Science Excursion as a One of the Tool for CCE in Science Subject

Dr. Priti Chaudhari, Lecturer in, Department of Education [CASE], Faculty of Education and Psychology, The Maharaja Sayajirao University of Baroda, Vadodara, India

Abstract
The present world is a world of science and technology. Everything and every event happening around us demand some knowledge of simple scientific facts or principles. "Learning by doing" and "learning by living" are the two cardinal principles of teaching and same is true in case of teaching science. It is the natural urge in the children to make things, to break things and to handle things but the present curriculum does not provide ample opportunities for the students for self expression, independent research, constructive activities and projects. For an effective science teaching, the facilities for experimentation should be provided by using the science laboratory. Report of National Curriculum Framework (2005) emphasized constructivist approach and given due importance to revitalize the methodologies of learning. Constructivism includes cooperative learning, collaborative learning, active learning, experiential learning, problem based learning and hands on learning as its methodologies.

Introduction
Education is generally considered as preparation for life. Education essentially helps the individual with knowledge, understanding of different concepts, phenomenon etc. and in the process it imbibes and inculcates desirable attitudes and abilities for solving various problems and leading to better living. It is well said that ‘as is the education, so is the society’. Education has a direct influence on society; through we can produce good citizens for a good society. Ours is a democratic society and the success of democracy depends very much upon education. To put it more briefly, education is the first essential preliminary to the success of democracy.

In the era of science and technology, IT and communication important of science has been multiplied. Due to technological and scientific advancement our society has changed tremendously. Science and scientific inventions have entered into every walk of life. Everybody is quite familiar with the impact of science on our way of thinking and the standard of living. We consciously or unconsciously use many gadgets, instruments, equipments, working on the principles of science and technology, which make our life easy and comfortable. The role of science does not stop here, it goes beyond this. It also acts as a ‘Social Reformer’. Many social taboos, superstitions and blind beliefs have been challenged by science. Mankind values science chiefly for the practical advantages they bring with it. In the report of Education Commission (1964-66) it is stated that, “Education has always been important but, perhaps never more so, in man’s history than today. In a science based world, education and research are crucial to the development process of a country, its welfare, progress and security.”

Science can be useful instrument for bringing about social change in the society, that is the reason why science education is given priority area in the education. Science has become an interestingly important part of general knowledge. Also inclusion of science in the school curriculum satisfies the intellectual, utilitarian, vocational and moral values. Science involves logical explanation, reasoning, critical observation, open-mindedness, free from superstition, false beliefs and thus lead to development of scientific attitude, which proves very useful for ‘healthy’ life of students in particular and society in general. Though the effect of science and technology is experience in everyday life of each and every body, there appears to be a very big gap between scientifically literate and the common person on the road on acquiring scientific attitude and scientific awareness. Even in the elite and highly educated group it is doubtful that how many of them have scientific attitude in correct sense. National Policy on Education, NPE (1986) the teaching of science is thus expected to impart training in scientific
method and develop a scientific attitude and scientific temper. Development of scientific attitude is considered as an important objective of science learning all over the world. Scientific attitude, a very important attribute should be developed in the children who are the future citizens of any nation, as the development of scientific attitude has been recommended by all the education commissions and committees appointed by the government of India. Development of scientific attitude is more important because of its very nature of transferable to other situations in life which will help the future citizens of our country to solve the problems.

Nature Of Science
From these definitions three basic principles of nature of science can be defined.
1) An accumulated and systematized body of knowledge.
2) The scientific method of inquiry and
3) The scientific attitudes.

The first point indicates the product of science, while second and third points indicate the process of science. Science is not just a static body of already established knowledge, but a living tradition of never finished exploration into the integrated and unexpected vistas of nature. Science as a body of knowledge characterized by a highly dynamic structure of knowledge, which is founded on numerous bits of information linked with one another into many generalization forming the substantive corpus of science constituting its product dimension. This structure of knowledge interacts actively with the reality. The mode of this active interaction is governed by the logic of the processes of scientific inquiry or the scientific method. This constitutes the process dimension of science. The method of construction of knowledge follows certain systematic logical steps for collecting and processing information, tracing out general trends and constructing theoretical models. This chain of activities mediates between the reality and the structure of knowledge, and constitutes the processes of scientific inquiry or scientific method which as stated earlier forms the process dimension of science. The process of scientific inquiry represents the spirit of science as an activity and is its essence that distinguishes science from other disciplines.

In other words, science is both a product and a body of knowledge that has been accumulated by scientists and the process in which they acquire this knowledge. Science is not only the accumulation of facts which most of us usually perceive, other most important aspect of science is its process for the generation of scientific facts and principles, scientific methods and process play a major role.

