NATURE OF SCIENCE

The students should begin to understand the cumulative nature of scientific knowledge. After studying science the pupil should acquire knowledge of the following
a. Fundamental principles and concepts useful in daily life.

b. A body of facts to understand scientific literature

c. Interrelationship and interdependence of different branches of science

d. Knowledge of general roles of health and human body.

ii) TOWARDS ACQUISITION OF SKILLS

Exposure to scientific concepts both in the classroom and in the laboratory leads to the acquisition of following skills in the pupil.

e. Experimental skills handling apparatus and instruments, arranging apparatus for an experiment and preserving chemicals, apparatus, etc.

f. Constructional skills of making improvised aids, making minor repairs when things go wrong in the laboratory.

g. Drawing skill involving drawing diagrams of experiments done and specimen observed.

h. Problem solving skill

i. Observational skills like taking readings and noting color changes.

(iii) TOWARDS DEVELOPMENT OF SCIENTIFIC ATTITUDES

The student should begin to develop scientific attitude characterized by

a. Openness

b. Curiosity
c. Tolerance

d. Honest doubt

e. Respect for another’s point of view.

f. Critical observation and thought

g. Freedom from superstition

h. Judgment made in scientific facts.

i. Faith in cause and effect relationship

j. A planned procedure in solving problems.

(iv) TOWARDS TRAINING IN SCIENTIFIC METHOD

As a result of science education, the student should habitually and skillfully employ sound thinking habits, in meeting problem situations in the daily walks of life. He should be able to adopt the following steps in problem solving.

a. Sensing a problem

b. Defining a problem

c. Collection relevant evidence

d. Organizing and interpreting the data

e. Formulating the hypothesis

f. Testing its validity and accuracy

g. Drawing rational conclusions.
(v) TOWARDS DEVELOPMENT OF INTEREST AND APPRECIATION

The teaching of science should enable a student to develop and enjoy personal interests, some of which are related to science. The student should be able to recognize and enjoy some scientific aspects of their natural and man made environment. The student could be encouraged by including in the science curriculum varied activates like science clubs, exhibitions excursions and the like.

(vi) TOWARDS HELPING STUDENTS FIT THEMSELVES BETTER INTO SOCIETY

The science curriculum gives extensive practice in working together, both in large and small group’s thus promoting cooperation and tolerance besides enhancing self-confidence and self-reliance among students. The students gain practice in conducting their projects etc. Independently while having increased contacts with outside work.

(vii) TOWARDS HELPING STUDENTS DEVELOP SUITABLE CAREER INTERESTS

The science curriculum should, Prepare the student for some vocation and speciation in the individual subjects and professional courses, like engineering, medicine, aeronautics, sericulture and soon.
1.17 DEVELOPMENT OF SCIENTIFIC ATTITUDE

The constituents of scientific attitude may not automatically develop in the outlook of the learners. The teachers will have to make efforts to point out these aspects in the process teaching science and try to inculcate this outlook in the behaviour pattern of the learners. Scientific attitude refers to critical observation, broad-mindedness and open-mindedness, objectivity in approach, non-belief in superstition and hearsay, belief in proof, trust in correct evidence, respect for others, obeisance, faith in scientific method, unprejudiced judgment, knowledge in cause and effect relationship.

1.18 DEVELOPMENT OF SKILLS AND ABILITIES

Teaching of science should aim at developing in the learners various skills involved in the study of science such as skill in drawings, diagrams and sketches of specimens and operators, constructional skills, experimental skills, for arranging experiments, instruments, and apparatus, skill observation and the skill in solving program status of teaching science at Diploma in teacher education level.

The children should able to understand the changes taking place globally and they should reject those that are undesirable but accepted maximize the desirable changes improve the quality of life. For this purpose some specific competency are required to teachers. They include the following abilities and skills.
• Develop and understanding of science takes a holistic view of science.

• Acquire the cultivation of scientific aspects of science.

• Formulate clearly the instructional objectives for each lesson.

• Analyse and organise the content in term of texts. Concepts principles activities and applications in everyday situation.

• Plan suitable science activities, mobilize resources and promote sprit of scientific enquiry and experimentation.

• Design identifies and implements strategies aimed at developing science process skill.

• Relate learning experiences and learning activities to the age and developmental state of the learners.