SCIENCE EDUCATION
The present age is marked by rapid progress and development in science. The improvement of the society is directly linked with the quality of science education and science educators. Science helps to enhance the thinking process, understand how things around us actually operate, develop the students’ logical reasoning due to the cause and effect relationship, it develops a positive attitude, open mindedness and suspended judgment, increase one’s awareness of environment and understanding the problems of global warming, satisfy the curiosity and creativity of a child. Taking in to consideration the importance of science and its potential to change the society, almost all the commissions and committees in our country have made efforts to make ‘Science’ a compulsory subject in our schools. On this line the important recommendations of different commissions and committees are mentioned here under:

The report of the Secondary Education Commission (1953), recommended the teaching of General Science as a compulsory subject in the high and Higher Secondary Schools. The all India seminar on the teaching of Science in Secondary School held at Tara Devi Report (Simla Hills) in 1956, dealt with almost all the problem facing for the Higher Secondary Classes. According to its report, it was suggested a unique and uniform system of Science Teaching for the entire country, suited to its needs and resources.

The Education Commission (1964-66), has pointed out that our science education is in bad shape and it becomes worse if we fail to reckon with the explosion of knowledge. The commission recommended that “we lay great emphasis on making science an important element in the school curriculum. We, therefore, recommended that Science and Mathematics should be taught on a compulsory basis of all pupils as a part of general education during first ten years of schooling. In addition, there should be provision of special courses in these subjects at the Secondary stage for students of more than average ability.” The teaching of science during first 10 years of school education has been strongly recommended in the National Policy of Education (NPE) (1986). It is recommended that science education should develop well-defined abilities and values such as the spirit of inquiry, creativity, objectivity, the courage to question and aesthetic sensibility. The fact methods and practices of science should be used as tools for attaining these abilities and values. Science education program should enable the learner to acquire problem solving and decision making skills and to discover the relationship of science with health, agriculture, industry and other aspects of daily life. Every effort should be made to extend science edu-
cation to the vast numbers who have remained outside the pale of formal education.

As a result of these recommendations, Science has been recognized as a compulsory subject right from the Elementary Stage and one of the core subjects at Higher Secondary stage. Moreover, the rapid advancement of science and technology and increasing need for scientists and technologists have made it all the more important to provide for science based education in the schools. With its accelerating importance in our society science has become an increasingly important part of general knowledge. NCERT (1990) the goal of Science education in the present curricula is to prepare scientific literate individuals at the end of the Secondary School Education. Sharma (2003) notes that “a remarkable change was observed in the objectives of teaching science after world war II. More emphasis was placed on developing science concepts, principles, skills in laboratory work and problem solving, attitude appreciation and interests.” Central Advisory Board of Education (CABE) (1992) has emphasized on inquiry method to enable every individual to be inquiry minded so that day to day life problems may be solved through inquiry or discovery skills. NPE (2005), an important purpose of science and technology teaching in general education up to secondary stage is to familiarize the learner with various dimensions of scientific and technological literacy. These would include understanding the nature of science, ability to properly apply appropriate science concepts and their technological applications, capacity to understand values that underlie science and technology, willingness to understand and appreciate the joint enterprise of science, technology and society, ability to develop rich and satisfying views of the universe and to continue science and technology education throughout life, and development of certain manipulative skills which are required in day to day life situations.

**Status Of Science Teaching In India**

The selection of method of teaching, any subject is largely based on the objectives of teaching the subject, nature of topic, level of learners and availability of resources. In a given set up, then the selection of method of teaching depends on the nature of the topic to be taught. All the methods are equally good if used effectively. The lecture method is one, most commonly employed in the science classes and even where lectures are followed by so called practical work, they do not develop a proper grasp of the subject matter or the necessary skill required for analyzing and solving problems on the basis of scientific principles and data or spirit of scientific inquiry. Seminar conducted for reviewing and revitalizing the system of science education in India has pointed out the following suggestions for improving the quality of teachers and teaching science.

a) Introducing content based curriculum changes.
b) Change in the methods of teaching and making it more inquiry based, raising curiosity, conveying the excitement of science and understanding and exploring nature through experiments. Quantum of practical work, field work must be substantially increased. To aid learning more exploratory methods must be incorporated in to the curriculum.
c) Need for a national model of science curriculum.
d) Increase the role of science journals, popular science magazines and comic strip.
e) Identification of strategies both local/region specific for a country as a whole.
f) Changing the do not touch and do not ask mindset.
g) More science parks for learning science outdoors.
h) Activities must be designed in full harmony with the child environment and from his environment more detailed concepts of scientific truth must be got and understood. This would sensitize the child to its environment and help to solve niggling problems at a later stage but makes the whole exercise of learning all the more interesting and invigorating.
i) School teacher training programmes be increased all over the country and they should be given an opportunity to understand more recent developments taking place in their subject discipline. This would help them to imbibe the same excitement in their students and raise the level of teaching.

The first national science survey commissioned by Indian National Science Academy (INSA, 2005) and conducted by the National Council of Applied Economic Research (NCAER) intended to find out the status of science education all over India. The data were collected from 3,46,000 people in rural and urban areas from different age group. Few of the results are as follow.

a) Sixty percent of science post graduate students are unemployed.
b) About one third of students said that they were not motivated enough to continue studying science after leaving school.
c) Indian students lack in application level and focused group discussion session compare to knowledge and understanding level of questions.
d) There is a need to strengthen the quality of science teachers, their teaching methods and the educational infrastructures.

It a nutshell, science teaching in India has a scope for modification as it experiences shortcoming mentioned in the findings of various researches above. Attempts have been made locally as well as globally to improve training of science teachers so as to improve the quality of teachers and teaching. International science teaching standards have torched out the movement globally.
Importance Of Science Activities:
“Learning by doing” and “learning by living” are the two cardinal principles of teaching and same is true in case of teaching science. It is the natural urge in the children to make things, to break things and to handle things but the present curriculum does not provide ample opportunities for the students for self expression, independent research, constructive activities and projects. There is little scope for the individual practical work by the students and no time is allotted for such type of work in the time table. Naturally there arises the need for such activities which can provide an outlet for the pent-up emotions of children and channelize their energies towards desirable goal.

For an effective and efficient teaching in science a good laboratory with necessary equipment is essential. In recent years the purposes of teaching science at the secondary stage have undergone drastic changes. We do not aim at stuffing the minds of the pupils with mere facts of science but at developing in them the application ability; skills of experimentation, construction, improvising scientific attitudes, interests, appreciation etc. These can be achieved only if the students get the opportunities to work with their own hands in an atmosphere which pervades in science teaching.

One of the important functions of the science laboratory is the deepening of the students, understanding that scientific concepts and application are closely related to his natural environment. In the laboratory the students can be taught more readily to be discriminating in observation, to evaluate evidence of data and to sense the importance of care and skill in the taking of measurements. Laboratory should be represented as an integral part of instruction in science. So, the laboratory, in all its forms, helps in achievement of the aims of teaching science which in turn help in future developments in the field of science. While constructing the science laboratory in the schools, the science teachers or science educators should be asked to collaborate with the architect in getting it built on the standardized and recommended plan in order to draw out the best educational purposes.

In the reports of National Curriculum Framework (NCF, 2005) great emphaeses has been given to relate the school experiences with child’s age range and its real life environment to consolidate learning. Further, above reports observed at school level, the quantum of practical laboratory work, field work must be substantially increased. To aid learning by inquiry, more exploratory methods must be incorporated in to the curriculum. A large number of experiments, kits and multimedia teaching aids should be created using locally available materials as far as possible. Various activities must be designed in fully harmony with the child’s environment and from this environment more detailed concepts of scientific truth must be understood. This would not only sensitize the child to its environment and help to solve niggling problems at a later stage but also make the whole exercise of learning all the more interesting and invigorating. In order to make the teaching learning more interesting, teacher has to use the available resources to their optimum level, seek for the new alternatives to create interest among the students for learning. Selection of suitable methods can ensure learning and enhance understanding of the learner.

Rationale Of The Study
The present world is a world of science and technology. Everything and every event happening around us demand some knowledge of simple scientific facts or principles. The gifts of science have been profitably used for making life comfortable and raising the standard of living. But the use or abuse of the wonderful gifts of science depends on man and his mind. One should be open-minded, rational enough to see the positive or negative aspect of science. A person having high scientific attitude can do this task effectively. Therefore, Citizen with scientific attitude is must in a country like India. Since we have people with different religion, caste, language, customs, traditions, it is expected that every citizen should have respect and tolerance for others customs, traditions, religion etc. and therefore Scientific attitude which is very crucial for the development of nation, is necessary to develop in our children.