• Design and organize activities suitable to slow learners, gifted children physically and mentally handicapped students.

• Develop suitable tests, procedures and methods of evaluation and use feed back for remedial action.

• Identify real life situation, the solutions which are undermined and probably could be obtained by teacher and learner working together.

• Improvise handle and utilize low cost teaching learning aids to make the learning environment joyful.

• Familiarize one self with the curricular changes taking place competence in teaching science.
• Teacher Trainee understands the central concepts of science, tools of inquiry and structures of the discipline and can create learning experiences that make science personally, vocationally and academically meaningful and relevant for students.

• Teacher trainee understands that children construct meaning and provide learning opportunities that support their intellectual, social and personal development.

• Teacher trainee understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse students needs including gender, cultural or ethnic background, disabilities, aspirations or interest in science.

• Teacher trainee understands and uses a variety of instructional strategies to encourage student’s development of critical thinking, problem solving and performance skills and matches there strategies to content learning theory and student diversity.

• Teacher trainee uses and understands the individual and group motivation and behaviors to create a safe, ethical and legal learning environment that encourages positive social interaction, active engagement in learning.

• Teacher trainee uses knowledge of effective verbal nonverbal and media communication technique to foster active inquiry, collaboration and supportive interaction in the class room.
• Teacher trainee fosters relationship with school colleagues, parents and agencies in the larger community to support individual students, learning needs and overall teaching practice.

• Accomplished science teachers create opportunities for students to integrate and coordinate the context of science with other subject areas.

• Science Teachers are aware of and act on knowledge related to social ethical and legal aspects of teaching.

1.19 DEFINITION OF TEACHER COMPETENCE

Achievement tests the development of pupils' social' skills. In addition, how competence is defined depends’ also on other aspects: the length of time in teaching the conception of the teacher's role, the context, and teaching such as the school characteristics and in geographic location. Finally, the definition depends on the level of competence which according to a single behaviour competence as a quality of a person.

Since there is no agreement on what constitutes a competent teacher, it is hard to determine an essential curriculum for developing competent teachers.

However, educators try to measure' competence as this proves to be an important indicator' on the achievement of teacher education programmes. In this study, competence is taken as possessing the necessary skills and abilities.
As the informants as: student-teachers of the Primary Teacher Educational Programme, the necessary skills and abilities for a primary school teacher is defined in a set of generic competence. Informants are asked to indicate their perceived competence which means estimating one perceives his/her level of capability. This competence is not only seen as a set of behaviour also seen as the quality of a person at a certain stage of development.

As comparison before and after the teaching practice is made, this reveals a pattern development along the course of study. In cases where the lecturers are asked to estimate the student-teachers' competence, it is a reflection of the respondents' perception on the student-teachers' abilities and Student-teachers' Development and the Teaching Practice The importance of field experience in teacher education programmes is well documented in the literature. Marso and Pigge (1987) revealed that classroom teachers typically indicate that college courses' are too theoretical and too impractical. The strongest influence on learning to teach is the student experience' (Koehler, 1983). Field experience, sometimes referred to student teaching, has been documented to involve: emotional and professional changes in the student-teachers.

Caruso (1977) concluded that student-teachers pass through six phases during this period. Phase one (anxiety/euphoria) is an uneasy period when students prepare to leave the campus for the school classroom.
Phase two (confusion/clarity) is a period when cohesive notions about teaching are formed though students' perceptions of the classroom and of themselves as an Impact of Teaching Practice: Perceptions of Teacher Competence among Student-teachers teachers remain narrow. Phase three (competence/inadequacy) involves a fragile equilibrium between students' feelings of competence and inadequacy. Students involve greater thought to children and professional issues in Phase four (criticism/awareness).

The Phase five (more confidence/greater inadequacy), concerns about survival in teaching fade, students seek greater responsibility and independence. Students, however, may still have frustrations as they find themselves unable to meet high personal standards. Students express both regret upon leaving their pupils and relief in the final phase (loss/relief). Sacks and Harrington (1982) also identified six stages of development from student to teacher. Before students begin to work in the classroom, Stage one (anticipation) starts which is characterized by eagerness, excitement and great anxiety. In Stage two (entry), students are excited to begin the experience but worry that the challenge is too great. Students often rely on teacher-like behaviours, learn from others and feel satisfied simply to get through each lesson in this stage. Students in Stage three (orientation) feel themselves inadequate and incompetent, painfully aware of the complexity of teaching.
Stage four (trial and error) is a longer stage while student-teachers struggle to find the right way to teach, to manage pupils, to assert power in the classroom, and to develop to be an independent, autonomous teacher. In Stage five (integration/consolidation), students experience effectiveness more consistently and begin to concentrate on the needs of pupils rather than personal needs. Few students can attain Stage six (mastery), which indicates an understanding of self as person and teacher, an awareness of strengths and weaknesses, and recognition that there are many ways to reach the goal of effective teaching.

The studies reflect that student-teachers experience much conflict and stress during their field experience. The strain to learn to teach may result in feelings of incompetence and has many implications for the confidence, attitude, behaviour and performance of the student-teachers as shown in the following studies. Diapoto (1980) found that student-teachers' attitudes toward teaching and school became less favorable after student teaching. Copenhaver, McIntrye and Norris (1981) and Sacks & Harrington (1982) found that after the field experience, students express more concern for the emotional needs of their pupils than for classroom control. Zeichner (1978) in studying the changes in ideology adopted by the students found that situational variables - classroom and school environment, cooperating teachers' attitudes, curriculum, and etc. have a great impact.
Conradson (1973) found that students' attitudes toward teaching have improved significantly as a result of early field experiences. Meanwhile, students will also develop a more realistic view of teaching. A study by Austin-Martin, Bull and Molrine (1981) revealed that in early field experiences students establish a more effective relationship with administrators, teachers and pupils in the school.

1.20. COMPETENCY BASED TEACHER EDUCATION PROGRAMME

Both qualitative and quantitative aspects of education should get equal stress in all efforts. One cannot be compromised at the cost of the other. The major focus in education for the masses needs to be on the teacher and the taught for proper development of their innate talents and for thus purpose, the teacher must possess the required competencies, skills and bent of Mind.

Competency means the right way of conveying units of knowledge, application and skills to students. The right way includes knowledge of content as well as the process, methods and means of conveying them in an interesting way. It is applied to an ancient human value for example, the right way to do things is the competent way, the right way to perform a job, the right way to live and work in association and cooperation with others. In other words it means a desired quality of job performance. The training for competency has always been training for creating abilities or qualities that are placed in actual job situation / context.
The teacher has a role to play as a friend, philosopher and guide and secure the cooperation of society, co-workers, officials and so on in the discharge of his/her duties and for the achievement of the desired results.

Classification of Competencies: The competencies can be classified as under:

1. Classroom competencies
2. Competencies related to administration and management
3. Competencies in relation to school, society co-workers and pupils
4. Competencies in relation to content and curriculum and
5. Motivational and value based competencies.

The empirically identified competencies are consolidated and classified under five major categories as under:

a. Cognitive based competencies: they are content based and help enlarge the sphere of activities. They define knowledge, intelligence, skills and abilities that are expected of a learner.

b. Performance based competencies: The learner demonstrates that he/she can perform some activity rather than simply being aware of facts. These competencies are skill based and over action oriented.
c. Consequence based competences: To demonstrate this competency a person is required to bring a change in others. The achievement of students is a standard measure of consequence based competency.

d. Affective competency: A great emphasis has to be laid on this type of competency rather than the above three categories. What one knows is not important but what one is able to teach and bring a change in the pupils are important. The affective competency means the expected attitudes and values. It is expressed in terms of behaviour.

e. Exploratory competences: The activities provide opportunity for students to learn, but specific nature of outcome cannot be desired. They are also referred as experienced objectives or expressive objectives.

Competencies may also be categorized according to the place of applicability.

1.21. COMPETENCY DEVELOPMENT PROGRAMME

A competency can be developed by different programmes and one single programme can develop more than one competency. The following programmes may be considered for the development of the above-mentioned competencies:
(i) Seminar

(ii) Workshop

(iii) Training

(iv) Discussion

(v) Symposium

(vi) Brainstorming etc.

The competency-based teacher education programme should aim at improving the achievement levels of students. Competency-based teacher education (CBTE) programme should make teachers discharge their duties efficiently for achieving success in providing quality education. It should also enhance the teaching skills of teachers. It is expected to formulate the various inputs for providing effective training programmes for teachers. The various inputs for effective training programme should be based on policy recommendations and principles for learning society and teachers' role to incorporate elements from gradual progressive knowledge base and local needs and aspirations.

The effectiveness of teacher education programme would largely depend upon the effectiveness of teacher-educators, who are expected to implement the various recommendations and reforms. It is therefore, essential for them to make themselves aware of the recent developments in the field. This calls for an effective approach on the part of teacher educators.
1.22 COMPETENCE IN TEACHING SCIENCE

General competencies in science education are, students teachers understands the central concepts of science, tools of inquiry and structures of the discipline and can create learning experiences that make science personality, vocationally and academically meaningful and relevant for students.

- Students - Teachers understand that children construct meaning and can provide learning opportunities that support their intellectual, social and personal development.

- Students - Teachers understand how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse student needs including gender, cultural or ethnic background, disabilities, and aspirations interest in science.

- Students - teachers understand and use a variety of instructional strategies to encourage students’ development of critical thinking, problem solving and performance skills and match these strategies to content learning theory and student diversity.

- Students - teachers use and understand the individual and group motivation and behaviour to create a safe, ethical and legal learning environment that encourages positive social interaction, active engagement in learning.
• Students - teachers use knowledge of effective verbal, non-verbal and media communication technique to foster active inquiry, collaboration and supportive interaction in the classroom.

• Students - teacher fosters relationship with school colleagues, parents and agencies in the larger community to support individual students, learning needs and overall teaching practice.

• Accomplished science teachers create opportunities for students to integrate and coordinate the context of science with other subject areas.

• Science teachers are aware of and act on knowledge related to social, ethical and legal aspects of teaching.

1.23 DISTRICT INSTITUTE OF EDUCATION AND TRAINING (DIET)

By the time of adoption of the National policy on Education (NPE, 1986) elementary education systems will be adequately supported by national and state level agencies alone. The NPE implied their further expansion as also considerable qualitative improvement provision of support to them in a decentralized manner had therefore become imperative. The NPE and programme of action (FOA) accordingly envisaged addition of a third district level, ties to the support system in the shape district institute of education and training (DIETs) wit its back ground, DIET was established and the mission of the “DIET” is to provided academic and resources support in the areas of elementary education.
A DIET has three main functions: (1) Training, (2) resources support and (3) Action research. It has got its linkages with elementary schools, school flexes, teachers headmasters, school supervisors and District level officers. It has got seven branches such as: (1) pre service teachers education branch (2) work experience branch (3) District resource unit (4) in service programmes field interaction and innovation coordination branch (5) Curriculum, material development and evaluation branch. (6) Educational technology branch and (7) Planning and management branch to have access for the elementary “DIET” students.

1.24. SCOPE OF THE STUDY

The teacher competence includes a thorough knowledge of the content. A teacher competence mainly includes the strategies, understanding of student psychology and the process of learning with regard to the former, plenty of resource material is available. But, the latter has been a continuous experimentation throughout the world. Psychology contributes substantially to enhance teaching competence. In recent times, neuro cognitive researches have demanded the teaching competence to be redefined to meet the challenges. The neuro science and the biomedical instruments have explored the hitherto unexplored regions of the brain.

In the teaching learning process, the functioning of the brain facilitates information processing, restoration and retrieval. The teachers should be fully aware of all the brain functions to make the teaching effective.
Besides, they should also be fully conscious about the problems of the slow learners. Teachers have to concentrate not only on the gifted children but also on the slow learners.

By identifying each group, they can plan their teaching strategy accordingly. There is a tendency among teachers to think that students are fully responsible for their poor performance in learning.

But physiology of the brain and its functioning is a vital factor which needs a thorough understanding. The neuroscientific developments have provided chance to explore the problems in learning and the causes which are all hitherto unknown and unavailable to the teachers. A trend has now come to revisit the teachers’ competencies with special reference to cognitive neuro science.

1.25 CONCLUSION

Teacher education is expected to equip future teachers with latest methods, techniques and innovative strategies for imparting instructions including the use of media devices and educational hardware so as to acquire new skills to cope with the demands of the complex society of twenty first century. Thus the investigator chooses the topic entitled “Role of Neuro cognitive therapy in facilitating teaching competence in science education among D.T.E students”.

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