In the absence of comprehensive philosophy of science education, the question that most needs an answer is “what is the justification for teaching science and technology in our schools?” Is it to have an educated citizen or to provide adequately prepared and motivated students to fulfill the industrial needs of the country?. Is scientific literacy one of the goals of science education?. If it is who can be considered scientifically literate?. According to one definition, a scientifically literate individual is one who makes informed decisions within a science and technology context by drawing upon their rich scientific knowledge, such as, an understanding of the concepts, principles, theories and processes of science (Abd-El-Khalick et al, 1998). Many science educators view achievement of scientific literacy as the educational solution to the varied economic, social and environmental challenges of the 21st century.

It is becoming clear that the teaching science has no single unambiguous aim. Different groups in society view the aims of science education differently. Some see the aims in vocational terms (providing skilled workforce); others perceive educational goals, in developing the individual potential of the child. The production of highly
qualified scientists and engineers is a valued objective, while another is to produce educated citizens. There is no shortage of statements of aims, but the translation of these aims to measurable objects result in the loss of important aspects and reduces science education to trivialities (Woolnough, 1989).

“Learning by doing” and “learning by living” are the two cardinal principles of teaching and same is true in case of teaching science. It is the natural urge in the children to make things, to break things and to handle things but the present curriculum does not provide ample opportunities for the students for self expression, independent research, constructive activities and projects. For an effective science teaching, the facilities for experimentation should be provided by using the science laboratory. This is possible only if adequate apparatus of right type is available in the science laboratory. Laboratory work forms the basis of scientific study. In order to arrive at any conclusion experimentation is needed. The achievements of science and technology today are all due to the experimental method.

Report of National Curriculum Framework (2005) emphasized constructivist approach and given due importance to revitalize the methodologies of learning. Constructivism includes cooperative learning, collaborative learning, active learning, experiential learning, problem based learning and hands on learning as its methodologies. This can be done by providing wide range of activities and experiences to the learners. Science by its nature has immense scope of using various activities in the science classroom, laboratory and outside. Activity based science teaching involves multiple senses of learner, which helps to insure their involvement in the learning and leading them for self learning also. National Council of Educational Research and Training (NCERT, 1986) in the guideline of curriculum transaction described that “Among the techniques of instruction, which play an important role in the type of effective curriculum transaction involving activity based approach, the teacher has to be apt at; planning activities, preparing the students for activities, conducting and supervising activities and conducting discussion for evaluating learning out comes. Teachers require due exposure to the ways and means of conducting various activities in science. This remains a prerequisite for providing various activities to students by the science teachers. We need teachers who organize learner centered, activity based, participatory learning experiences, play projects, discussion, dialogue, observation, excursions and learn to reflect on their own practice”.

In a nutshell, classroom observations while teaching the course, review of related literature and interaction with the students and teacher educators reassured that study related to science activities has a vital scope. Therefore, this study was proposed for pre-service teachers at the bachelor level. Further, it was presumed that this study results in the improvement of competencies of student teachers as science teachers.

Statement Of The Problem
Science excursion as a one of the tool for CCE in science subject

Objectives Of The Study
1) To provide student teachers experiential learning through science excursion at District Science Centre Dharampur
2) To study the effectiveness of science excursion at District Science Centre Dharampur in terms of
   a) suitability of the place
   b) organization
   c) learning experiences

Population
The student teachers with graduation / post-graduation in science of the B.Ed. programme, Department of Education of academic year 2010-11 of the Maharaja Sayajirao University of Baroda, Vadodara, comprised the population for the present study.

Sample
For the present study, purposive sampling technique was used. By purposive sampling technique, all the students having science method during academic year 2010 -2011 of the Department of Education, Faculty of Education and Psychology, The Maharaja Sayajirao University of Baroda were selected as sample for the present study.

Tool And Technique:
The questionnaire was prepared containing both open ended and close ended questions on various aspects of excursion at DSC. Focused group discussion was conducted to collect the data related to immediate responses of the student teachers on science excursion at DSC.

Collection Of Data:
For the purpose of collecting data for the study, investigator had personally administered the questionnaire on the sample, conducted focused group discussion and collected the data.

Procedure Of Data Analysis
Factual information collected through objective one was analyzed quantitatively by using frequency and percentage analysis. Information obtained through focused group discussion was qualitatively analyzed by content analysis technique.
Major Findings:

a) With regard to the DSC as the suitable place for the scientific visit, out of total thirty nine students, three (07.69 %) students had reported that DSC was poor as the suitable place for the scientific visit, three (07.69 %) students had reported that DSC was average as the suitable place for the scientific visit, eleven (28.20 %) students had reported that DSC was good as the suitable place for the scientific visit while twenty two (56.42 %) students had reported that DSC was very good as the suitable place for the scientific visit.

Graph 1 – The suitability of DSC for science field trip

- Of the total students, three (07.69 %) students had reported that preparation of field trip was poor, six (15.38 %) students had reported preparation of field trip was average, twenty (51.28 %) students had reported that preparation of field trip was good while ten (25.65 %) students had reported that preparation of field trip was very good.

b) The two (5.13 %) students had reported that time schedule prepared was poor, sixteen (41.01 %) students had reported that time schedule prepared was average, fifteen (38.46 %) students had reported that time schedule prepared was good and eight (20.50 %) students had reported that time schedule prepared was very good.

c) Of the total students, three (7.69 %) students had reported that arrangement for the transport was poor, three (7.69 %) students had reported that arrangement for the transport was average as the suitable place for the scientific visit, eleven (28.20 %) students had reported that DSC was good as the suitable place for the scientific visit while twenty two (56.42 %) students had reported that DSC was very good as the suitable place for the scientific visit.

d) Of the total students, four (10.26 %) students had reported that non working models were poor, thirteen (33.32 %) students had reported that non working models were average, ten (25.65 %) students had reported that non working models were good and twelve (30.77 %) students had reported that non working models were very good.
a) The fifteen (38.46 %) students had reported that route travelled for DSC was average, thirteen (33.33 %) students had reported that route travelled for DSC was good and eleven (28.21 %) students had reported that route travelled for DSC was very good.

b) One (2.56 %) students had reported that working models were poor, four (10.26 %) students had reported that working models were average, ten (25.65 %) students had reported that working models were good and twenty four (61.55 %) students had reported that working models were very good.

c) With regard to the quality of indoor exhibits, three (7.69 %) students had reported that indoor exhibits were poor, fifteen (38.46 %) students had reported that indoor exhibits were good and twenty one

Graph 2 – Quality of non-working model

Graph 3 – Quality of working models

a) With regard to the food provided, three (7.69 %) students had reported that food provided was poor, seven (17.95 %) students had reported that food provided was average, seventeen (43.59 %) students had reported that food provided was twelve (30.77 %) students had reported that food provided was very good.

b) Three (7.69 %) students had reported that contribution made by the students to meet the expenditure was average, twenty four (61.54 %) students had reported that contribution made by the students to meet the expenditure was good and twelve (30.77 %) students had reported that contribution made by the students to meet the expenditure was very good.

c) With regard to the quality of indoor exhibits, three (7.69 %) students had reported that indoor exhibits were poor, fifteen (38.46 %) students had reported that indoor exhibits were good and twenty one
(53.85 %) students had reported that indoor exhibits were very good.

d) With regard to the quality of outdoor exhibits, four (10.26 %) students had reported that outdoor exhibits were average, sixteen (41.02 %) students had reported that outdoor exhibits were good and nineteen (48.72 %) students had reported that outdoor exhibits were very good.

e) Nine (23.07 %) students had reported that label placed on exhibits were average, nine (23.07 %) students had reported that label placed on exhibits were good and twenty one (53.86 %) students had reported that label placed on exhibits were very good.

f) Ten (25.65 %) students had reported that charts used were average, twenty one (53.85 %) students had reported that charts used were good and eight (20.50 %) students had reported that charts used were very good.

g) With regard to scientific games, two (5.13 %) students had reported that scientific games were poor, four (10.26 %) students had reported that scientific games were average, twenty two (56.41 %) students had reported that scientific games were good and eleven (28.20 %) students had reported that scientific games were very good.

h) Of the total students, seven (17.95 %) students had reported that auditorium for sky watching was average, four (10.26 %) students had reported that auditorium for sky watching was good and twenty eight (71.79 %) students had reported that auditorium for sky watching was very good.

i) Three (7.69 %) students had reported that living organisms at the DSC was poor, ten (25.65 %) students had reported that living organisms at the DSC was average, seventeen (43.59 %) students had reported that living organisms at the DSC was good and nine (23.07 %) students had reported that living organisms at the DSC was very good.

Conclusion:
The study dealt with the excursion at District Science Centre Dharampur of Valsad district. The study revealed DSC was the suitable place for the science excursion. The student teachers had reported that experiential learning provided, gave them the opportunity to interact with exhibits in the center, science concepts got clear due to group discussion, created awareness regarding DSC and its functioning. The all most all the student teachers had revealed that they had never been to such places during their schooling and promised to take their students and when they will be science teacher in future. The science excursion had created curiosity for many science concepts, which were not clear to them and it has also changed the attitude towards science and their group members. The student teachers had revealed that science excursion was very useful in achieving the objectives of science teaching, development of educational and social values and providing experiential learning.

References: