PRESENT STATUS OF IMPLEMENTATION OF PROJECT WORK IN CBSE SCHOOLS AT HIGHER SECONDARY LEVEL IN KACHCHH DISTRICT

A

Thesis submitted to

The M. S. University of Baroda

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Doctor of Philosophy

In

Education

Guide | **Investigator**

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December, 2012

Declaration

I, S. Krishna Kumari do hereby declare that the present research work 'Present Status of Implementation of Project Work in CBSE Schools at Higher Secondary Level in Kachchh District' is my original work carried out by me and it has not been submitted elsewhere. Also I have fulfilled all the requirements related to the attendance criteria.

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CERTIFICATE

This is to certify that S. Krishna Kumari has worked for her Ph.D. dissertation under my guidance and supervision on the topic, “Present Status of Implementation of Project Work in CBSE Schools at Higher Secondary Level in Kachchh District.” Her work is original and the findings of the study have not been submitted elsewhere for the award of any degree. It is further stated that the doctoral research was carried out fulfilling the requisite attendance criteria as per the O. Ph.D.:3(i) of the M. S. University of Baroda, Vadodara.

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December, 2012 **S. Krishna Kumari**

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LIST OF THE ABBREVIATIONS

1. AAAS - American Association for the Advancement of Science
2. ANCOVA - Analysis of Co Variance
3. CABE - Central Advisory Board of Education
4. CBSE - Central Board of Secondary Education
5. CCE - Continuous and Comprehensive Evaluation
6. CM - Conventional Method
7. DESM - Department of Education in Science and Mathematics
8. ESS - Elementary Science Study
9. EVS - Environmental Studies
10. ICT - Information and Computer Technology
11. ISK - Integrated Science Kit
12. ITM - Inquiry Training Method
13. JNNS&EEC- Jawaharlal Nehru National Science and Environment Exhibition for Children
14. JNNSEC - Jawaharlal Nehru National Science Exhibition for School Children
15. JNNSMEE - Jawaharlal Nehru National Science, Mathematics and Environment Exhibition for Children
16. KVS - Kendriiya Vidyalaya Sangathan
17. LBL - Lecture Based Learning
18. MMK - Molecular Model Kit
19. MSBK - Microbiology Lab Kit
20. MSPK - Micro Physics Lab Kit
21. MTK - Mini Tool Kit
22. NCERT - National Council of Educational Research and Training
23. NCF - National Curriculum Framework
24. NCFSE - National Curriculum Framework for School Education
25. NCFTE - National Curriculum Framework for Teacher Education
26. NCISE - National Center for Improving Science Education
27. NCTM - National Council of Teachers of Mathematics

28. NIE - National Institute of Education
29. NIF - National Innovation Foundation
30. NPE - National Policy on Education
31. NVS - Navodaya Vidyalaya Samithi
32. PBL - Project Based Learning
33. PCK - Pedagogical Content Knowledge
34. pPBSc - Performance Project Based Science Curricula
35. PSK - Primary Science Kit
36. SBA - School Based Assessment
37. SCERT - State Council of Educational Research and Training
38. SEP - Science Education Program
39. SES - Socio Economic Status
40. SLSEEC - State Level Science and Environment Exhibition for Children
41. SMCLK - Secondary Micro scale Chemistry Lab Kit
42. SMK - Secondary Mathematics Kit
43. SPMT - Standard Progressive Matrices Test
44. SSK - Secondary Science Kit
45. SSMCLK - Senior Secondary Micro scale Chemistry Laboratory Kit
46. SSMK - Solid State Model Kit
47. SUPW - Socially Useful Productive Work
48. UNESCO - United Nations Educational Scientific and Cultural Organization
49. UNICEF - United Nations International Children’s Emergency Fund
50. UPMK - Upper Primary Mathematics Kit
51. UPSK - Upper Primary Science Kit
52. UTs - Union Territories
53. WE - Work Experience

Chapter 1

INTRODUCTION

Chapter I

INTRODUCTION

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Chapter I

INTRODUCTION

1.0 Introduction

Education or teaching in the broadest sense is any act or experience that has a formative effect on the mind, character or physical ability of an individual. In its technical sense education is the process by which society deliberately transmits its accumulated knowledge, skills and values from one generation to another. The schools are strategically placed as a medium to convey to the population those facts about human life which will go farthest toward giving the student the best grasp of his environment and of his life. It is mandatory on the part of the teachers in educational institutions to direct the education of the students and to draw on many subjects, like languages, mathematics, science and history.

Education being a continuous and creative process, aims to develop the capacities latent in human nature and to co-ordinate their expression for enrichment and progress of the society by equipping them with knowledge and experience. In the context of reconstructing the educational system in India, the Radhakrishnan University Commission (1948-49) reported, "Educational systems are built for a time and not for all times. There are no changeless ways of educating human nature. A curriculum which had vitality in the Vedic period or the Renaissance cannot continue unaltered in the 20th century. Realizing that the vision of free man in a free society is a living faith and inspiring guide of democratic institutions, we must move towards the goal adopting wisely and well to changing conditions."

The present day model of education, bequeathed to us by the British, aims at cramming down information than enabling the intellect. Information, unless digested and assimilated, is mere burden to the brain. At the earliest opportunity, like immediately after the examinations, it evaporates. Many a time the teacher fails to tell the significance of what is taught. Johann Heinrich Pestalozzi (1801) attempted to 'psychologise instruction.' He declared that the basis of all education is a drawing out process and not a pouring in process. Hence those methods of instruction must be sought and constructed to that end.

The effect of recent development in educational philosophy upon the methods of teaching has been revolutionary. The central place in the school, in theory at least, has been given to the student. Any process that is not based upon the ‘student activity’ is not in accord with recent educational theories. The present century has been termed as ‘the century of the child.’ Jean Jacques Rousseau (1712-1778) considers that ‘child is a hero in the drama of education’ and as such, he must play the dominant role.

1.1 The Need and Importance of Science Education

Ordinary knowledge does not reflect attributes of validity and reliability while scientific knowledge possesses these qualities. Scientific knowledge is open to testing and real life experience. It is logically related with clearly arranged knowledge of items. This knowledge should help a student to be in a position to take up some vocation and enter the world of work. In this context, the Mudaliar Commission Reports (1952-53), "…to be effective, a democratic citizen should have the understanding and the intellectual integrity to sift truth from falsehood, facts from propaganda and to reject the dangerous appeal of fanaticism and prejudice. He must develop a scientific attitude of mind to think objectively and base his conclusions on tested data."

Before eighteenth century science had not developed as much as we see it in the present form. The field of science education comprises science content, some social science, and some teaching pedagogy. The target individuals may be children, college students, or adults within the general public. Today scientific investigations and researches are being made with an enormous speed. All our means of communication, radio, television, food grains, clothes and medicines depend upon the development of science. Science has become an integral part of human life.

The twentieth century witnessed the application of scientific inquiry to the process of education. Findings in educational psychology challenged and refuted the doctrine of mental discipline and caused educators to reassess their objectives, methods and the content of the curriculum. Traditional schooling came under attack for lacking the spirit of true education. The tremendous social and industrial changes placed new demands on the schools. The wall between the school and life began to feel the seismic shocks of a new philosophy of education. The new philosophy of progressivism demanded an experimental approach to education. The new goal for our schools was to develop the capacity of the learner in the direction of how to think, not what to think. The new cry for schools was to prepare for and to lead for a better life.

1.2 Relating the Nature of Science Education and Methods of Teaching

Science is a body of knowledge developed through the process of investigation that is combined with thoughtful reflections guided by critical thinking skills. In its more restricted contemporary sense, science refers to a system of acquiring knowledge based on scientific method and to the organized body of knowledge gained through such research. Science and science literacy requires acquiring knowledge about the natural world and understanding its application in society, or in other words, the nature of science. An understanding of the nature of science is an important part of science literacy. The nature of science has four basic themes or dimensions:

1. Science as a body of knowledge,
2. Science as a way of thinking,
3. Science as a way of investigating and
4. Science with its interaction with technology and society

Science is not only hands-on; it is 'minds-on' as well. When hands are on, the students are allowed to perform science as they construct meaning and acquire understanding. Similarly minds are on with the activities which focus on core concepts, allowing students to develop thinking processes and encouraging them to question and seek answers, enhance their knowledge and thereby help to acquire an understanding of the physical universe in which they live (NCISE, 1991 and NCTM, 1990).

Hands-on authentic learning experiences help the students experience the true nature of science. Science will touch them if they get their hands on it. Teachers agree that students learn the best with hands-on experiences and concrete examples with real world connections. For example, learning in a laboratory by conducting experiments leaves a lifelong and memorable impact on the minds of the students. The teaching of science should shift from textbook style to hands-on experiences. The learning experience is further enhanced when students are required to use their newly acquired information in a real world problem solving situation. The program of study in science is ought to be developmentally appropriate, interesting and relevant to the students' lives. It should emphasize on understanding through inquiry.

According to the American Association for the Advancement of Science, (AAAS) 1990, the goal of science education is the preparation of scientifically literate students. In order to instruct students in the nature of science with its history, development, methods and application, science teachers use text books as the primary organizer for the curriculum. Science textbooks are the dominant instructional tools that exert great influence on instruction of content and its delivery.

Using a variety of methods in teaching can help students in their discovery of the content and process of science. Variety promotes a better interest level, especially with young children. Some methods are more effective than others in a learning situation. The teacher in the role of an instructor decides which approach to use in the inquiry of scientific facts. Also, with the various methods more students can participate in leadership roles. As a resource person, the teacher is the valuable contributor to the whole arena of science for young people today! As an introduction, a film or a video can be brought to the class room to inspire the students about science and is nature.

1.3 Historical Perspectives about Activity Oriented Learning Experiences in Science Education

Science education started in the beginning of 20th century in our country. But its real advancement was achieved during the second half of the last century. National Government at the centre has organized and planned education of science in all areas and fields.

1.3.1 Science Education in Ancient India

The Vedas and the Upanishads have certain references of scientific information such as the origin of the universe, the concept of atom and medicinal herbs. The study of Mathematics, Astronomy and Medicine flourished in ancient India. The 'O' sign was a remarkable discovery of the Indians. Dhanwantri was the legendary founder of the Indian Medicine. Tarka Sastra (Logic) was fairly well developed. The Universities at Taxashila and Nalanda were famous centers of learning. In ancient India when the students used to live in their schools (ashrams) with their teachers (gurus), they had to do every kind of manual work for living and learning. Education was related to the life of the students. The dichotomy between education and work did not exist.

1.3.2 Science Education during the British Period

With the advent of the British in 1600 A.D. modern science began to spread in India. But science education did not progress well during the British period. The main reasons were the medium of instruction and the hostility against the British.

1.3.2.1 The Abbot-Wood Report, 1936-37

There was no provision of manual work or activity based teaching in formal education during the British period. This limitation was pointed out in Woods Education Dispatch (1837) which contemplated the introduction of prevocational education at the secondary stage. But practically, no action was taken in this direction.

In pursuance of the Resolution of 1935 of the Central Advisory Board of Education (CABE, 1921) two expert advisers, Messrs. Abbot and Wood were invited in 1936 to advise the Government "on certain problems of educational reorganization and particularly on problems of vocational education." The Abbot-Wood Report, submitted in 1937, suggested a complete hierarchy of vocational institutions parallel with the hierarchy of institutions imparting general education. They also stressed the need of manual work in education for the sake of harmonious development of the child’s personality. As a result of their recommendations "a new type of technical institution called the Polytechnic has come into existence." The provinces also started technical, commercial or agricultural high schools conducting non-literary courses.

1.3.2.2 Wardha Scheme of Basic Education, 1937

The Government of India Act 1935 empowered the Congress party to devise a national scheme of education for the country. In October 1937, Mahatma Gandhi proposed the scheme of basic education in his paper, “The Harijan” at a conference of national workers at **Wardha.** The conference endorsed that the core of the basic education scheme should centre on some form of manual productive work. This scheme of basic education was known as **Wardha Scheme of Basic Education.** A committee was appointed under the Chairmanship of Dr. Zakir Hussain to prepare a detailed syllabus on these lines. The main principle of the basic education was learning through activity. In fact, the word 'basic,' is derived from the word 'base' which means the bottom or the foundation of a thing upon which the whole thing rests or is made.

Gandhiji's philosophy of education was not only Indian in origin but also Indian in setting. **Basic education** was envisaged to have far-reaching consequences and was hailed on 'epoch-making,' 'original,' 'revolutionary' and 'harbinger' of a new era based on truth and non-violence. Further, Rousseau (1712 –1778), Pestalozzi (1746 – 1827), Froebel (1782 – 1852), Dewey (1859-1952), and Karl Marx (1818-1883) also reached to similar conclusions.

1.3.3 Science Education in India after Independence

After independence, agriculture and the allied vocations started developing along with the industrial growth. The **National Council of Educational Research and Training (NCERT, 1961)** sponsored education of science in all areas and fields. This central organization has launched various schemes through its extension services for the improvement of scientific education at all levels and in all fields of human work. Some of its working schemes are as under:-

i. To stimulate the urge for scientific education among school children,

ii. To augment classroom teaching with independent investigations and research at all levels of school and college teaching by providing guidance and equipments for experimental work,

iii. To popularize scientific education among common people,

iv. To promote the establishment of science clubs,

v. To organize scientific fairs, seminars and symposia,

vi. To select the talented and gifted children in the field of science through examinations and to encourage them by the award of scholarship, stipends and appreciations in various ways,

vii. To establish a central science workshop for imparting effective instruction to science teachers in practical investigation and workshop methods along with techniques of work and instruction,

viii. To prepare efficient science teachers for effective teaching and productive guidance.

1.3.3.1 Secondary Education Commission, 1952-53

Secondary Education Commission, 1952-53 under the Chairmanship of Dr. A. Laxmanswamy Mudaliar recommended the teaching of General Science as a compulsory subject in the High and Higher Secondary Schools. The Commission envisaged the teaching of specialized sciences at an advanced level in the Higher Secondary Schools by competent and highly qualified teachers. The teachers should adopt new and suitable methods of teaching in order to develop capacity for clear thinking and expand the range of students' interest. The Commission held the view that the teachers play an effective role in education for inculcating values like scientific temper, democracy and secularism. Inclusion of craft, social studies and general science in the curriculum was aimed at orienting students towards an industrial and science-centered democratic life.

This **Commission** has emphasized the need for the right methods of teaching in these words. **"**Every teacher and educationist of experience knows that even the best curriculum and the most perfect syllabus remain dead unless quickened into life by the right methods of teaching and the right kind of teachers. Sometimes even an unsatisfactory and unimaginative syllabus can be made interesting and significant by a gifted teacher who does not focus his/her mind on the subject matter to be taught or the information to be imparted on his students, but their interests and aptitudes, their reactions and responses. The success of the lesson is not the amount of matter covered but by the understanding, the appreciation and the efficiency achieved by the students."

The following major recommendations of the **Secondary Education Commission (1952-53**), in the context of work oriented education shows its concern regarding the dynamic methods of teaching in schools.

(1) They should aim not only at mere imparting of knowledge in an efficient manner, but also at inculcating desirable values, proper attitudes and habits of work in the students.

(**2**) The emphasis in teaching should shift from verbalism and memorization to learning through purposeful concrete and realistic situation and, for this purpose, the principles of "Activity

Method” and “Project Method” should be assimilated in school practice.

(3) Students should be given adequate opportunity to work in groups and to carry out group projects so as to develop in them the qualities necessary for group life and cooperative work.

1.3.3.2 All India Seminar on Teaching of Science, 1956

An All India Seminar on the Teaching of Science popularly known as **Taradevi Report** was organized in 1956 with the following objectives:

1. To critically evaluate the draft syllabus in Physics, Chemistry and Biology in General Science,
2. To examine the Elementary Science syllabus at the primary stage and middle school stage,
3. To consider the various aspects of the teaching of science at the Higher Secondary level such as the needs of equipment and apparatus, practical work and so on,
4. To review the methods of testing and examination in Science subjects,
5. To consider the instructional materials and co-curricular activities to be used in science teaching,
6. To suggest a dependable and uniform pattern of school science education for the whole nation.

The Seminar considered various aspects of teaching of the new integrated subjects of general science in the higher secondary schools and critically examined the syllabi in science published by the NCERT on behalf of the Ministry of Education. The curriculum, the text-books, and the methods of teaching Science at the Elementary and the Secondary stages were carefully revised and many recommendations of a practical nature were made in this connection. The seminar focused on some weak points in the teaching of science and suggested suitable remedial measures. A full report of the proceedings of the seminar was published by the Ministry of Education in 1956. This report summarized the aims of general science teaching at high and higher secondary stage as follows:

- To familiarize the pupil with the world in which he lives and to make him understand the impact of science on society so as to enable him adjust himself to his environment,
- To acquaint him with the 'Scientific Method' and to enable him to develop the scientific attitude and
- To give the pupil a historical perspective, so that he may understand the evolution of the scientific development.

1.3.3.3 Malik Committee, 1960

Malik Committee, 1960 was a panel on School Buildings appointed by the Government of India to lay down norms and standards to guide the design of Higher Secondary School buildings. It recommended that laboratories should always be planned taking both educational and economic factors into consideration. An area of 20 sq. ft. per student in laboratories was considered essential.

1.3.3.4 Committee of Emotional Integration, 1961

At the Conference of the Education Ministers held in November 1960, the distressing frequency with which disruptive tendencies were making themselves in the country was discussed. The conference recommended that a committee be set up on promotion of Emotional Integration. In May 1961, under the Chairmanship of Dr. Sampurnanand, **a Committee of Emotional Integration** was set up. One of the recommendations of this Committee was about the "School Projects." Schools may conduct several projects, which improve their general knowledge of the country. For instance, 'Know Your Country' project can be undertaken during which the children may share with others the collection of information about a State in the Indian Union.

1.3.3.5 NCERT Committee before 1962

The National Council of Educational Research and Training set up a committee with Prof. P.C. Mahalanobis, a member of the Planning Commission, as its President. This committee was expected to study and make recommendations on the following issues:

i. Qualitative and quantitative improvement of science-teaching at all stages, especially at the school level,
ii. Promoting science talents in the country and
iii. The training programs for science teachers.

It published its findings in 1962, which has useful information regarding:

- The number of schools providing elective sciences,
- Laboratory work at various levels,
- Science clubs-their number and activities,
- Publications on the teaching of science and the nature of financial assistance given and so on

1.3.3.6 The Indian Parliamentary and Scientific Committee, 1962

The Indian Parliamentary and Scientific Committee, 1962 under the guidance of Shri Lal Bahadur Shastri, studied all the problems of science education at the primary, secondary and higher secondary stages at the Third Five-Year Plan. It found out, "the gap between what is taught and what should be taught at various levels." It observed that, "quite a number of school buildings are lacking in physical facilities such as laboratory equipment, apparatus and library." The report of this Committee on **"Science Education in Schools"** contains the following information:-

1. The essential requirements of science laboratories,
2. The financial procedures in force in the various states,
3. Conditions of laboratories, apparatus and equipment,
4. Various types of grants in different States,
5. Money allotted for buying equipment and apparatus in schools in different States and the methods of expenditure and
6. Tools required for workshops in high schools and teacher-training institutions.

The main suggestions of the Committee in the context of Science Education were as follows:

1. Science education should be compulsorily introduced in primary schools in the form of nature study. Use of visual aids, visits to botanical and zoological gardens and other methods of instructions have to be employed as far as feasible. Ministry of education with the assistance of NCERT should undertake this,
2. General Science courses should be started in the middle schools, i.e., classes VI, VII and VIII,
3. Science should be made compulsory at High School Stage,

4. School science curriculum should be modernized and
5. Handbooks for teachers of science should be prepared.

1.3.3.7 United Nations Educational, Scientific and Cultural Organisation (UNESCO) Mission, 1963-64

The UNESCO Planning Mission stayed in India from 1963 to 64, under the leadership of Prof. S.G. Shapovalonko. It worked on the problems of science education in India and suggested ways to improve it. The Mission focused its attention on

- The objectives and tasks of science and mathematics education in general type of schools in India,
- The place of science and mathematics in school curriculum,
- The content of science and mathematics education,
- The philosophy of preparation of syllabi, text books, methods and organization of education and
- What should be done essentially before the completion of the Third Five-Year Plan and during the Fourth Five-Year Plan with a view to improve the quality of science and mathematics education in India?

The report was submitted in **six** parts which included a plan for establishing laboratories-cum-lecture rooms with necessary equipment to teach Physics, Chemistry and Biology and Mathematics. As a follow up program, the Department of Science and Mathematics Education of the NCERT took up the pilot project of preparing new disciplinary science curricula at middle (VI-VIII) level, text books (Physics, Chemistry, Biology), teacher's guides, science kits, kit guides, teacher training films and evaluation material. This Science Program was changed to Integrated Science Program in mid-eighties.

1.3.3.8 The Indian Education Commission, 1964-66

The Indian Education Commission, 1964-66 headed by Professor D. S. Kothari, was appointed by the Government of India in July, 1964 to review the national condition of education and to plan developmental schemes for education. The Kothari Commission was also instructed to advise the government about the principles and policies to be adopted for the development of education. It submitted its report in July 1966, recommending guiding principles and working policies for the development of Indian Education at all stages and in all respects.

The Commission condemned the rigidity of the existing system of education. Based on its recommendations, 10+2+3 Education scheme started in Delhi Schools, Central Schools and other schools. The first Secondary School Examination was conducted by the Central Board of Secondary education (CBSE), in 1977. The same year a new Science Course was introduced at +2 stages in class XI in Senior Secondary Schools, and in 1979 the first batch of class XII students appeared in Senior Secondary Examination conducted by CBSE. The NCERT developed secondary and senior secondary science curricula which are being used by the schools under CBSE.

The Commission recommended that the work experience (WE) be introduced as an integral part of all education, general or vocational. Accordingly, it has been implemented as an integral part of the new scheme of studies under the pattern of 10+2+3 under the **National Policy on Education (1968).** Stressing the importance and the purpose of work experience, the Commission said: "In addition to being an effective educational tool, work-experience can, in our view, serve some other important purposes. It can help to make the distinction between intellectual and manual work less marked as also the social stratification is based on it. It could make the entry of youth into the world of work and employment easier by enabling them to adjust themselves to it. It could contribute to the increase in national productivity. It could generate in them the habit of hard and responsible work. And it might help social and national integration by strengthening the links between the individual and the community and by creating bonds of understanding between the educated persons and the masses." The commission also recommended vocationalisation of the secondary education and strengthening of the centers of advanced study.

10+2+3: A Major change in School Education, a handbook published by the Ministry of Education and Social Welfare, enumerates the following purposes of work-experience: "Work-experience has to fulfill some specific physiological, historical, sociological and economic purposes." Some of them could be as follows:

1. To develop occupational or manual skills and systematized physical techniques necessary for the job,

2. To give understanding of the facts, the terms, and the scientific principles involved in the job,
3. To develop insight into productive processes,
4. To develop productive competency to make a living or thereby to benefit community or society,
5. To develop organizational skills and competence for running small units of production,
6. To inculcate respect and love for manual work,
7. To inculcate the spirit of modernization and innovation,
8. To develop a sense of self-reliance by making the students productive,
9. To develop useful personality traits such as cooperation, hard work, rational inquiry and commitment to social welfare.

1.3.3.9 Science Education Program, 1970

The NCERT developed a Science Education Program (SEP) called "Science is Doing," in 1970 under the assistance of the United Nations International Children's Emergency Fund, (UNICEF). It was used in primary schools throughout the country. This program was a package of classes I and II Science Syllabus, class III-V Science Texts, Teachers Guides, Primary Science Kit, Kit Guide and Teacher Training Films. This program was changed to Environmental Studies (EVS) program in mid-eighties.

1.3.3.10 Ishwarbhai Patel Committee, 1977

With the formation of the Janata Government in March 1977, the Education Minister appointed **Ishwarbhai Patel Review Committee** in June, 1977 under the chairmanship of Dr. Ishwarbhai Patel, ex-Vice Chancellor, Gujarat University, to review the syllabi and the textbooks prepared by the NCERT for 10+2 pattern of School Education.

The major recommendations of this **review** in relation to work education are

1. The principles of Basic Education as evolved by Mahatma Gandhi and as accepted in the Kothari Commission Report with the stress on work education need to find a central place in the educational system.
2. The classroom is not the only place from which the children learn. The environment and society are also the sources from which children acquire attitudes and knowledge. The term 'Socially Useful Productive Work'

(SUPW), will be preferred to that of 'Work Experience.' The Patel Committee described SUPW as follows: "SUPW may be described as purposive, meaningful manual work designed to prepare the pupils in producing either goods or services which are useful to the community. Purposive, productive work and services, which are related to the needs of the child and the community, will prove meaningful to the learner. Such work must not be performed mechanically, but must include planning, analysis and detailed preparation at every stage, so that it is educational in essence. Adoption of improved tools and materials, where available, and the adoption of modern techniques will lead to the appreciation of the needs of a progressive society, based on technology."

3. In order to implement the SUPW work effectively the Review Committee recommended more time frames.

The aim of the curricular area under this committee was to provide children with opportunities of participating in social and economic activities inside and outside the classroom and enabling them to understand the scientific principles and processes involved in different types of work and setting. Its purpose will be to bring about attitudinal changes and to develop readiness for work practice. The various activities under SUPW are classified as

(**a**) Skill and Product Oriented Activities and
(**b**) Value and Service Oriented Activities.

Two projects should be at least selected from the following illustrative areas in each class.

- Health and Hygiene,
- Food,
- Shelter,
- Clothing,
- Culture and Recreation,
- Community Work and Allied Social Service.

1.3.3.11 National Review Committee, 1977

In October 1977, the then Union Education Minister, Dr. P. C. Chunder, in his capacity as President of the NCERT, appointed **a National Review Committee** under the Chairmanship of Dr. Malcolm S. Adiseshiah, the then Vice-Chancellor of University of Madras, to review the curriculum of the +2 stage of school education with special reference to vocationalisation of education. It recommended work-based learning according to which learning must be based on work either through what the Ishwarbhai Patel Committee calls SUPW or through vocationalised courses. The general education spectrum should allocate 15% of the time to such activities.

1.3.3.12 National Education Conference, 1977

The National Education Conference (18^{th} to 20^{th} December, 1977), held in New Delhi, under the Chairmanship of Shri Sriman Narain, recommended that 50 percent of the total school time ought to be devoted to productive, creative and recreational activities, at least half of which should be focused on SUPW of various kinds. It also urged, as did Patel Committee, that the existing burden of textbooks on students, due to a large number of compulsory subjects, should be proportionately tied up.

1.3.3.13 National Policy on Education, 1986

The National Policy on Education 1986 is formulated on the fundamental principle that "education is a unique investment in the present and the future." The major guidelines in relation to work orientation are 'work experience' and 'science education.'

1. **Work experience**: Work experience, viewed as purposive and meaningful manual work, organized as an integral part of the learning process and resulting in either goods or services useful to the community, is considered as an essential component at all stages of education, to be provided through well-structured and graded programs. It would comprise activities in accordance with the interests, abilities and needs of the students. It would also depend on the level of skills and knowledge to be upgraded with the stages of education. The experience would be helpful for an entry into workforce.

2. **Science education**: Science education will be strengthened so as to develop well defined abilities and values such as the spirit of inquiry, creativity, objectivity, the courage to question and an aesthetic sensibility in the child.

   Science education programs will be designed to 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 will be made to extend science education to the vast numbers who have remained outside the reach of the formal education.

The National Policy on Education (1986) and the 1992 Program of Action assign a special role to NCERT in preparing and promoting a National Curriculum Framework (NCF).

1.3.3.14 The National Curriculum for Elementary and Secondary Education: A Framework, 1988

The National Curriculum for Elementary and Secondary Education; A Framework, 1988 served as a means of modernizing the system of education in India. It was the first document detailing a national curricular framework in schools. It was published in response to the desire expressed in the "National Policy on Education," 1986 that the implementation of education policy and emergent trends in education should be reviewed periodically. Subsequently two National Curriculum Frameworks (NCFs) have been brought out: National Curriculum Framework for School Education, 2000 and National Curriculum Framework, 2005. In this context, the National Curriculum Framework of 1988 has prescribed compulsory work experience in all stages of school education.

1.3.3.15 Yashpal Committee, 1992-93

The revised Program of Action 1992 reported that certain urban area schools recommend a large number of books leading to the overburdening of the students. Consequently a National Advisory Committee was set up under the Chairmanship of Professor Yashpal, former Chairman of Union Grants Commission. In its report the committee recommended a revision of natural science syllabi for secondary and senior secondary classes to ensure that most of the topics are linked with experiments or activities that can be performed by the children and the teachers.

1.3.3.16 National Curriculum Framework for School Education, (NCFSE) 2000

The National Curriculum Framework for School Education, 2000 encompasses all the stages of school education from the pre-primary to the higher secondary stage. The main emphasis is on the 'learner-centered approach' along with the physical, mental, social and emotional development of the learners. In this context, the shift from the traditional Piagetian (1920) model of the 'Child Development,' to the Vygotsky's (1978) model of 'Zone of Proximal Development' of the learner assumes great importance.

Chapter 3 of the document deals with the organization of curriculum at the higher secondary stages, which has been covered in the NCFSE for the first time. The higher secondary stage of education offers maximum challenge in many ways. Passing through the crucial years of adolescence to the youth, the students can choose courses according to their needs, interests, capabilities and aptitudes. They may go for specialized academic courses or job oriented vocational courses. A large number of students after this stage may enter the world of work while some would pursue higher studies of their choice. Hence, education at this level has to focus on knowledge, skills, attitude and entrepreneurship. In order to equip the youth to cope up with the changes and challenges in life, it is essential to appropriately emphasize and carefully nurture natural and ethical values as well.

In addition to this, integration of Information and Computer Technology (ICT) into schooling needs serious consideration. Teachers, educators, curriculum developers, evaluators and others will have to redefine their roles to tackle ICT rich environment and harvest its full potential for the benefit of the learners.

1.3.3.16.1 Innovations for Improvement of Science Education

In the process of 'Universalisation of Science Education,' Science Education forms an integral part of school curriculum up to the secondary level. The National Policy of Education (NPE) 1986 has laid considerable emphasis on strengthening the science education in the school education. The current situation of teaching of school science content is Environmental Studies at the lower primary level (Classes I-V). Integrated approach of teaching science at the upper primary stage (classes VI-VIII) and secondary stage (classes IX-X) is by integrating all disciplines of Science in a natural fashion.

The NPE, 1986 envisages extension through every effort of Science Education to those who are in the formal school system. Several attempts are being made to improve science teaching in India, both formal as well as in non-formal sectors of school education. Some of the innovative experiences in science education at the school level include **Nehru Science Exhibition, Vikram Sarabhai Science Centre, Science Museums and Mobile Science Vans.** In these innovative experiences and science activities, the students get an opportunity for individual initiative, independent or collective study and creativity. The learning is fitted to the abilities and interests of the learners.

On the occasion of the Children's Day, a National Science Exhibition is organized by the NCERT. Initially this exhibition used to be organized at Teen Murti Bhavan, New Delhi. Now it is organized in different States and at three levels— District, State and National. National level exhibition is called as **Nehru Science Exhibition**. Children from all over the country, from all the States and Union Territories (UTs) participate in these exhibitions with their selected exhibits.

Every year NCERT announces a main theme and sub-themes for Nehru Science Exhibition. Children make their exhibits on these sub-themes.

Example:

Main theme: Science is our environment

Sub-themes:

i. Agriculture, Horticulture, Farming and Animal Husbandry
ii. Conservation of the Environment
iii. Health
iv. Energy Conservation and Needs
v. Astronomy
vi. Town and Village Planning
vii. Machines in the Service of Rural Areas
viii. Teaching Aids for Science and Mathematics
ix. Innovations

Main theme, sub themes and all the necessary information for participation in the exhibition reaches every school of the country, from the NCERT to States and UTs and from States and UTs to all the schools. On receiving this information, children start working on their projects-static or working models, or investigatory science projects under the guidance and supervision of their science teachers. If a school has a Science Club, it becomes active after receiving this information under the supervision and guidance of the science club sponsor, the science teacher. In Nehru Science Exhibition one finds static and working models, or novel experiments demonstrated by the students with the help of charts and graphs.

1.3.3.17 National Curriculum Framework for School Education, 2005

The National Curriculum Framework for School Education (NCFSE), 2005 in its guiding principles states as follows:

There is a need to plan and pay attention to systematic matter that will enable us to implement many of the grid ideas that have already been articulated in the past. Paramount among these are:

- Connecting knowledge to life outside the school,
- Ensuring that learning is shifted away from rote methods,
- Enriching the curriculum to provide for overall development of children rather than remain textbook centric, and
- Making examination more flexible and integrated with classroom life.

It emphasizes active engagement of the children, which involves enquiry, exploration, questioning, debate, application and reflection leading to theory building and creation of ideas. In this context, the schools should aim to provide the same. The **NCFSE, 2005 proposes that at the Higher Secondary Stage, science should be introduced as a separate discipline with special emphasis on experiments/technology and problem solving.** Accordingly, modern methods of teaching should be adopted.

1.3.3.18 National Curriculum Framework for Teacher Education, 2009

There is public acknowledgement that the current system of schooling imposes a tremendous burden on children and they must be freed from it. The recommendations of the NCF 2005 on school curriculum are built on this plank. Educationists are of the view that the burden arises from treating knowledge as a ‘given,’ an external reality existing outside the learner and embedded in textbooks. Knowledge is essentially a human construct, a continuously evolving process of reflective learning. This view of education points to the need to take a fresh look at teacher preparation.

Education is not a mechanical activity of information transmission and teachers are not information dispensers. Teachers need to be looked at as crucial mediating agents through whom curriculum is transacted. Textbooks by themselves do not help in developing knowledge and understanding. Learning is not confined to the four walls of the classroom. It needs to connect knowledge to life outside the school and enrich the curriculum by making it less textbook-oriented. Commenting on **the Vision of Teacher and Teacher Education**, the framework emphasizes that the teachers need to be trained in organizing learner-centered, activity based and participatory learning experiences like play, projects, discussion, dialogue, observation, visits and integrating academic learning with productive work.

1.4 Methods and Techniques of Teaching Science Based on Activity Oriented Learning Experiences

The poor state of science education in India is reflected in the reviews of the government of India during 1877-92. Science even did not form a school subject in the beginning of the twentieth century. Indian Education Commission (1964-66) reveals that, "our science education is really in bad shape and it will become worse if we fail to reckon it with the explosion of knowledge." Hence knowledge based activity oriented learning experiences and methods of teaching are to be focused.

1.4.1 Traditional versus Modern Methods of Teaching

Traditional methods of teaching are dominated by verbalism, dictation, memorization, and summarization giving insufficient scope to practical and productive work. These methods are usually devoid of correlating and integrating various subjects and experiences. These are teacher-centered methods where the teacher communicates information for giving knowledge through verbal means. The learners mostly remain passive. In most of the learning processes lecture seems to be the centerpiece of instruction, where the students passively absorb pre-processed information and then regurgitate it in response to the periodical testing and examination. Such a learning environment provides incentives to learn only at the surface (passive) level rather than at the deep (active) level (Marton & Saljo, 1976). According to Jaques (1992), the traditional format encourages students to concentrate on superficial indicators rather than on fundamental underlying principles, thus neglecting deep (active) learning.

Modern methods are dynamic and progressive providing suitable opportunities for 'learning by doing,' for 'observation,' for 'experimentation' and for 'cooperation.' The learning here refers to experiences in which students are thinking about the subject matter as they interact with the instructor and each other. Such innovative learning methods have the following broad principles underlying beneath them. These include

- orderly procedure in teaching,
- an arrangement of subject matter to avoid waste of time and energy and
- redistribution of emphasis, which will secure the greatest cooperation from the students and maintain their active interest.

These modern methods of teaching aim at not only imparting knowledge, but also inculcating desirable values and attitudes and developing the habits of work among the students**.** A good method links up the teacher and his pupils into an organic relationship with constant mutual interaction. The emphasis is on teaching to learn through purposeful, concrete and realistic situation for which some principles of activity are to be assimilated in the school practice. An opportunity is given to the students to learn actively and to apply practically the knowledge that they have acquired in the classroom. There is special stress on clear thinking and clear expression. The student is trained to acquire knowledge through personal effort and initiative. Individual differences are considered and the students have a chance to progress at their own pace. The students work individually and/or in groups to carry out the activities ensuring group life and cooperative work.

According to John Dewey, a pragmatist, project method of teaching is recommended. The process of generating and testing knowledge is the process of "trying and undergoing", trying an idea in practice and learning from observation of the consequences of the trial. Pragmatists are of the view that the mind has the capacity for active generation of ideas so that the problems faced by the individual can be resolved. According to Smith, (1979), Education should aim at purposive, problem-solving activity carried on in its natural setting. Jeff Brodie provided an important addition in this regard by saying that it makes learning fun for both the students and the teacher.

Rousseau, the father of modern dynamic methods of teaching, in his book "EMILE," has emphasized child centered education through project method and discovery methods of teaching. Pestalozzi, a disciple of Rousseau recommended educating teachers before teaching especially in activity methods.

In fact, these methods are strengthened by the general support from the head masters, senior teachers, parents, peer group and the society. Mastery of the subject matter by the teacher, its constant and due orientation, provision for a good library and teaching-learning materials will enhance the new methods of teaching.

1.4.2 The Objectives of Modern Methods of Teaching

The following are some of the objectives of modern methods of teaching.

1. They aim at developing 'love for work,'
2. They aim at inculcating the desire to do work with maximum efficiency,
3. They aim to develop the capacity for clear thinking,
4. They aim at providing adequate opportunities for participation in freely accepted projects and activities in which cooperation and discipline are constantly in demand,
5. They aim to expand the student interest as recommended by the Secondary Education Commission (1952-53). It says, "We would urge all schools to provide in the timetable, at least one free period everyday in which students pursue their favorable hobbies and creative activities individually or in groups, preferably under the guidance of some interested teachers,"
6. They aim at providing opportunities to pupils to apply the practical knowledge and skill acquired by them,
7. They aim to transform schools into 'work schools' and 'activity schools.'

1.4.3 Activity Based Teaching Methods with Respect to Their Common Features

For the most meaningful student learning to occur, independent study, individual writing, student-centered projects, and oral reports should be the major features of instruction. There will be times when students are interested in an in-depth inquiry of a topic and will want to pursue a particular topic for study. This undertaking of a learning project can be flexible: the investigation can be done by an individual student, a team of two, a small group, or the entire class. The project is a relatively long-term investigative study from which students produce something called culminating presentation. It is a way for students to apply what they are learning. The culminating presentation is a final presentation that usually includes an oral and written report accompanied by a hands-on item of some kind (e.g., a display, play or skit, book, song or poem, multimedia presentation, diorama, poster, maps, charts, and so on.)

The possibility of a system which can succeed in keeping children motivated and fully occupied, while they are mastering the fundamentals is highly desirable at this juncture. Most of such activity based methods of teaching have certain similar features which are given below.

1. They all make a definite attempt to break away from the conventional methods of teaching in a way that places more importance on the learner than on the subject under study. They are all learner centered methods.
2. They try to allow a learner to construct its own methods of approach to knowledge, and in the long run to form its own opinions about it.
3. They give the learner an opportunity to 'learn how to learn.' The learning takes place due to the active involvement of the students.
4. They usually succeed in breaking down the artificial barriers that have been erected around the various academic subjects in the past; although in recent years it has become quite common practice for one subject to have a major influence on the way the completed topic is presented.
5. They all seek to evolve the learner's interest through a natural method of acquiring knowledge in the real world.
6. In these methods, the teacher functions as a facilitator or as a stage setter for learning.

1.4.4 Activity Based Methods for Teaching of Science

There are numerous activity based methods of teaching science with common characteristics. These common characteristics are related to classroom interaction and are related to different modes of learning. All these methods fulfill a specific requirement which is based on psychological facilities. Therefore, each method has its own specific characteristic. However, all these methods seek participation of the learner. Various methods of teaching such as Lecture-cum-demonstration Method, Experimental Method, Heuristic Method, Problem-solving Method and Project Method have been advocated from time to time. Each method has its own merits and demerits.

In most of the institutions science is taught though lecture method. Thus the students are unable to develop understanding of science, which is going to become a big problem for teachers as well as students. The activity based methods for teaching of science allow the students to:

- Show interest by asking questions,
- Use their sensory organs,
- Use inquiry to explore or investigate new concepts,
- Form predictions and hypotheses,
- Formulate experiments with alternatives,
- Record ideas and observations,
- Use various resources to seek explanations,
- Make connections between prior knowledge and new concepts,
- Self-evaluate

Some of the activity based methods of teaching science are discussed in the following sections.

1.4.4.1 Lecture cum Demonstration Method

Demonstration is an act of displaying the working process of some experiment. The teacher illustrates certain phenomenon and the application of certain abstract principles through demonstration of experiments. Demonstration of experiments provides an opportunity in visual learning tasks from a different perspective. They can be exercised in several ways. Many of the demonstrations are teacher oriented as the teacher will also be an active participant. Demonstrations may include use of films, slides, overhead projector or the micro projector. The students develop the power of observation, thinking and reasoning.

The teacher explains the theoretical portion with the help of lecture method making use of diagrams and statements. The students get a clear picture of the topic.

The shortcomings of the lecture method are removed by the merits of the demonstration method, thus making it a lecture-cum-demonstration method.

The only precaution is to rehearse the demonstration and ensure that it is clearly visible to all the students. It will be more successful if followed with experimentation.

1.4.4.2 Experimental Method/Laboratory Method

Experiments are the heart of science. They are the natural methods of exploration developing interest, excitement, and curiosity of the learners. Experiments are ideal for problem solving and give an orientation to the science topic. Laboratories are a must for experimentation. Hence it is also called as a Laboratory Method. The students remain active and learn to perform curriculum related activities under the guidance of the teacher. They record the observations and draw conclusions. If an experiment fails, the teacher and students figure out together what might have went wrong and repeat the experiment. Experimental conditions can be controlled with more precision and certainty in the lab.

Describing the experimental method Dr. S. K. Mangal (2004) said, “Students are encouraged to derive the laws and principles of science themselves by actually performing the experiments. The students are given all necessary materials and equipments in the laboratory along with proper instruction for carrying out their experiments with their own initiative and effort, and then they carry on the experiments and record the observation and infer their own results. They learn by their own experience, observation, testing and verification. The teacher supervises their work and also guides them where necessary.” It usually involves carrying out the experiments individually or in small groups. The students find qualitative or quantitative solutions to their problems.

This method encourages self learning, assists in meaningful learning and trains in scientific methods. It keeps up the scientific quest and promotes the students to think and read the available scientific literature such as encyclopedias, bulletins, journals, magazines and newspapers. An extension of their reading gives them an opportunity to give oral reports in front of the class or to make their own journal or written report. The students love to "share" what they have learned.

1.4.4.3 The Techniques of Investigation

In the techniques of investigation the students learn the basic facts of science and they develop the aptitude to recognize truth. It is the original work carried with open-ended experiments. Usually there is no coordination between the theory and practical work. The students require the knowledge of scientific facts as starting point for further discovery. It includes precise and logical thinking.

Inquiry-based learning (Enquiry-based learning in British English) or inquiry-based science describes a range of philosophical, curricular and pedagogical approaches to teaching. Its core premise includes the requirement that learning should be based around student's questions. It is an instructional method developed during the discovery learning movement of the 1960s.

Pedagogy and curriculum require the students to work together to solve problems rather than receive direct instructions on what to do from the teacher. The teacher's job in an inquiry learning environment is therefore not to provide knowledge, but instead to help students along the process of discovering knowledge by themselves. The teacher does not begin with a statement, but with a question. Posing questions for students to solve is a more effective method of instruction in many areas. This allows the students to search for information and learn on their own under the guidance of the teacher. In this form of instruction, it is proposed that teachers should be viewed as facilitators of learning rather than vessels of knowledge.

To illustrate, Inquiry begins with a puzzling event presented to the students like "an electric bulb blew out in the class." The students ask the teacher certain relevant questions and inquire as what has happened. The interaction between the teacher and students continues with a 'Yes and No' answer. The teacher does not give the readymade answers. The students take it as a problem and start searching through reference books at the library or at home. They ultimately find clarifications to the events.

Discovery learning is a method of inquiry-based instruction and is considered a constructivist based approach to education. It is supported by the work of learning theorists and psychologists like Jean Piaget, Jerome S. Bruner, and Seymour Papert. This form of instruction has great popularity. Discovery learning takes place in problem solving situations where the learner draws on his own experience and prior knowledge. It is a method of instruction through which students interact with their environment by exploring and manipulating objects, wrestling with questions and controversies or performing experiments. This method deals with the initial stages of development of research work conducted in connection with an invention. The students are placed in the situation of a discoverer or an inventor.

J.S. Bruner often credited with originating discovery learning in the 1960s, writes, "In this method the students discover new facts or knowledge in an original manner as per their mental level, age, class and other related facts. The facts are explained in a manner by which they give a sense of new facts." It makes the students active and develops their power of reasoning and observation.

The word **Heuristic** from the Greek for "find" or "discover" is an adjective for experience-based techniques that help in problem solving, learning and discovery. Heuristics are "rules of thumb," educated guesses, intuitive judgments or simply common sense. A heuristic is a general way of solving a problem. Heuristics as a noun is another name for heuristic methods. In more precise terms, heuristics stand for strategies using readily accessible, though loosely applicable, information to control problem solving in human beings and machines. A **heuristic method** is used to rapidly come to a solution that is hoped to be close to the best possible answer, or 'optimal solution.'

The heuristic method was started by Prof. Henry Edward Armstrong. The purpose of this method is to put the pupil in the place of a discoverer/researcher. According to Prof. Vaidya, the students are introduced to reasoning from their own observations and/or experiments. It demands the students to stop, to think, to discuss and to suggest modifications for further experiments. It restricts the use of text books assuming that the students learn through laboratory. It develops the spirit of enquiry.

1.5. What Project Method Is

The most appropriate instructional approach that a science teacher can use to teach science for understanding is Project Method. It makes science classrooms mini experimental stations, research laboratories and scientific agencies. This method helps the children to organize their knowledge in a scientific manner.

The main feature distinguishing the project method from similar methods is the degree of freedom offered to students to select the project topic and the means of working through it. The project method is based on the socially acceptable interests and needs of the individual child.

Project Method is a teaching strategy characterized by project work. Project work is an approach to teaching that centers on the regular use of 'Projects.'

The project method gained widespread acceptance as an adjunct to the main curriculum, and is popular because of its emphasis on developing the whole person and not simply intellectual performance, and the importance it gives to education as a process of living in association with others. There is blurring of the distinctions between the project method and the problem-solving method as both are identified with the activity movement as forms of "active learning" in which all students are involved.

The project method is generally associated with William Heard Kilpatrick's (1918) advocacy of purposeful activity, problem solving, and the needs and interests of the individual child in action, learning and conduct. It was influenced in particular by Dewey's support for a problem method of teaching. It was absorbed later into the movement of activity methods of the 1920s. What commenced as a specific activity became part of a general method of education for the free society based on modern learning theory.

Kilpatrick defined the basic class work as "the hearty purposeful act," involving the factor of action, the laws of learning and the ethical quality of conduct. There was a marked contribution to character building as "Education based on the purposeful act prepares best for life." The project method offers an approach to education morally appropriate in a free society and technically consistent with modern learning theory.

Several attempts are made to preserve the distinctive qualities and the early practical emphasis of the project method. Monroe (1926) differentiated between the problem method where "the exercise is assigned" and the project method where "it is proposed by the pupil." He regarded the project method as incompatible to a fixed curriculum, especially as it made planning difficult when a teacher had to rely on the intentions of the students. Alberty (1927) stressed the practical, independent, real-life activity involving direct experience which had made it possible to judge objectively whether an activity was a project, and queried why Kilpatrick's subjectively defined "whole-hearted purposeful activity proceeding in a social environment" was ever called the project method. The association of the project method with "learning by doing" ignored the need to know about and understand the activity and diverted attention away from the learning it was expected to accomplish. Alberty (1927) sought to restore the practical meaning of the project method by a redefinition:

The project method in education . . . aims at securing learning (i.e., the acquisition of knowledge, habits, skills and ideals) indirectly by means of activities which have the following characteristics:

1. The goal which is supposed to dominate the pupil and lure him on to the accomplishment of the end is not the learning sought by the teacher, but is some concrete result or accomplishment.
2. The learning essential to the satisfactory completion of the activity is always instrumental to this goal. That is, whatever learning is achieved is a by-product of the activity and is not directly arrived at by the pupil.

To illustrate, how would a group of children carry out a project; for example, to establish which washing powder washes clothes cleanest? Clearly, the project will require the use of various types of washing powder, and include practical experiments in washing, drying and ironing clothes. Mathematics will be used to collate and assess the statistics. Chemistry will be required for analyzing the contents of each type of soap powder; art may be used to display the findings of the experiment or to assess the quality of the advertisements used by the soap manufacturers. A study of the standard of English used in advertisement copy can be made, and the children can be encouraged to write and set to music advertising jingles of their own.

Even from this short outline it can be seen that projects tend to combine a number of conventional subjects such as mathematics, science, art and music so that children can obtain a better understanding of the subject under investigation.

There are four generally accepted steps in the project-method procedure as advocated by W. H. Kilpatrick (1918). These steps are: Purposing, Planning, Executing, and Judging. These will be seen to approximate closely the steps suggested for problem solving.

The aspects of **purposing** are given as follows.

Throughout the whole of modern methodology is heard the note of emphasis upon motivation. It was stressed particularly in the consideration of the problem method. It is returned to here. A special virtue of the problem is that it arouses mental perplexity that leads naturally to a desire to find relief from the mental disturbance thus engendered. Because of its practical problematic nature, the project should enlist the wholehearted cooperation of the students even more effectively. Ideally, as all admit, in cases where the project originates with the pupil the fullest measure of genuine purposing is achieved. There is a definite urge present to carry it out to completion. As far as possible, the students should be encouraged to originate projects. There are difficulties of a very real nature, however, in undirected, pupil-initiated projects. The all-absorbing thing that the student may be emotionally set to do, possibly has little educative value. Or, it may have educative value for another time and place, but little value in contributing to the immediate needs of the student in the particular learning stage which he may have reached at the moment. Continuity and next steps may, indeed probably will, have much to do with the determination of the appropriateness of a given project at a particular time. The grave danger of overemphasis upon student initiative in the selection of projects lies just here. The projects are likely to be devoid of educative value on the one hand, or, if valuable educationally, they may be badly misplaced, with the result that they benefit the student very little. The good teacher knows that the average student is readily susceptible to suggestion. It is usually not difficult to lead the student to desire or purpose to do the things which the teacher's larger perspective and knowledge indicate should be done. The immaturity of the student, as contrasted with the maturity of the teacher, dictates the wisdom of the teacher's selecting the projects that best meet the educational needs of the student, and then challenging the student's acceptance of those projects.

It should be borne in mind that the genius of the project lies in the wholehearted enlistment of the student in the doing of it. If this is not secured, the project has little more value than any other method. In one sense it is no more a project than the problem is a problem when no true perplexity exists. The motions of project performance may be discharged, but the significant values, the peculiar virtues resident in the method, will not be realized.

The particulars of **planning** are as given under.

Once the project has been wholeheartedly accepted, the students usually are eager to get the task under way. Impetuous youth may be more eager to "do" than to "plan." None the less, the crux of the project method is in the planning. It is the important phase of the problem-solving aspect of the project. The success of the project depends upon the care with which the details of procedure in the undertaking have been worked out. **The student should carry the chief responsibility for planning.** He cannot achieve vicariously the power of good planning. The strategy of good planning comes only by constant intelligent planning, with some errors; but with the errors, comes wisdom. Too often learning is acquired only at the expense of costly mistakes. The school seeks to reduce the need for such expensive learning to a minimum. For this reason, the teacher will not permit errors of too serious a nature to occur. Subtle guidance will steer the student past the most serious pitfalls, but the wise teacher will probably allow a certain number of minor errors to occur so as to make the student conscious of the need for alertness, and for the most critical examination of every proposed step in the carrying forward of the project. The competent teacher will guide the activity be subtle questions that direct the student's attention to problems of procedure, force a careful appraisal of a given step in the development of a plan of action, and in consequence lead the student to a habitually critical study of a plan before the plan is adopted. **A written statement drawing up the details for the execution of the project gives the student, an excellent training.** It forces him to think exactly instead of in the vague way in which one is too likely to think when he has not forced himself to commit his cogitations to objective statement. More than that, he can examine deliberately and critically every proposed step for the accomplishment of the project. **When group acceptance of a common project has**

taken place, the teacher may act as discussion leader to draw from the group a desirable plan for the execution of the project.

The particulars on **executing** the project are given below.

The execution of the project is the most interesting phase of project teaching. In the eager mind of the student this is the most vital part of the project procedure. He finds here that activity and the doing of things of a tangible nature, in which are developed immediate interests of a most challenging sort. It will be relatively easy for the student to become lost in things he is doing and to overlook the original purpose of his activity. Every phase of the activity should be directed toward the realization of the objective that brought the project into being.

As far as possible, the teacher should see that necessary materials are readily available. As in the problem method, the student should be able to keep attention and energy centered on the educative aspects of the project, and not allows time and effort to be dissipated in fruitless bypaths. If too much effort is given to non-essentials, the focus of attention will be diverted from the project, and interest will lag as well.

The student may prove to be “all thumbs and no fingers” in the execution phase. It may require excessive time to do things the teacher realizes he could do in but a fraction of the period allowed the student. Teachers, at times, to escape the discomfort of slow clumsiness, are prone to want to do things for the student. They curb their impatience, and realize that this is a vital part of the youth’s training. Anyone doing things for the first time is likely to be slow and awkward. It is to be expected of the student. **This is his royal road to learning.** It cannot be short-circuited without loss to the individual. When excessive slowness tends to hold back a class, it may be necessary to speed up the work of the individual for the benefit of the group. Not only will project work seem slow to the mature teacher, but the product of the work may be very crude. Even so, the value or need of the project might be in question if the work bore evidence of too much finish. It is the training that counts when the best efforts of the students have been put forth.

The teacher needs to observe closely the progress made while the execution phase is in progress. Plans should be followed carefully. The student should be trained to follow plans as carefully as he is trained to make them, and at the same time he should be taught to maintain a critical attitude toward those plans. He should be taught to be critical of every phase of the execution technique. Auto-criticism was a factor in Binet's judgment of mental ability. Certainly it is indispensable to the student who wishes to profit by his experience. This is essentially a supervised study. There are times when an appropriate suggestion will be in order. It may be that in some constructive phases, where mechanical skill is necessary, the teacher at times may well give discriminating assistance. The teacher must at all time act in the role of friendly stimulator, lest enthusiasm falter in difficult or non-spectacular phases of the project's execution. Projects should not be abandoned partly finished. The student should be taught the practical values of seeing a thing through to completion, at whatever cost.

The terms on **judging** the project are specified below.

The final stage in project learning is the passing of judgment upon the finished product. The student who has completed the task set before him has achieved something. What is the worth of that achievement? "By our mistakes we learn," someone has said. This is true, of course, if we have been made aware of our mistakes, and further, if we have had some constructive suggestions as to ways in which improvement might be made either in the finished product or in the techniques to be used in a similar project undertaking.

Here again the tendency of the teacher will be to act as judge and jury without reference to the students. The procedure here must be conditioned by the circumstances. If the project is individual, the student should become as far as possible his own best critic. The teacher should equip him with the necessary standards of evaluation and guide him in his use of them. As occasion may demand, the teacher may become judge, but only when student judgment proves inadequate. **The student receives a most valuable training in self-criticism.** Psychologically it is a well-established fact that self-criticism will be received more gracefully than will suggestions from others.

Where group activity is involved, student judging is most desirable. **It is the student who needs to develop powers of critical analysis and the ability to offer constructive suggestions.** It has a wholesome effect on the morale of the group to be given the responsibility of evaluating their own project work. A student is more likely to receive seriously the judgments of his peers than he would those of the teacher. The average student is much more concerned with the opinions of those of his own age or set than with any others. The teacher should take advantage of this additional spur to student incentive.

1.5.1 Relating Project Method with other Methods

For those methods which have for their primary purpose the development of mental skills, concepts, attitudes and ideals, the problem is somewhat basic, particularly for those which deal with general ideas. These do involve reflective thought. Some methods, such as the lecture or recitation, may serve other educational purposes besides the development of mental skills. They may, at times, legitimately center upon perceptual, memory, or associational learning. At other times their use can be justified only when they are adapted to problem solving in some form. The problem and project methods are the newer methods developed to train students specifically in the solution of problems. They are not readily usable in products of perceptual or associational learning, except as these become by-products of problem-solving effort. The more individualistic methods, such as the Morrisonian, Contract, Wisconsin, and Supervised Study are closely identified with the problem method, since problem solving or the development of reflective thinking is an important factor.

1.5.2 Project Method – How It All Began

The intellectual origins of Project Method were associated with the child study and scientific movement and the educational progressives' stress on the development of the whole person, the relevance of the curriculum to social existence, and the need for flexibility in schools. The practical pressures came from achieving a degree of mass education through raising the level of school attendance. The project method acknowledged the increasingly diverse and heterogeneous student body, in part the result of compulsory school attendance, and as it developed it adopted the imprecise rhetoric of the child study movement to describe its main features.

It emerged as part of the challenge to formalism in the classroom and reflected the increasing freedom of intellectual and physical movement offered to ambiguities implicit in many of the phrases used in building the child's interests and experience, encouraging social contacts and desirable attitudes-suggest the variety of motives, programs, and achievements of the promoters of the project method. At one extreme, the activities had economic and practical significance, and at the other they were part of a general method of instruction linking desirable social aims with practical efficiency so that every child could succeed at something worthwhile in preparation for democratic citizenship.

Originally the "project" had reference to a method of problem solving largely associated with practical problem-situations of a manipulative or constructive nature in manual arts or agriculture. As problem-solving procedures became accepted as educationally more important, the techniques of the "project" were recognized as having broad application value in all types of problem-solving situations. Particularly this has been true as the emphasis has shifted from primary responsibility of the teacher to that of the pupil in the actual process of learning. Pedagogically the method is fundamentally sound and contemporary in applicability to problem-solving learning.

1. Home Project:

The first formal project recognized as such was introduced in 1908 in the Massachusetts Vocational Agricultural High School. R.W. Stimson, an agent of the Massachusetts Board of Education, used the term "home project" to describe a plan of part-time work done away from school and only partially under school direction. Projects of this kind were specific instructional techniques which arose out of concrete and natural conditions-the growing of potatoes as a cash crop at home was based on material learned at school and the amount of money earned by each student was carefully recorded and had specific practical and economic significance in an agricultural community.

2. The Project Method:

At the beginning of the twentieth century, an American educationist, W. H. Kilpatrick, a colleague of John Dewey, suggested that a method of teaching could be evolved by putting the emphasis on autonomous learning by the pupil. The American word for a student's model in woodwork or metalwork at this time was 'project,' and the word carried with it the implication that the article was made from materials obtained in their raw state. This implication still exists in our present use of the word 'project' which invites pupils to pursue an investigation into a subject from the basic facts available, irrespective of any boundaries which might be thought to exist between the more conventional academic subjects.

When William Heard Kilpatrick of Colombia University published his paper on "The Project Method" in 1918, he provided not an exposition of a specific practical teaching technique but an account of the main features of a directly functional curriculum organization, based on an instrumental view of knowledge. The project method was related to what Dewey advanced as the problem method of teaching in his work on reflective thinking. This was based on the concept of the complete act of thought which proceeds from the initial effort of thought to the solution of a problem. The problem method and pragmatist philosophy which held that concepts are understood through observable consequences and that learning involved direct contact with things.

1.5.3 The Meaning of the Project Work in the Context of Teaching

In collaboration with the teacher, students select a topic for the project. The teacher can stimulate ideas and provide anchor studies by providing lists of things students might do, by mentioning each time an idea comes up in class that this would be a good idea for an independent, small group, or class project, by having former students tell about their projects, by showing the results of other students' projects (anchor studies), by suggesting Internet resources and readings that are likely to give students ideas, and by using class discussions to brainstorm ideas.

Sometimes a teacher will write the general problem or topic in the center of a graphic web and ask the students to brainstorm some questions. The questions will lead to ways for students to investigate, draw sketches, construct models, record findings, predict items, compare and contrast, and discuss understandings. In essence, brainstorming is the technique often used by teachers in collaboration with students for the selection of an interdisciplinary thematic unit of a project.

The students are allowed to choose whether they will work alone, in pairs, or in small groups. If they choose to work in groups, job descriptions for each member of the group should be delineated. For project work, groups of four or less students are usually preferred to groups of more than four. Even if the project is one the whole class is pursuing, the project may be broken down into parts with individuals of small groups of students undertaking independent study of these parts.

A track of the students' progress may be kept by reviewing weekly updates of their work. Deadlines are set with the groups. Meeting with the groups daily helps to discuss any questions or problems if they have any. Based on their investigations, the students will prepare and present their findings in culminating presentations.

Coaching and guidance is provided. Working with each student or student team in topic selection and in the processes of written and oral reporting is desirable. The students are allowed to develop their own procedures, but guidelines are given for their preparation of work outlines and preliminary drafts, giving them constructive feedback and encouragement along the way. The students are aided in their identification of potential resources and in research techniques. The coordination with the library and other resource centers is central to the success of project-work. Frequent drafts and progress reports from the students are a must. With each of these stages, students are provided with constructive feedback and encouragement. Written guidelines are provided and time lines are negotiated for the outlines, drafts and the completed project.

The students are promoted to sharing. The students are insisted that they share both the progress and the results of their study with the rest of the class. The amount of time allowed for this sharing will depend upon many variables. Careful planning and steady guidance are essential for teaching through project work for both students and the teacher. The students with the guidance from the teacher decide what project to do and how to do it. The role of the teacher is to advise and guide students so that they experience success. A project should not be laid out in too much detail by the teacher. There must be a balance between structure and opportunities for student choices and decision making.

Writing is a required component of project work. Options are provided that insist on writing or (drawing) as a part of each student's work. Writing is a complex intellectual behavior and process that helps the learner create and record his or her understanding—that is, to construct meaning.

When teachers use project work for teaching, a paper and an oral presentation are usually automatically required of all students. It is recommended to use the I-Search paper instead of the traditional research paper. Under careful guidance of the teacher, the students (1) lists things they would like to know and from the list select one that becomes the research topic, (2) conduct the study while maintaining a log of activities and findings, which, in fact, becomes a process journal, (3) prepare a booklet of paragraphs and visual representations that presents their findings, (4) prepare a summary of the findings, including the significance of the study and their personal feelings, and (5) share the project as a final oral report with the teacher and classmates. The teacher assesses the final product of the project which may be in form of papers or oral reports and presentations. The final assessment of the study may be based on the following criteria:

(a) organization, including meeting draft deadlines;

(b) the quality and quantity of both content and procedural knowledge gained from the experience;

(c) the quality of the student's sharing of that learning experience with the rest of the class;

(d) the quality of the student's final written or oral report.

According to the Shorter Oxford English Dictionary on Historical Principles, (1968), a Project is

1. a plan, draft, scheme or table something; a tabulated statement; a design or pattern
2. a mental conception or idea; speculation
3. something projected for execution; a plan, scheme, purpose; a proposal
4. to plan, contrive, or design (something to be done, or some action to be carried out); to form a project of
5. to set forth, exhibit; to present to expectation

Projects are special individual or small group "researches" designed to enrich the scientific experience of individual children. Projects are meant for the students to work independently or cooperatively on tasks outside of normal class work and who are motivated by a challenge to do something for themselves. The incentive for projects should come from the child or the group; projects must not be teacher-assigned because they are then merely another kind of teacher-imposed task.

Project is a scheme of something to be done. Project as a method of teaching is a natural, whole-hearted problem solving and purposeful activity carried to completion by students in a social environment under the guidance of their teacher. As stated earlier it is the outcome of pragmatic philosophy of education propounded by John Dewey. He put the child in the real situation of learning. He assigned spontaneous, purposeful and socialized activities to the child. Good's definition of a project is 'a significant unit of activity having educational value and aimed at one or more definite goals of understanding; involves investigation and solution of problems and frequently the use and manipulation of physical materials, planned and carried to completion by the pupils and teacher in a natural like manner.'

A project may or may not involve investigation. If it involves investigation, it will be an investigatory project. It may be a curricular or enrichment activity. The students observe, refer, collect data, analyze the data, and prepare their project reports. The report may be hand written or typed and it may include pictures, charts, graphs, models and so on. Students learn a lot when these project reports are discussed in the class. Project method is an example of Assignment Method. **Project method helps to develop abstract and concrete scientific skills.**

A project is a good way to provide extra, stimulating work for the science-centered child who can stay well ahead of the class in his formal science study and is ready for new opportunities. The project must be so safe that the child working by himself is in no danger. It must be on a level at which success is probable. Even the most ambitious and hard-working child can undertake too much, with the strong probability that frustration will soon end the project.

1.5.4 Project Work- Salient Features

The **salient features** of Project work are as follows:

1. No limits are set to the eventual scope of the subject being studied.

2. There is always an element of research in a project. This research usually arises from a desire to inquire more deeply into facts which have been observed or acquired previously.
3. Many or all the conventional subjects may be put to use in order that the subject matter can be adequately studied.
4. The teaching time required to complete projects, is usually measured in weeks.

The following features **characterize** projects:

(i) a project is a purposeful activity,

(ii) a project is a real life activity,

(iii) a project is an activity in a natural setting,

(iv) a project is a problem centered activity,

(v) a project is an activity in a social setting,

(vi) a project is a whole hearted activity,

(vii) a project is an activity which results in concrete and positive success

(viii) a project is a cooperative activity,

(ix) a project is an activity which provides an integrated view of a subject,

(x) a project is an activity through which a solution of a problem is found out by the pupils themselves,

(xi) a project is a new way of teaching the child to live,

(xii) a project seeks to encourage individuals to understand life in its unity,

(xiii) a project provides a lot of freedom to the child.

A good project has the following **qualities:**

1. A project has its proper aims and objectives,
2. A project is useful and applicable and related to the lives of the students outside the school,
3. It incorporates the vocational interest of the students,
4. It is to be completed in time,
5. The learning experiences in a project are applicable,
6. The knowledge gained from the project encourages further knowledge,
7. The students remain cooperative in a group project,

8. Before starting the project work, environmental and seasonal factors are kept in mind,
9. The project is designed in such a way that the students keep themselves active both physically and mentally and
10. The work of a project is not imposed on the students. They are free to work according to their own interest, ability and attitudes.

1.5.5 Project Work-Significance in Teaching Learning Process

The project method and the project work are presented as a distinguishing feature of the activity and core pattern of curriculum. This view arose as a reaction against the traditional methods of teaching, which creates monotony, laziness and kills not only the interest but also ignores the natural instinct of the students in general. The project work helps to achieve the various outcomes of science teaching and thus the teaching-learning takes place in broad framework of network. It involves-

1. **Non-verbal learning in Science:** Many a learning science is kinesthetic, i.e., they come to the students through the muscles. Let is think about the force of magnetism. One way of experiencing it effectively is to use two strong magnets to feel the attraction or the repulsion!

2. **Value of tangible experience in Science:** Many aspects of learning tend to be abstract. In Sciences, the students often have an opportunity to see something happen, unfold and develop. They can explore with the materials and exert a measure of control over their experiences.
3. **Development of critical judgment:** It entails evaluation. This is an essential factor in a student's developing maturity.

4. **Value of working with others:** The students have an opportunity to share their ideas and to broaden their perspective when they work with others.

Project work stimulates the interest in science and helps in developing personality traits like persistence, self-confidence, cooperation, leadership, emotional stability and problem-solving ability. It is a compound method, which can lead to effective teaching and learning.

The importance of project work is manifold in the context of teaching learning, especially at higher secondary level. It helps in:

- increasing learning
- achieving motivation to learn
- increasing fun in learning
- increasing skill proficiency
- promoting independent thinking
- increasing decision making based on experience
- increasing perception
- increasing creativity
- introducing the students to the 'world of work'
- training in 'scientific method'
- developing positive attitude towards science
- arousing interest and stimulating curiosity
- developing functional understanding
- logical development
- reading readiness
- developing scientific aptitude and scientific attitude
- assessing learning outcome
- introducing current methods in assigning projects to students
- enhancing research mentality
- developing heuristic attitude
- granting freedom to the teacher and the taught

The values and purposes of encouraging project work in learning are to:

- Develop individual skills in cooperation and social interaction.
- Develop student skills in writing, communication, and higher-level thinking and doing.
- Foster student engagement, independent learning, and thinking skills.
- Optimize personal meaning of the learning to each student by considering, valuing, and accommodating individual interests, learning styles, learning capacities, and life experiences.

- Provide opportunity for each student to become especially knowledgeable and experienced in one area of subject content or in one process skill, thus adding to the student's knowledge and experience base and sense of importance and self-worth.
- Provide opportunity `for students to become intrinsically motivated to learn because they are working on topics of personal meaning, with outcomes and even time lines that are relatively open ended.
- Provide opportunity for students to make decisions about their own learning and to develop their skills in managing time and materials.
- Provide opportunity for students to make some sort of a real contribution.

As has been demonstrated time and again, the students choose their own projects, integrate knowledge as the need arises and thus motivation and learning follow naturally.

1.5.6 Project Work – Principles

The main **principles** behind the use of a project work are

- the principle of purpose,
- the principle of activity,
- the principle of social experience,
- the principle of reality,
- the principle of freedom and
- the principle of utility.

1.5.7 Project Work-Steps

The various **steps** in the implementation of a project work in any school organization are:

- providing a situation (by the teacher),
- selection and objectives (i.e., selecting with appropriate objectives, where the teacher works as a guide to help the student/s for selection),
- planning (by the student/s),
- executing the plan (by the student/s),
- recording (by the student/s) and

- evaluating (by the students and by the teacher)

The teacher **provides a situation** in which some problems are focused. These problems are ought to be according to the interest of the students.

Selection of a project with appropriate and clear objectives is very important. It is the centre round which a project moves. Therefore, the teacher helps the student in selecting the project in order to achieve the aims and objectives. The project should be a definite need to the students. In case of a wrong selection, the teacher helps the students to select another project clarifying the reasons for the change.

Planning is a scheme for accomplishing a purpose or a scheme drawn up beforehand or a scheme of arrangement. It is also a very important step. Good planning leads to better results. With the cooperation of the teacher the students draw out a blue-print of the given project. The teacher encourages his students to give their suggestions. The resources which are available with the students should be considered. Through discussion different alternatives should be suggested to make a good plan. The suggestions of all the students should be critically examined and properly utilized.

Execution is the longest step and requires more time. The whole project is completed through the cooperative efforts of all the students. According to the interest and ability of the students, the activities of the whole project are equally divided among the students. The teacher provides proper guidance to the students in the process of execution of the project work, so that desired objectives could be achieved. The students keep themselves busy in collecting, organizing, tabulating, interpreting and analyzing the data.

At the **recording** stage, all activities concerned with the project work are maintained. The students note down all the details of the different steps. Planning of the whole project is recorded for future reference and guidance.

The students and the teacher make **evaluation** of the whole work when it is completed during all the steps. The students review their work. They learn a number of lessons from the committed mistakes in the various steps of a project. The students make self-criticism on their own work. It is a valuable form of training. The students see whether the desired objectives have been achieved or not. The success of a project depends on the achievement of desired aims and objectives made by the students before executing the project work. It is submitted to the teacher for the final evaluation.

1.5.8 Project Work – Types

The project may be as simple as an investigation into a class problem, with a short, oral report, either to the class or to the teacher. It may be the construction of a model that will help explain or illustrate a class activity. Whatever the project is, the initiative is of the child's. The value of the project increases as the student delves more deeply in his research. The teacher acts as guide and merely refers the student to the appropriate school and community resources.

A project may be either an individual or class planned undertaking designed to compile information, collect objects, construct materials, or create something. As group enterprise, a project might consist of such real-life experiences as purchasing and preparing food for a class luncheon or creating a class newspaper. As an individual learning opportunity, projects might involve painting a mural, writing a story, making clothing or collecting and mounting different plant or animal specimens.

Knowledge is applied instrumentally to assist in the completion of the following main types of projects:

A. Practical tasks such as the construction of a useful article—"to embody some idea or plan in external form;"
B. Appreciation of an aesthetic experience-"to enjoy some experience,"
C. Problem Solving-"to solve some problem" and
D. Mastery of a skill or knowledge—to obtain some action or degree of skill or knowledge.

Kilpatrick. William, H., (1871-1965) mentions four types of projects:

(i) The Producer type,
(ii) The Consumer type,
(iii) The Problem type, and
(iv) The Drill type.

In addition to this there are **five** main types of science projects. It's easier to choose a project idea once it is determined what sort of a project is interesting.

The **experiment or investigation** is the most common type of project, where the scientific method is used to propose and test a hypothesis. After acceptance or rejection of the hypothesis, conclusions are drawn about what had been observed. For example determining whether a cereal contains the amount of iron listed on the box or not.

The **demonstration** usually involves re-testing an experiment that already has been done by someone else. Ideas can be obtained for this type of project from books and on the internet. For example presenting and explaining an oscillating clock chemical reaction. This type of project can be improved by predicting how temperature would affect the rate of the clock reaction.

In the r**esearch** project, information is collected about a topic and the findings are presented. For example, a research project can be an excellent project if the data is used to answer a question. An example would be polling people to ask about their belief in global warming, then drawing conclusions about what the results mean for policy and research.

The **model** type of project involves building a model to illustrate a concept or principle. An example for a model is the vinegar and baking soda volcano. It can be an incredible high school or college project by building a model of a new design or a prototype for an invention. In its best form, a project with a model illustrates a new concept.

The **collection** project often displays a collection to illustrate the understanding of a concept or topic. For example as with the demonstration, model, and research project, a collection has the potential to be a lame project or an exceptional project. It could be a butterfly collection to observe how wing lengths of the insects differed from year to year and look into possible explanations for the phenomenon. Discovering a correlation with pesticide use or temperature or precipitation could have important implications.

1.5.9 Project Work--Advantages

The following laws of learning lead the merits of the Project Work:

A. **Laws of Readiness:** The students get ready to learn through motivation. The project method provides the situation to make the students ready to work.

B. **Law of Exercise:** The students learn through practice to make learning more effective and permanent. The project method provides opportunities of 'learning by doing' to the students.

C. **The Law of Effect:** According to this law if learning is effective and permanent, it leads to satisfaction and happiness. The students get pleasure when they manipulate their own activities.

On the basis of these laws of learning stated above, the merits of the project work are:

1. Meaningful and purposeful activities provide practical and permanent learning which is quiet related with the daily life of the student. The students get opportunities to be aware of themselves with the real life problems,
2. The students get practical knowledge of the different subjects of the curriculum,
3. It develops a sense of cooperation,
4. It enhances the power of interaction among the students,
5. It promotes the habits of thinking for community welfare among the students,
6. It develops the power of tolerance among students,
7. It encourages the students become self-dependent to complete their work,
8. It transforms the students to become the resource person as they collect different information regarding their project work,
9. It inculcates democratic learning because the students select, plan and execute a project themselves,
10. It promotes the students to understand the dignity of labor and respect for all types of work,
11. It initiates the habits of constructive and creative thinking,

12. It helps students to solve other related problems based on the same project,
13. It provides freedom to the students as they work with their self-chosen projects,
14. It solves the problem of indiscipline as they are all busy,
15. The students get joy and take pride in their finished product,
16. It is a playful and natural way of learning.

An added advantage of the project work, besides learning, is that these various activities afford enjoyment, relaxation, satisfaction and recreation to the student community. These activities bring in activeness in the entire school environment.

1.5.10 Project Work – For Kinesthetic Learning

The project work is the learning modality based on Kinesthetic: learning based on hands-on work and engaging in activities. Kinesthetic learning is a teaching and learning style in which learning takes place by the student actually carrying out a physical activity, rather than listening to a lecture or merely watching a demonstration. It is also commonly known as a "do-er." Some people are visual learners, some kinesthetic learners, and some are auditory learners. Students associated with this predominant learning style are thought to be natural discovery learners; they have realizations through doing, as opposed to having thought first before initiating action.

Kinesthetic learning is when someone learns things from doing or being part of them. The kinesthetic learner usually does well in things such as chemistry experiments, sporting activities and acting. They also may listen to music while learning or studying. It is common for kinesthetic learners to focus on two different things at the same time. They will remember things by going back in their minds to what their body was doing. They also have very high hand-eye coordination and very quick receptors. They use phrases such as "I can see myself doing that" and "It's starting to come alive."

1.5.11 Project Work-As a Means of Individualized Instruction

An element of flexibility should be provided in the instructional programs of Science for the school children. Project work is an ideal way to build the necessary flexibility. Such work challenges the individual or a small group to think independently and to make decisions.

If the project is undertaken by a small group, individuals learn to cooperate and to work together. This in itself is no mean feat. The teachers must work with small groups in such a way that certain individuals do not continuously dominate the work of the group as a whole.

A science project is an investigation. It involves good research techniques at the child's level of maturity and development. In fact, the child may not be discovering something new for humanity, but, to the child to whom the items of information are unknown, there may be a pressing need for discovery and enlightenment. The element of personal discovery which is always involved in such instances is as unique, creative, as it would be if the phenomenon were happening for the first time in the history of human race.

It is through "research projects," that an opportunity is given for the individual to pull ideas together, to make associations among ideas, and to bring to bear all the resources at his disposal in the acquisition of knowledge. Such work provides an excellent opportunity for the individual to be involved in situations that require maximum thinking.

Often a project has as its end point some type of exhibit or finally accumulated information. The individual is encouraged to evaluate the final product, i.e., the fruits of his research and undertaking. A self-evaluation involves a critical examination of the adequacy and soundness of the scientific approach used in the development of the project. Clarity is another feature which needs to be examined. How direct, discrete and to the point is the information amassed? How adequately has an abstract idea been reduced to the level of the concrete and the obvious? Finally, what elements of creativity are evident? Is the approach original? How dramatically and effectively is the idea being presented to catch and to hold the attention of those to whom we wish to communicate?

Project work undertaken by individuals or small groups encourages children to be creative and to answer their own questions. One project often leads to another.

1.5.12 Project Work – A Wonderful Tool

Project work is a wonderful tool to make pupils imbibe the concepts. The student will choose a topic for the project under the guidance of a teacher. The topic so chosen gives scope for fieldwork, to study in the library and to collect and interpret the data. Thoroughness, diligence, discipline, analytical and presentation skills - all these will be put to test in the process. And such a grind makes the student an expert and spurs him to probe further.

A curriculum that is broad based, that encourages original work and independent thinking and that which puts a premium on going beyond the curriculum to explore the vast ocean of knowledge would enable the children to excel in whatever they do. And that is the purpose of education. Project work for school children has now become a regular practice in many of the schools. The number of projects in a year varies from school to school. Project work is a new and encouraging trend being followed by many schools for their primary to higher secondary school students.

An encouraging note about these projects is that they cover all fields of study. There are projects showing the growth of a butterfly from its egg state, or depicting the course of a river from the mountains to the sea, or representing the benefits of a man made dam. Each of these projects is interesting and requires considerable time to be completed. For the children it is an avenue of exhibiting their creative skills. It also provides variety to the mundane school homework and daily routine.

Project Work as an instructional approach offers an opportunity to create innovative learning environments. It affords students with working in teams, engaging in meaningful activities such as problem-solving, analyzing, evaluating, collaborating, reporting and presenting over a significant period of time, in order to create a product, realistic and relevant to the learners. Project Work creates a logical link to content-based instruction, now a major goal of education. Teachers' conceptions of teaching and learning are the key factors for the effective project work.

How to select the projects is a crucial step. Preferably those projects ought to be attempted, in which there is a reasonable chance of success. And they ought to be of the type which can be completed within the stipulated time. An attempt should be made to find projects that include everyone throughout the work.

Before taking up any activity in the school, the authorities must make sure whether the project is within the comprehension of the group concerned and a practical one? Will it be interesting to students and encourage initiative and originality? Will it enlarge students' horizon and develop responsibility? Will it help to develop cooperation with schoolmates and teachers? Student Council and House System, beautification of the school are some of the examples of projects.

1.5.13 Project Work –The Role of a Teacher

Although the teacher may not appear to occupy the center of attention in some aspects of the problem method, yet the teacher is an important cog in the machinery of project work. The tendency is to individualism in problem solution. Whatever the direct approach, the degree to which the teacher himself is a master of problem solving will bear a somewhat direct relation to the effectiveness of his direction of others in this process. A teacher who has the ability to see problems clearly, the power to analyze with a keen discernment, and the facility to synthesize and draw conclusions with an uncanny accuracy, will be a rare help to the students in their mastery of the difficult technique of problem attack. Guidance in problem solving is in reality training in "how to study," and, it might be added, in "how to think." Therefore, the role of a teacher in teaching involving project work is given as under--

1. Asking the students to identify and select the problem/topic,
2. Discussing the basic idea of the project,
3. Providing students with a simple chart showing types of data and possible ways of analyzing them,
4. Asking the students to collect and record the data,
5. Acting as a mentor, monitor, adviser, assist, facilitator,
6. Providing extra help for struggling groups and encourage between group's interaction, dialogue and sharing of ideas,
7. Keeping a mental record of the progress of the student/s,

8. Discussing the protocol of presentation and criteria that will be used for evaluating project reports,
9. Providing the students with a template/format for report writing and discuss rules of scientific writing.

1.6 Need of the Present Study

Science has a profound impact on our individual lives and our culture. It plays a role in almost all human endeavors and affects how we relate to one another and the world around us (American Association for the Advancement of Science: Atlas 2001). The foundations of science education will help students become responsible citizens, aid in decision-making and problem-solving, and care for the community in which they live. Accordingly, today's instructional strategy needs a paradigm shift in the process of instruction.

The foundation laid at school stage in general and at higher secondary stage in particular, equips the students with the basic knowledge of the concepts, their application, skills and attitudes towards making meaningful contribution in any field they choose. This is considered important as it offers diverse choices of study streams to the students according to their need, interest and aptitude. Passing through the crucial years of adolescence to youth, this stage may be the end of their formal education leading to the world of work; for others it may provide a foundation for higher education. They may either choose specialized academic courses or job oriented vocational courses. Therefore, the Education Commission (1964-66) made an emphatic recommendation about introducing a uniform pattern of school education in all States and Union Territories (the 10+2 structure). The importance of higher secondary stage of education as terminal stage for a large number of the student population as also a feeder stage to professional education cannot be underscored.

In this context, science instruction at higher secondary level should aim at the following behavioral changes.

- To prepare young learners to enter scientific professions and occupations
- To prepare future scientists and technologists
- To develop scientific research skills that is appropriate to meet the needs of professional training in science

- To develop the ability to identify and use scientific knowledge appropriately to make wise choices
- To make judicious critical judgments about the reliability and accuracy of information that is passed off as scientifically based
- To use required scientific knowledge constructively
- To generate knowledge and enhance intellectual capability
- To solve problems encountered in their professional and personal lives effectively

Fifth Survey of Educational Research (1988-92) insists on some topics in science education in which research is needed. For example usage of mathematics projects for students to encourage creativity in mathematics, use of computers for teaching of mathematics. The NCERT (1986) emphasizes on the guidelines of curriculum transaction which follows as under, "among the techniques of instruction which play an important role in the effective curriculum transaction, involving activity based approach, the teacher has to be apt at: planning of activities, preparing the students for activities, conducting and supervising activities and conducting discussion for evaluating the learning outcomes.

Most of the teachers are not trained for teaching at higher secondary level. The postgraduate teachers are appointed with a minimum qualification of post graduation degree in the relevant subject and a bachelor's degree in education with the relevant methodology at the secondary level. The teachers are usually trained to teach only the secondary section by most of the teacher education providers, but they may later on get a chance to teach students of +2 level. Under these circumstances, whatever the teachers learn during their training is in fact relevant to secondary sections only. However, the same methods are adopted in teaching higher secondary classes also. The teachers may be under pressure to cover the vast syllabi. Many important aspects of learning such as practical and field trips, ways of learning such as reference work, project work and presentations are not fully utilized in the absence of enough guidelines provided to the schools for carrying on project work, to the detriment of overall learning. Well-equipped laboratories, libraries, and access to computers and clear guidelines for the introduction of project work are essential and all efforts must be made to ensure that schools and junior colleges are well equipped with such resources. Therefore, the research based evidences are needed to throw more light on the present practices of project work at +2 levels.

1.6.1 Statement of the Problem

Present status of implementation of Project Work in CBSE schools at higher secondary level in Kachchh District

1.6.2 Objectives of the Study

1. To study the set criteria in implementation of project work in CBSE schools.

2. To study the practices of implementation of project work in CBSE schools at higher secondary level in terms of
    - The orientation given to the students and the teachers
    - The number and variety of projects given to the students in relation to the content matter of each subject
    - The problems encountered by the teachers and the students
    - The evaluation procedures
    - Preservation and maintenance of the projects
    - Further utility of the projects in life by the students

3. To study the students' opinions about the project work in relation to
    - availability of time
    - usefulness of the projects
    - interest
    - socio economical aspects related to the projects

4. To judge the present practices in the context of set criteria for implementation of project work

1.6.3 Explanation of the term

Project Work

The term project work consists of two terms: Project and Work. Here the word project means a curricular-based activity given to the students, enabling them to develop their ability either individually or in groups. The term 'project work' encompasses the meaning of both the process and the product.

1.6.4 Delimitations of the Study

The present study is delimited to only Class XI Science stream students and the teachers teaching at higher secondary level in Science stream of the CBSE affiliated schools in Kachchh district.

1.7 Organization of the Thesis

The thesis is organized into five chapters and the details of the same are given below.

Chapter I discusses the need and importance of education, historical perspectives about activity oriented experiences in science education, methods and techniques of teaching science based on activity oriented learning experiences, the origin and the meaning of the project work in the context of teaching. It also discusses the salient features, significance, principles, steps and the types of the project work in learning process. The statement of the problem, the objectives of the study, explanation of the terms and delimitations of the study are also given.

Chapter II reviews the related studies on the implementation of the project work in India and abroad. It outlines and analyses the abstracts of the research studies relevant to the present study. A discussion follows based on the analysis of the review of related literature and its implication to the present study.

Chapter III details the methodology and the research design of the present study. It also focuses on the construction of the tools and the procedures adopted for the data collection.

Chapter IV discusses the data analysis and interpretation of the data with respect to the document analysis, with respect to the teachers' questionnaire and with respect to the students' questionnaire. It also describes the major findings of the study and elaborately discusses them.

Chapter V reviews the earlier chapters and briefly summarizes the methodology and findings of the study. It focuses on the implications of the present study. This chapter concludes with suggestions for further research studies.

Chapter 2

REVIEW OF RELATED LITERATURE

Chapter II

REVIEW OF RELATED LITERATURE

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Chapter II

REVIEW OF RELATED LITERATURE

2.0 Introduction

Research cannot be treated as an isolated piece of work or a separate entity. It carries with it the endless research work of yesteryear. The researchers find the original ideas and concepts from the collective body of prior work referred to as the literature of a field. It is in fact a significant and necessary part of the research process. A review of the related literature familiarizes and provides a wide range of information to the researcher of present and past in his/her area of research and assists him/her throughout his/her investigations. It saves considerable amount of time by building on what is already known. It as well enables to study the tested methodology and the instruments used. Review of related literature assists to assess the merits of previous studies, their soundness, relevance, design quality, findings and conclusions developing an insight for further study. It helps to learn from the errors of the others and alarms to avoid pitfalls. According to **Tuckman, B.W. (1999)** reference to relevant studies helps to uncover and provide:

- Ideas about variables that have proved important or unimportant in a given field of study.
- Information about work that has already been done and that can be meaningfully extended or applied.
- The status of work in a field, reflecting established conclusions and potential hypotheses.
- Meanings of and relationships between variables chosen for study and hypotheses.
- A basis for establishing the context of a problem.
- A basis for establishing the significance of a problem.

The literature search, especially in the findings and recommendations of others, often provides more and more persuasive justification for research on the problem. Previous researchers often identify gaps or areas where more research is needed. The review thus helps to justify the study by what is known and what remains to be investigated in the topic of concern.

For the current topic under study, the researcher reviewed all the relevant researches compiled in the educational surveys and those that are displayed on the webliography. The literature search includes researches, articles, reports and reviews pertaining to the study. The studies have been described to get a comprehensive idea. Later on the relevant studies have been bifurcated into studies that were conducted abroad and in India. The reviewed related literature is then arranged in a chronological and alphabetical order. An analysis of the researches is also presented in a tabular form followed with discussion.

At the end, a discussion based on the review of related literature to locate the research gaps and its implication to the present study is focused.

2.1 Studies conducted abroad in relation to Project Work

Bell, Stephanie, (2010) carried out a study on project-based learning for the 21st Century and skills for the future. It was found that the project-based learning (PBL) is an innovative approach to learning that teaches a multitude of strategies critical for success in the twenty-first century. Through the Project-Based Learning the students drive their own learning through inquiry, as well as work collaboratively to research and create projects that reflect their knowledge. The students benefit from this approach to instruction as it involves gleaning new, viable technology skills, to becoming proficient communicators and advanced problem solvers.

Bencze, John Lawrence, (2010) conducted a study about promoting student-led science and technology projects in elementary teacher education for an entry into core pedagogical practices through technological design. It is a known fact that the future elementary school teachers often lack self-efficacy for teaching science and technology. They are particularly anxious about encouraging children to carry-out student-directed, open-ended scientific inquiry and/or technological design projects. Moreover, often this is also the case with the practicing elementary school teachers. It is difficult for student-teachers to gain practical experience facilitating student-led project work during practicum sessions. To provide student-teachers with expertise and motivation for promoting student-directed, open-ended project work, a group of future elementary teachers were taken through a constructivism-informed "apprenticeship" during their university-based teaching methods course and then invited to make project work, the subject of the action research that they were required to complete during their practicum. The researcher judged the children's designs to be modestly successful and the data indicated that the self-efficacy of the group of teachers for promoting project work increased significantly. Analyses of qualitative data collected during the methods course and practicum also indicated that the aspects of the "curriculum," "teachers," "students" and "milieu" appeared to contribute to this success. Such findings suggest that teacher educators should focus on helping future elementary teachers to develop expertise and motivation that would enable and encourage children to conduct technological design projects before conducting scientific inquiries. Such an approach may be the most pragmatic--and, arguably, epistemologically-sound--approach for helping "science- and technology-phobic" student-teachers to move from the periphery to the core of practices in science and technology education.

Chang, Ling-Chian; Lee, Greg C., (2010) conducted a study and developed a team-teaching model for practicing project-based learning in high school with collaboration between computer and subject teachers. Project-based learning (PBL) is a highly effective means of motivating students to learn independently. However, training or encouraging teachers to practice PBL in their classrooms is challenging, especially if the educational system does not accommodate creative teaching practices. In particular, in a test-driven educational system, time constraints and an excess of teaching content makes it difficult to practice PBL at the high school level. This work presents a novel team-teaching model that is based on collaboration between subject teachers and the computer teacher to facilitate PBL in the classroom. A two-year experiment was conducted to study the feasibility of the proposed model, in which the school computer teacher conducts PBL with the 10^{th} grade students in the first year, and subject teachers conduct PBL with the 11^{th} grade students in the second year. Experimental results indicate that the proposed model is feasible in the given educational setting. No class time was lost, and the subject teacher successfully conducted PBL activities. Furthermore, a follow-up survey indicated that the students enjoyed the PBL activities in both classes.

Juuti, Kalle; Lavonen, Jari; Uitto, Anna; Byman, Reijo; Meisalo, Veijo, (2010) did a survey about the science teaching methods preferred by grade 9^{th} students in Finland. The students find science relevant to society, but they do not find school science interesting. This survey study analyzed Finnish grade 9^{th} students' actual experiences with science teaching methods and their preferences for how they would like to study science. The survey data were collected from 3,626 grade 9 students (1,772 girls and 1,832 boys) across randomly sampled secondary schools. The students were asked to evaluate how often a particular teaching method is used in science (chemistry and physics) teaching and how often they would like to see the teaching method used. The data were analyzed using nonparametric tests. Boys seemed to be more satisfied with current and traditional science teaching methods like direct teaching, solving basic problems, reading textbooks, and conducting practical work, while girls desired more discussion. The students who were interested in school science or thought that the school science is relevant in everyday life would like more creative activities such as brainstorming and project work. The results thus indicated that understanding the connection between student interest and teaching method preferences, especially interpreting interested students' desire for creative activities, are important aspects for future research.

Kanter, David E., (2010) conducted a study about doing the project and learning the content by designing the project-based science curricula for meaningful understanding. Project-based science curricula can improve students' usable or meaningful understanding of the science content underlying a project. However, such curricula designed around "performances" wherein students design or make something do not always do this. The researcher surveyed for alternative ways to design performance project-based science curricula (pPBSc) to better support the meaningful understanding of science content. Using existing curriculum design frameworks, it was identified as the learner's need to "create the demand" for the science content, anticipating how to use it in the performance, and to "apply" the science content, both being necessary to ensure meaningful understanding. Designing the pPBSc "I, Bio" it was discovered how these guiding principles manifested as curriculum design challenges. Further it was generalized from the design of "I, Bio" and related literature design approaches for addressing each challenge. Finally, it was measured the extent to which a pPBSc incorporating these design approaches developed meaningful understanding. 652 middle grades students using "I, Bio" completed pre- and posttests on the science content behind the "I, Bio" performance. The findings of the study provided the preliminary evidence that a pPBSc that incorporates these design approaches is consistent with gains in meaningful understanding. It was discussed how the results of this work can be used to improve systematic experiments on instructional supports.

Pascaul, R., (2010) conducted a case study about enhancing project-oriented learning by joining communities of practice and opening spaces for relatedness. The researcher described how an extension of project-oriented learning helps to increase social construction of knowledge and learning. The focus was on (a) maximizing opportunities for students to share their knowledge with practitioners by joining communities of practice, and (b) increasing their intrinsic motivation by creating conditions for student's relatedness. This study considered a capstone course in Mechanical Engineering. The work addressed innovative practices of active learning and beyond project-oriented learning through (a) the development of a web-based decision support system, (b) meetings between the communities of students, maintenance engineers and academics, and (c) new off-campus group instances. The author hypothesized that this multi-modal approach increases deep learning and social impact of the educational process and supports for a successful achievement of the educational goals. It is also suggested that this methodology can easily be extended to further improve the learning process.

Williams, Ashleym, (2010) carried a study about the environmental education and education for sustainability projects which are inspiring and facilitated implementation. We all know that our world is faced with a vast array of environmental catastrophes ranging everywhere from climate change, to air and water pollution, to mass extinction of species which all threaten the environment and human existence. As of now, students are not being informed on the sustainability issues, or engaged in the change process at school. Rote memorization occurring in schools does not create critical thinkers that could help make the changes needed for the environment. The purpose of this study was to present the ways in which these topics can be implemented in schools; specifically through local environmental action projects. Previous literature described the need for environmental education and education for sustainable development, as well as the background of the movements. An exemplary model project, the STRAW Project, was presented through an interview with the creator of the project and personal observations of the project. This research has shown that when students are taught the skills they need to make a change for the environment and are engaged in environmental project based learning projects, they feel empowered and more ready to make a change. In addition to this other benefits and implementation methods are also presented.

Zimmerman, Daniele C., (2010) tried about the project based learning for life skill building in 12th grade social studies classrooms in the form of a case study. Based on the assumption that project based learning (PBL) in 12th grade social studies classrooms contributes to the development of life skills for high school seniors in this advanced and globalized time, this research would investigate student experiences with PBL methods for helping them acquire skills along with a case study of a successful PBL program. The purpose of this study was to help educators discern the value of this instructional strategy. Constructivism refers to the concept that students learn through their experiences and curriculum designed around the Theory of Multiple Intelligences allows them the opportunity to learn through a variety of methods during each lesson. A qualitative approach to gathering research, using the interview format was conducted with three teachers who agreed to participate in the study. These teachers had created a unique PBL program in their high school classrooms. The focus of their work was to document the success in teaching life skills to high school students with the goal of preparing them for college, jobs, and life after secondary education. Information was also gathered by observing the teachers as they were involved in working actively with students using PBL. The major themes found within the literature highlighted the success of the project based learning method, the importance of skill building for life and that fundamental changes were needed for education and instruction. The researcher believed and concluded from his reading, review, research, interviews and observations that the PBL method was successful in teaching and building life skills in high school social studies classrooms, and was able to better prepare students for life after secondary education. Through this instructional method the students were able to acquire skills that would help them achieve success in college, the work-force and in life.

Bahar, Mehmet, (2009) made a comparative study about the relationships between pupils’ learning styles and their performance in mini science projects. This study aimed to investigate (i) the relationship between pupils' learning styles and their performance in mini science projects and (ii) the degree of enjoyment of pupils with different learning styles towards mini projects. A total of 80 pupils (7th grade-14 years of age) from two different primary schools participated in the study. The

Grasha-Riechmann Learning Style Scale was used to determine the pupils' learning styles. The results showed that all categories of pupils except avoidant were stimulated to varying degrees by the mini projects. However, the pupils who were in the "independent," "competitive," and "participant" groups had relatively higher achievement scores in the mini projects than the pupils in the "avoidant," "dependent," and "collaborative" groups. Similar results also appeared for the degree of enjoyment. Further, the implications of the results for teaching and learning science were discussed.

Barak, Moshe; Zadok, Yair, (2009) presented a study about learning and the problem solving process identified among junior high school pupils participating in robotics projects in the Lego Mindstorm environment. This research was guided by the following questions: (1) How do pupils come up with inventive solutions to problems in the context of robotics activities? (2) What type of knowledge pupils address in working on robotics projects? and (3) How do pupils regard or exploit informal instruction of concepts in science, technology and problem solving within a project-based program? Data collection was made through observations in the class, interviews with the pupils, observations of the artifacts the pupils had constructed, and analyses of their reflections on each project. **This study revealed that the pupils had often come up with inventive solutions to problems they tackled by intuitively using diverse kinds of heuristic searches.** However, they encountered difficulties in reflecting on the problem solving process they had used. In robotics projects, the pupils dealt primarily with qualitative knowledge, namely, the ability to identify specific phenomena in a system or factors that affected system performance. This study also showed that pupils were likely to be benefited from implementing informal instruction on concepts in science, technology and problem solving into a project-based program. It was suggested that this type of instruction should take place in the context of pupils' work on their projects, and adopt a qualitative approach rather than try to communicate in the class procedural knowledge learned by rote.

Doppelt, Yaron, (2009) evolved a strategy on infusing creative thinking competence through the design process of authentic projects. This would require not only changing the teaching methods and learning environment, but also adopting new assessment methods, such as portfolio assessment. The participants in this study were 128 high school pupils who have studied MECHATRONICS from 10th to 12th grades

(16-18 years old). By the end of 12th grade, the pupils had created 57 authentic projects. The intervention program had two parts: first, the pupils documented their project according to a creative design process that had been introduced to them. Second, the projects were assessed according to a creative thinking scale. This scale was designed to assist pupils in documenting the design process. It could be used as a guideline for teachers and pupils during the course of the project. The research examined pupils' performance during project-based learning. The research tools included were observations of class activities, portfolio assessment, and external matriculation assessment. The findings showed that first of all the pupils learned to document their design process. Secondly, the pupils' projects demonstrated various levels of creative thinking skill. Evidences for high-level documentation of the projects were also found in the pupils' portfolios. On the other hand, there was much to be learned about documenting teamwork and pupils' reflection. It was recommended that this research could assist researchers and teachers who are interested in assessing engineering education outcomes.

Lam, Shui-Fong; Cheng, Rebecca Wing-Yi; Ma, William, Y.K., (2009) conducted a study about the teacher and student intrinsic motivation in project-based learning. In this study the relationship between teacher and student intrinsic motivation in project-based learning was examined. The participants in the study were 126 Hong Kong secondary school teachers and their 631 students who completed evaluation questionnaires after a semester-long project-based learning program. Both the teachers and the students were asked to indicate their motivation in the program, and students were also asked to report the instructional support they received from their teachers. The results of hierarchical linear modeling analyses showed that teacher intrinsic motivation predicted student intrinsic motivation directly as well as indirectly through the mediation of instructional support. Thus it was found that when teachers reported higher intrinsic motivation in the program, their students tended to perceive receiving more support from them and to report higher intrinsic motivation in the learning experience.

Meerbaun-Salant, Orni; Hazzan, Orit, (2009) studied the challenges in mentoring software development projects in the high school according to Shulman's teacher knowledge base model. The r focus of the study was to analyze the difficulties encountered by Computer Science teachers in the mentoring process according to

Shulman's Teacher Knowledge Base Model. The main difficulties that emerged from the data analysis belonged to the following knowledge sources of Shulman's model: Content knowledge, pedagogical content knowledge (PCK) and knowledge of learners and their characteristics. It was suggested that the complexity of the mentoring process of software project development in the high school results mainly from the fact that the process involved a variety of knowledge types, as well as management activities and pedagogical aspects. This fact leads to conclude that a mentoring methodology should be defined for this complex task, similar to software project development methodologies applied in the industry. The study summarized with a discussion of the nature of such a methodology.

Sadeh, Irit; Zion, Michal, (2009) made a comparative study for the development of dynamic inquiry performances within an open inquiry setting and a guided inquiry setting among high school biology students. Dynamic inquiry learning emphasizes aspects of change, intellectual flexibility, and critical thinking. This learning is characterized by the following criteria: learning as a process, changes during the inquiry, procedural understanding, and affective points of view. It was hypothesized that open inquiry students who engage in the inquiry process from its initial stage, participating in the decision making process of asking inquiry questions and planning all "aspects" of the inquiry, will outperform students who experienced guided inquiry, in terms of developing dynamic inquiry performances. Students were divided into two groups one each for the guided and the open inquiry learning approaches. Both the groups were followed throughout their 2-year inquiry learning process. The data sources included interviews, students' inquiry summary papers, logbooks, and reflections. A quantitative content analysis of the two groups, using a dynamic inquiry performances index, revealed that open inquiry students used significantly higher levels of performances in the criteria "changes during inquiry" and "procedural understanding." However, the study's results indicated no significant differences in the criteria "learning as a process" and "affective points of view." It is concluded that the implementation of dynamic inquiry performances during inquiry learning sheds light on the procedural and epistemological scientific understanding of students conducting inquiries.

Tural, Guner; Yigit, Nevzat; Alev, Nedim, (2009) studied that the Project work is the primary method which enables practicing the activities that contemporary learning theories suggest. The aim of the study was to determine the issues encountered during project work in accordance with students' and teachers' views in secondary schools physics courses in the city of Trabzon, Turkey where project work has been executed. Case study strategies were adapted using semi-structured interview protocols with five teachers and five students in three different secondary schools. The findings revealed that the students who designed their own projects lacked fundamental and experimental process skills such as "deciding on the project topic," "observation," "measuring and using the numbers," "drawing conclusion" and "organizing and writing a report." Issues such as time, availability of materials required in the project and consultancy needed have an effect on the process of project-based work. This study also indicated that students have not acquired the skills and knowledge of doing project-based work during their elementary education. Finally, the study illustrated that issues such as teacher pre-service and/or in-service training, cooperation among schools, university and other parts and support from local and national level are not enough to use project-based work in secondary schools, and thus it only depends on the school and teachers to utilize this mode of teaching of physics.

Wong, Kenson Kin Hang; Day, Jeffrey Richard, (2009) conducted a Comparative Study of problem based learning (PBL) and lecture-based learning (LBL) in Hong Kong secondary students' science achievement. The Secondary One students were divided into two groups: group A (n = 37), was taught two topics: "Human Reproduction" and "Density" through PBL; group B (n = 38) was taught the same topics by LBL. Multiple choice questions and short structured response items were used to assess students' academic performance. Pre and post tests were categorized into three domains: knowledge, comprehension and application according to Bloom's Taxonomy (Bloom 1956). The results of this study suggested first that PBL is at least as effective as LBL in gaining the knowledge required to achieve the syllabus' learning objectives; secondly, the PBL group showed a significant improvement in students' comprehension and application of knowledge over an extended time. Seemingly, PBL was favored for knowledge retention compared to a more conventional teaching approach, by these early adolescent children in Hong Kong. It was suggested that an ongoing longitudinal study on students' interactions wouldl further determine whether students taught through PBL developed improved learning in relation to high order skills, in a local situation which still tends to focus on factual recall but where higher skills are being demanded by systemic reform.

Rojas-Drummond, S. M; Albarran, C. D.; Littleton, K. S., (2008) conducted a study about the collaboration, creativity and the co-construction of oral and written texts. In this study the authors explored how primary school children "learn to collaborate" and "collaborate to learn" on creative writing projects by using diverse cultural artefacts--including oracy, literacy and ICT. Initially some key socio-cultural concepts were reviewed which served as a theoretical framework for the research reported. Secondly, the context in which the children talked and worked together to create their projects was described. This context is a "learning community" developed as part of an innovative educational program with the aim of promoting the social construction of knowledge among all the participants. Later on a micro genetic analyses of the quality of the interaction and dialogues taking place as peers worked together on their projects, and how these collaborative processes and uses of the mediational artifacts were taken up by the children were presented. In order to exemplify these processes, the analyses were centered on selection of examples of dialogues, texts and multimedia products of stories created by groups of fourth grade (9-10 years old) children. Overall, the work revealed the dynamic functioning in educational settings of some central socio-cultural concepts. These socio-cultural concepts included co-construction; intertextuality and intercontextuality amongst oracy, literacy and uses of ICT; collaborative creativity; development of dialogical and text production strategies and appropriation of diverse cultural artifacts for knowledge construction.

Martin-Hansen, Lisa M., (2005) described a way of incorporating an inquiry approach to teaching by refining a crayfish unit originally found in an ESS (Elementary Science Study) module. The researcher used a “coupled-inquiry” approach, a combination of guided-inquiry and open-inquiry, with an application used for assessment purposes. In five or six class periods using a few, easy-to-find materials, students can investigate crayfish in the classroom. It was sought to have students learn both process and content skills through both a guided and an open-inquiry approach. Later, the same investigations were used with the eighth-grade life science students and even with the college-level pre-service teachers. It was found that all the students marveled at the behavior of the small, broken lobster-like creatures. The author found that the coupled-inquiry model was useful in achieving the teaching objectives while enabling the students to design their own investigations.

Ekpo, Johnson, (1991) aimed at assessing safety skills and practices in chemistry as perceived by senior secondary and secondary students in Nigeria through student's self-evaluation technique. The main objectives of the study were (i) to assess the Chemistry laboratory safety skills by students and (ii) to assess the chemistry laboratory safety practices adopted by students. The sample of the study comprised 300 senior secondary students from 30 randomly selected secondary schools in Akwa, Ibom State. A questionnaire was formulated and administered in this study. The collected data were analyzed statistically using percentages and means. The major findings were (i) The study indicated that more than 70% of the students failed to protect their eyes, face, hands and even their body. (ii) They did not wear aprons and gloves while engaged in chemical experimentation. (iii) They had poor knowledge about identified emergency facilities and equipment. (iv) It also revealed the evidence of poor experimental techniques.

Price, Suzanne M., (1989) identified three variables influencing a recurring problem for science teachers that a high percentage of students do not participate in or completing a science research project. These three variables that have been influencing the problem are identified as follows (1) students' failure to engage in an active search for science research topics; (2) inadequate resource materials at the middle school level; and (3) students' failure to adequately research the topic prior to designing the experiment. Hence, software was created for the Apple IIe computer that assisted students in their search for research topics. In addition to this, the software helped the students to conduct a literature search by offering research guidance. Finally, the software offered students some specific examples of experimental designs in the areas of science that interested them. The targeted students spent two weeks using the software and an additional three weeks completing the science research projects. The student progress was observed and recorded and an attitude survey was administered before and after the completion of the science research adventure. It was concluded that this practicum increased student motivation and interest in the science research project and resulted in higher participation in all phases of the research. The study also included the details about the purpose of the project, a brief literature review, a summary of the methods used, results, and recommendations. In addition to this the appendices included a copy of the student attitude surveys, statistics, a student guide, a teacher guide, correspondence and summary results.

2.2 Studies conducted in India in relation to Project Work

Mala, S. and Sumar, S., (2009) conducted a comparative study of attitude of government-aided schools and public schools science teachers towards project method. It was a survey design of study with a sample of 200 teachers. The data was collected through questionnaires and interviews. The major finding of the study was that there was no significant difference in the attitude of the science teachers with respect to gender, type of the school and the teaching experience. But there was a significant difference in the attitude of science teachers towards project method taking secondary classes and senior secondary classes.

Smita, V. P. and Manjula, P. Rao, (2009) designed and conducted an experimental study on the effectiveness of guided discovery learning on critical thinking of secondary school students. The objective of the study was to find out the effectiveness of the guided discovery learning on critical thinking of secondary school students. The instruments for this study consisted of the Standard Progressive Matrices Test-SPMT (Raven, 1958) for measuring intelligence and a Critical Thinking Test constructed by the investigator adopting the cognitive skills given in the Delphi Report (1990). The major findings of the study revealed that guided discovery learning is more effective than conventional teaching in developing critical thinking of secondary school students. It was also found that boys and girls are equally benefited from guided discovery learning. During this study it was observed that, for effectively implementing guided discovery learning, the teacher student ratio should be kept less, preferably 20-25 students per class; also teacher preparedness should be very high. The study indicated that critical thinking could be improved in students through appropriate classroom techniques and teaching methods such as the teacher deliberately focusing on development of critical thinking of students and adopting strategies that promote critical thinking. The classroom culture and interaction levels could have an effect on the development of critical thinking abilities and they could be the subjects of further research.

Kasinath, H. M., (2000) studied the effectiveness of Inquiry Method of teaching science in fostering science process skills, creativity and curiosity. The purpose of this study was to compare the Inquiry Training Method (ITM) and Conventional Method (CM) of teaching science in fostering science process skills, creativity and curiosity of the learners. ITM and CM were taken as independent variables. A sample of 72 students of grade IX were divided into experimental and control group using intelligence as the control variable. The data was collected using science process skills test, verbal test of creative thinking and curiosity test. The pretest-post test parallel design was used. The experiment was carried out for a period of three months. Two-way analysis of variance was carried out. T-test was used to study the difference between two groups where necessary. ITM of teaching science was found to be more effective than CM in fostering science process skills, creativity and curiosity of the students.

Umashree, P.S., (1999) conducted a study on science curriculum and its transaction. It was an exploratory study in secondary schools of Vadodara, Gujarat. The researcher has made efforts to explore the curriculum transaction in science classes, indicating that-lecture method was used in 70% of cases, lecture cum discussion method in 10% and lecture cum activity teaching strategy in 6% of the cases. Non-conventional approaches were observed in the remaining 14% of the classes i.e., reading aloud, a brief explanation and silent reading. The instructional activities operating in the secondary schools at Vadodara in the classroom transaction were centered on the textbook. The instructional strategy in the intended objectives focused on the child centered, activity based learning approach, and with the teacher acting as a facilitator. But in none of the classes under observation, problem solving or enquiry based teaching have been noticed. Learners were not assigned any project work.

Prabha, Rashmi, (1992) investigated the effectiveness of programmed mathematics in relation to some socio-academic variables. The main objective was to seek the relationship between achievement in mathematics through programmed text and through the traditional method of teaching and to see whether the parental education, profession, income and caste affected achievement through programmed text. The sample consisted of 217 secondary final year students studying in two randomly selected schools of Patna. A critical test was used for collection of data. It was found that the performance of the programmed text group was better than the traditional method group. The programmed text group was found to be significantly better than the traditional method group. The parent's education, income and caste significantly affected the achievement in mathematics through programmed text.

Shishta, Rama, (1990) conducted an investigation into the effectiveness of guided discovery learning vis-à-vis the conventional approach to the teaching of scientific concepts in life sciences conceptually rather than factually. The objectives of the study were: (i) to identify through analysis of subject-matter, conceptual hierarchies of the concepts of leaf photosynthesis, food chain, purification of air, balance of nature and to identify behavior specifications of each objective for teaching each concept, (ii) to develop a program which would help to encourage curiosity and spirit of inquiry amongst the students about the world in which they live, and (iii) to compare the scholastic performance of concept achievement of pupils who undergo a teaching program based on guided approach of teaching scientific concepts in biology with pupils who undergo the conventional type of program. The sample consisted of class VII students belonging to the Delhi Public School, T.K.Puram, New Delhi. Advanced Progressive Matrices and Achievement Test were used to collect the data. The major findings of the study were (i) it was observed that the performance in achievement test of the experimental group was superior to that of the control group on the concept of photosynthesis, (ii) it appeared that the treatment of teaching concepts of photosynthesis with blended strategies and different modes of teaching had brought significant difference in the achievement of biological concepts.

Alexander, P., (1989) investigated the problems of typical teaching behaviors of science teachers at higher secondary levels and to know whether they revealed the essential teaching behaviors necessary for effective science teaching. The sample was studied using the observation schedule. It was found that the most occurred behaviors in the science class were explaining, illustrating, asking lower order questions, repeating, classifying and comparing, the students observing and the teachers responding. The least occurred behaviors were appreciating, responding to students' questions, showing exhibits, specimens, displaying models or charts and labeling parts. There was more teacher-talk and less student-talk in the class.

Sundararajan, S., (1988) evaluated the teaching of biology at the higher secondary stage in Tamil Nadu. The main objectives of the study were (i) to determine the extent of awareness as well as the realization of the objectives of teaching biology, (ii) to find the teaching strategies employed, (iii) to identify the teaching model used, (iv) to find the problems faced by the teachers in their teaching of biology, (v) to determine the adequacy of the practical activities organized for the +2 stage biology students and (vi) to evaluate the physical facilities available in schools for the teaching of biology. The sample of the study comprised of 1,000 higher secondary students covering 520 boys and 480 girls selected from South Arcot. The sample also includes 278 biology teachers and 60 experts. The tools used in the study included a Questionnaire, a Perception Scale, an Inventory of Physical Facilities, an Opinionnaire, an Achievement Test and an Attitude scale. The major findings included the hierarchy of giving importance to knowledge, understanding, application and skills. The teachers were found to follow expository type of teaching strategies in teaching of biology. They did not encourage discussion among the students and other student centered teaching techniques. The biology laboratories were in a bad shape. A full complement of chemicals and equipment were not found in many schools and they did not have essential teaching aids, too.

Dighal, K. C., (1985) did a study for improving methods of teaching biological sciences in schools of Tripura and West Bengal. The objectives of the study were (i) to explore how to make life science teaching lively, realistic and interesting to the students, (ii) to attempt scientifically the improvement of the present methods, (iii) to remove drudgery in the teaching of biological science, and (iv) to prepare better method, which was an extraction from existing methods, and more scientific and refined. The sample consisted of 500 students of class IX from five schools, four in Tripura and one in West Bengal. The tools used were two questionnaires. The design of the study was a survey and it was comparative in nature. The statistics used were graphical representations and product-moment correlation. The major findings of the study were (i) There was a significant difference in the effectiveness of 'self activity method', 'life science club method', and 'audio-visual method'. (ii) Two of three methods when combined, formed an improved one on the basis of their similar nature. Combination of methods could be made according to the needs of a teacher. (iii) Preparation of charts and models, collection of specimens through local excursions, organization of science exhibitions by the students, arrangement of film shows by the school and orientation programs for life science teachers brought better results.

Gangoli, S. G., and Gurumurthy, C., (1985) conducted a comparative study of the effectiveness of open-ended approach of doing physics experiments versus traditional approach at higher secondary stage. The specific objectives were to compare knowledge and understanding in learning concepts, principles, facts, and development of observational skills. This was an experimental study. The students were allocated to the experimental and control groups after matching them on variables of intelligence, SES scale, creativity test, achievement test. The sample of the study consisted of 92 students selected from two colleges of Mysore city. The tools used to get the data were: Baqer Mehdi's Creativity Test, Raven's Progressive Matrices, Kuppuswamy's SES scale and achievement and skill tests developed by the investigator. The major findings were the students of guided open-ended group showed better performance in achievement tests and skill tests than those of the traditional laboratory group. The students of experimental group were found to be superior to students of the control group. In both the groups, girls were found to be superior to boys.

Natarajan, M. R., (1983) worked for the Evaluation of District Level Science Fair and Educational Exhibitions, SCERT, Andhra Pradesh. The objectives of the study were (i) to evaluate the organization of district level science fairs in the districts of Andhra Pradesh and (ii) to evaluate the achievement of the objectives of the science fairs and exhibitions organized at district level. The study was a survey of opinions of teachers and students who participated in the school science fairs and exhibitions organized in 12 different districts of Andhra Pradesh. A sample of 200 teachers and 400 students of different schools were taken. They were administered two questionnaires. The first questionnaire for teachers was to know their opinion about the science fairs and educational exhibitions in which they had participated. The second questionnaire for students was to know their opinions about the benefits of the science fairs and educational exhibitions to which they had gone as observers or participants. The findings of the study were (i) Many students felt that they were benefited from the books of science and the efforts made in the organization of science fairs. (ii) Students felt that these fairs not only motivated them but also motivated their teachers to use innovations in the classroom. (iii) Teachers as well as students felt that the science fairs helped in using local resources easily. (iv) With the science fairs and organization of exhibitions, the teacher-student interaction and participation of both teachers and students increased. (v) The science fairs and exhibitions helped in building rapport among administrators, teachers and pupils. (vi) With the organization of science fairs cognitive insight of teachers and pupils increased. (vii) Teachers expressed that the scheme was good and it helped them to make their teaching easier for pupils. (viii) In case of organizational aspects of science fairs, 66 percent of teachers opined that winners should be given certificates but most of them favored that participants should be provided scholarships. (ix) Pupils, teachers and organizers were of the view that there was a need for separate committees for arrangement of science fairs and a different committee was required for speedy judgment.

Mohammad Miyan, (1982) conducted a study to examine the effectiveness of methods of teaching mathematics in developing mathematical creativity. The objectives of the study were to find the comparative effectiveness of methods of teaching on mathematical creativity, convergent and divergent thinking components. Students of class IX of a Kendriya Vidyalaya, New Delhi comprised the sample. The guided discovery method was most effective in enhancing originality as compared with the 'tell and do' and the pure discovery methods.

Mukhopadhyay, M., and others (1981) worked on the Polytechnic Curriculum Evaluation Project in Gujarat. The project had three sets of objectives pertaining to objectives and contents, teaching-learning process, and resource needs and utilization. The main objectives were to assess the awareness of teaching-learning innovations in teachers, to determine the teaching strategies used by teachers in classrooms, laboratories, workshops and project works, to identify problems in using new teaching-learning strategies/techniques and suggest measures to improve the implementation of the curriculum and to determine the training needs of teachers in innovative teaching-learning strategies/techniques. The study was conducted on engineering courses. The teachers and the students responded to the evaluation instrument which contained both structured and open-ended items. The data were tabulated and subjected to descriptive analysis and the results were presented primarily through descriptive tables. The major findings of the project were (i) about

74 percent teachers used demonstration method, 31 percent used project method, 33 percent used case studies in teaching, 19 percent used seminars, 17 percent used games and simulation, (ii) there was a need to train more teachers in project methods and case study approaches.

SCERT, Andhra Pradesh, (1980) undertook an Evaluation Study of State Level Science Fair and Educational Exhibition. The objectives of the study were (i) to examine the science fair and educational exhibition with a view to evaluating creativity, (ii) to evaluate the science fair and educational exhibition from the point of view of organizers, teachers and participant pupils, and (iii) to assess the effectiveness of the science fair and educational exhibition from the point of view of teachers and students with respect to attainment of new knowledge and using innovations in teaching. The study was conducted with a sample of ten organizers, 60 teachers and 200 pupil participants. They were administered different questionnaires. The questionnaire for organizers was used to know about the organization of the science fair. The questionnaire for teachers and pupils was used to know about the theme and use of the science fair. The sample organizers were also asked to observe the creativity level of the participants in the science fair. The findings of the study were (i) More than 50 percent teachers felt that the main themes selected for the science fair for high school and upper primary classes were clearly brought out. (ii) Almost all participant pupils felt that the science fair was helpful to clarify their understanding of various concepts in science. (iii) The organizers felt that creativity of the pupils was fully exhibited in the science fair. They also opined that creativity was more in physical sciences than in life sciences. (iv) The teachers felt that the science fair was helpful in bringing our creative talent among the students. (v) The innovations brought out in the science fair were of high standard. (vi) The teachers felt that the prizes given in the science fair were not adequate. (vii) The pupil participants felt that the criteria of judgment were suitable and appropriate. (viii) The organizers indicated that students who showed their talent in the state level exhibition should be given extra coaching by the state to compete for science talent examinations held at national level. (ix) The organizers and the teachers felt that the science fair was very effective as the students were able to learn many new concepts which otherwise could not be easily clarified in the classroom. (x) The pupil participants felt that after the science fair the teachers used many new methods of teaching to teach concepts in science.

Adinarayan, K., (1979) developed a teaching strategy for developing appropriate skills required in students for conducting scientific investigations. The objectives of the investigation were (i) to construct learning packages suitable for average children in an ordinary classroom situation, (ii) to determine the advantages and effectiveness of learning through the packages by individual and groups, (iii) to extend the study of the classroom situation and evaluate the outcomes (iv) to obtain evidence concerning the ability of Standard VII children to conduct simple scientific investigations in a laboratory situation. The sample consisted of students of Standard VII in the age group 11+. The data were collected with the help of the individual record sheets, revision data sheet and error sheet prepared to modify the learning packages, criterion tests for four units prepared to measure the development of skills, performance test and checklist prepared to measure students' competence in conducting investigations and reaction and attitude scales. The obtained data were analyzed using t-test. The major findings of the investigation were (i) at the demonstration phase the performance of the experimental group taught through the learning packages was significantly better than that of the control group taught by the conventional method, (ii) The effectiveness of learning through the packages did not differ from unit to unit when examined in terms of knowledge acquisition but differed significantly when examined in terms of knowledge and development of skills, (iii) The development of laboratory skills was not uniform, (iv) The students had favorable reactions towards learning packages.

Jha. I., (1979) designed a study to test experimentally the relative effectiveness of various methods of teaching biology. The study was conducted on class X government girls' high school students in Patna. The three groups formed from the sample were taught each with the demonstration method and the activity method and the third group was as control. The main finding of the study was that there was strong evidence in favor of activity-based approach in teaching school science with respect to the acquisition of knowledge, application of the scientific knowledge and development of scientific skill.

Muddu, V., (1979) conducted a study to know the prevalent status of instructional procedures in Biology in High Schools. The objectives of the study were (i) to evaluate the facilities provided to teachers, such as laboratories, audio-visuals, etc., (ii) to find out the type of instruction adopted in teaching biology and in accordance with concepts envisaged in the syllabi, and (iii) to find out the extent to which the instructional procedures met the demands of biology syllabi in the process of reorganizing the scheme of secondary education. The study was designed as a quantitative empirical study. The sample consisted of teachers of 120 high schools teaching biology in Classes VIII, IX and X of the twin cities of Hyderabad and Secunderabad. The variables involved in the investigation were (a) the present status of instructional procedures followed by teachers in biology teaching, (b) the adequacy of classroom instruction to effect behavioral changes in students, and (c) adequacy of the laboratories, reading materials, extra-curricular activities, etc., in secondary schools. A questionnaire was prepared and administered to the selected teachers. Percentages were computed to process the data. Analysis of the data revealed (i) 59% of the teachers stated they did not have adequate classrooms to teach biology. For 85% of the teachers, instructional procedures followed by them were not according to the aims and objectives of biology teaching. This was due to non-availability of adequate teaching aids. (ii) Most of the teachers preferred only the lecture-demonstration method. (iii) Facilities of reference books, informative pamphlets, magazines and general books on biology were not adequately available in school libraries. (iv) In 70% of the schools there were no separate laboratories for biological sciences and in 30% schools there were improvised laboratory facilities for biological instruments. (v) Teachers expressed their difficulty in conducting demonstrations and practicals in biology, because of the absence of adequately equipped laboratories, lack of leisure periods and over-crowded classrooms. (vi) Tools such as demonstration tables, bulletin board, etc., were in poor condition and were rarely used in biology instruction; availability of the teaching aids like filmstrips, projectors, microscopes, etc., were very inadequate.

Rajput, J. S., Gupta, V. P., and Vaidya, N., (1978) conducted a survey on the role of laboratories in the basic education of science as perceived by the science teacher. It intended to analyze the objectives and realization of laboratory work, time allotment for laboratory work in each subject, the assistance in the conduct of laboratory work by trained laboratory attendants and the problems in conduction of laboratory work. The study was conducted on teachers from Madhya Pradesh, Gujarat and Maharashtra. A questionnaire was developed to collect data. The main findings of the survey were (i) The objectives of laboratory work outlined by the teachers were to verify facts taught in theory classes, to develop independent work among the students and to create interest in science, to prepare students for higher studies and ultimately to prepare good scientists for the country, to develop skills of handling the apparatus/equipments, to observe and critically think about the results, to develop the habit of reasoning, to avoid memorizing the subject, to create interest for research, to have clear understanding of the concepts of the respective subjects and to find limitations and drawbacks in the theory portion and to develop habit of doing systematic work. (ii) The major unwritten goal of laboratory was to prepare students for practical examinations held externally. (iii) Most of the schools had below average and varying percentages of water supply, gas supply, electric fittings or botanical garden. (iv) It was also found that the main problems faced by the teachers were: lack of free time for them to arrange for practical work, laboratory assistant being busy elsewhere, the poor quality of equipment and chemicals supplied by firms offering lowest quotations and disciplinary problems of students.

Sharma, N. D., (1978) conducted an experimental study of teaching natural sciences at the primary level in central schools. A survey was conducted to ascertain the existing position of teaching natural sciences at the primary level in the central schools, and to compare the effectiveness of different methods of teaching science at the primary school level. In the first part a 106 item questionnaire was used to collect data from the primary teachers of central schools. In the second part of the study examined, experimentally, the relative effectiveness of the self activity and guided activity. The results of the study were (i) Most of the teachers used traditional methods for teaching natural sciences. Some tended to make natural sciences teaching at this level activity-oriented. (ii) The teachers were not well equipped for teaching science at this level. (iii) It was admitted by most of the teachers that activity should be the basis of teaching natural sciences at the primary level. (iv) Guided activity was more effective than self activity in respect of concept formation, development of scientific attitude, acquisition of scientific knowledge, training in scientific skill and development of scientific attitude.

Pillai, K. K., (1970) sought to survey the various aspects of mathematics instruction in secondary schools of Kerala with the following objectives (i) to study the aims of teaching mathematics in the context of socioeconomic conditions; (ii) to study how far the syllabus in mathematics reflected the objectives sought; (iii) analysis of the content in mathematics textbooks; (iv) to study the methods and techniques followed in teaching mathematics; and (v)to study the professional preparation of the mathematics teachers. Data were collected through the study of literature in mathematics, mathematics textbooks, syllabus published by the Government of Kerala from time to time, and discussions carried out with various people connected with the teaching of mathematics. Questionnaires were administered to the heads of the institutions and the teachers of mathematics to collect information. The findings of the study revealed that (i) no syllabus published since 1932 gave objective of teaching mathematics but syllabi published in 1962 and 1964 gave the objectives of teaching mathematics in secondary schools; (ii) the syllabus framed reflected the objectives of teaching mathematics to a large extent though improvements are needed in certain areas; (iii) the mathematics syllabus followed in the secondary schools of Kerala is superior in certain respects when compared with the syllabus followed in Tamil Nadu and Andhra Pradesh but it is far below the level of the syllabus suggested by the NCERT; (iv) many schools do not have facilities to teach graph, lack in instrument boxes and other mathematical models; (v) reference books in mathematics are rarely found in the libraries of the schools; (vi) many teachers lack knowledge of modern trends in teaching mathematics and are not familiar with modern mathematics books and literature; (vii) seventy four percent of the teachers report that the curriculum is heavy in mathematics whole fifty eight percent feel that the methods followed do not inculcate the necessary enthusiasm and interest in the pupils.

Kamala Kanthan, T. S., (1968) attempted to find out the effectiveness of the two specific methods of teaching i.e., the traditional (conventional) or problem solving methods. The aim of the study was to find the gain in retention of knowledge and abilities. The sample consisted of 32 students of class X, who were selected based on pre test. The students were divided into two groups with sixteen students in each and were designated as experimental and control groups. The control group was taught by the traditional method. The experimental group was taught by the problem solving method. The study gave the finding that from the point of view of objectives and the end-products of science teaching, the problem-solving method had positive favorable points as compared to the traditional method of teaching.

Patole, N. K., (1967) has undertaken a study to explore the existing weaknesses of teaching science in primary schools and devise methods for improvement in the existing situation. The objectives of the study were (i) to study the existing facilities available for teaching of science in rural primary schools; (ii) to frame general science syllabus for standards to I to VII; (iii) to study the effectiveness of activity based method and traditional method of teaching the subject; (iv) to suggest measures which can help improve the teaching of science in rural primary schools. A sample of 100 schools was taken and a questionnaire was given to schools. A teacher questionnaire was given to 550 teachers and also to 550 trainees in selected primary training colleges to find out their difficulties in implementing the syllabus, methods they follow, etc. Spot observation study was made in 51 schools. An effort was to evolve general science syllabus for classes I to VII based on the criteria like pupils' interest and needs of the society. The method of teaching science was studied by the controlled group technique. The experimental group performed well and the difference in the performances of the two groups was significant. The important findings of the study in relation to the present topic are only ten schools possessed a complete set of equipment for the practical demonstration of experiments; none of the schools had a separate science room; none of the schools subscribes to any periodical devoted to scientific knowledge and information; the activity based method was found superior to the traditional one.

2.3 Analytical study of the reviewed literature

The analytical review of the literature helped to gain a general outlook and formed a base to rationalize the present study. The detailed analyses of the literature lead the investigator to raise certain review questions like who the researcher/s were, what the type of the research carried on by them was, what the level of study was, what the nature of the sample was, which the tools utilized in the study were, what the area of focus of study was and what the findings and the conclusions were.

Keeping in view the objectives and focus of the present study, a total of **42** studies are reviewed and presented. An attempt is made to find the focus of the reviewed research studies. After a detailed analytical study of the reviewed related literature, the studies are tabulated and described. A discussion is also carried on with reference to the methodology of studies reviewed. The major findings, conclusions and suggestions which are in the purview of the present study are implied to locate the research gaps and arrive at a rationale.

Tabulation of all the reviewed studies is based on the following criteria:

- **List showing year-wise classification and the number of researches reviewed**
- **List showing the classification of studies based on the type of the research and the number of research studies**
- **List showing the classification based on the level of the study and the number of studies**
- **List showing the classification based on the nature of the sample and the number of studies**
- **List showing the classification of studies based on the nature of the tool or technique used in India, abroad and in toto**
- **List showing the classification based on the focused areas of the study and the number of research studies**

In order to have a comprehensive and a holistic perspective, the focused areas of studies were further categorized as follows:

- **Commonly focused areas of reviewed literature conducted abroad and in India**
- **Independently focused areas of reviewed literature conducted abroad**
- **Independently focused areas of reviewed literature conducted in India**

Following the above criteria all the studies are displayed in the form of classification tables in the forthcoming sections.

The following table shows year-wise classification and the number of the researches reviewed.

Table No. 2.1

List showing year-wise classification and the number of researches reviewed

Sl. No.	Year	Number of the research studies					
		In India	%	Abroad	%	Total	%
1	2010	--	--	08	40	08	19.04
2	2009	02	09.09	08	40	10	23.80
3	2008	--	--	01	05	01	02.38
4	2005	--	--	01	05	01	02.38
5	2000	01	04.54	--	--	01	02.38
6	1999	01	04.54	--	--	01	02.38
7	1992	01	04.54	--	--	01	02.38
8	1991	--	--	01	05	01	02.38
9	1990	01	04.54	--	--	01	02.38
10	1989	01	04.54	01	05	02	04.76
11	1988	01	04.54	--	--	01	02.38
12	1985	02	09.09	--	--	02	04.76
13	1983	01	04.54	--	--	01	02.38
14	1982	01	04.54	--	--	01	02.38
15	1981	01	04.54	--	--	01	02.38
16	1980	01	04.54	--	--	01	02.38
17	1979	03	13.63	--	--	03	07.14
18	1978	02	09.09	--	--	02	04.76
19	1970	01	04.54	--	--	01	02.38
20	1968	01	04.54	--	--	01	02.38
21	1967	01	04.54	--	--	01	02.38
Total		**22**	**99.92**	**20**	**100**	**42**	**99.97**

From the above table it is known that **(42)** forty two research studies were reviewed which are in relation to the present study from the years 1967 to 2010. It is also observed from the above table that twenty two (22) studies from India and twenty (20) studies from abroad were conducted from 1967 to 2009 and 1989 to 2010 respectively. From 1989 to 2008 one to three studies were conducted per year. On the contrary eight studies were conducted in each year of 2009 and 2010. This indicates that there has been an increase in the number of studies related to the present study in the last two years. Prior to that the number of studies carried on was very scarce.

The following table depicts the classification of studies based on the type of the research and the number of research studies.

Table No. 2.2

List showing the classification of studies based on the type of the research and the number of research studies

Sl. No.	**Type of the research**	**Number of the research studies**					
		In India	**%**	**Abroad**	**%**	**Total**	**%**
1	Experimental studies	10	45	11	55	21	50
2	Survey designs	12	55	06	30	18	42.85
3	Case studies	--	--	03	15	03	07.14
Total		**22**	**100**	**20**	**100**	**42**	**99.99**

It is understood from the above table that 21 studies were conducted in experimental design, 18 in survey design and three in case study design.

The following table shows the classification based on the level of the study and the number of research studies.

Table No. 2.3

List showing the classification based on the level of the study and the number of studies

Sl. No.	Level of the study	Number of the research studies					
		In India	%	Abroad	%	Total	%
1	Primary level	02	09.09	03	15	05	11.90
2	Middle level	02	09.09	01	05	03	07.14
3	Secondary level	15	68.18	13	65	28	66.66
4	Higher secondary level	03	13.63	02	10	05	11.90
5	College level	--	--	01	05	01	02.38
Total		**22**	**99.99**	**20**	**100**	**42**	**99.98**

From the above table it is learnt that 28 studies were conducted at secondary level and only one study at college level. The rest of studies conducted were five each at primary and higher secondary level and three at middle level.

The following table shows the classification list based on the nature of the sample and the number of research studies.

Table No. 2.4

List showing the classification based on the nature of the sample and the number of studies

Sl. No.	Nature of the sample	Number of research studies					
		In India	%	Abroad	%	Total	%
1	Teachers	06	27.27	03	15	09	21.42
2	Students	10	45.45	17	85	27	64.28
3	Teachers and students	06	27.27	--	--	06	14.28
Total		**22**	**99.99**	**20**	**100**	**42**	**99.98**

From the above table it is understood that a majority of the studies (27) were conducted on the student samples, nine studies were conducted on teachers and six studies were conducted on both the teachers and the students.

The following table details the classification of studies based on the number and the type of the tool or technique used in various research studies.

Table No. 2.5

List showing the classification of studies based on the nature of the tool or technique used in India, abroad and in toto

Sl. No.	Type of the tool or technique	Number of the tools used					
		In India	%	Abroad	%	Total	%
1	Questionnaire	10	25.64	02	08.69	12	19.35
2	Observation	01	02.56	03	13.04	04	06.45
3	Interview/semi structured interview	01	02.56	04	17.39	05	08.06
4	Others	27	69.23	14	60.86	41	66.12
Total		**39**	**99.99**	**23**	**99.98**	**62**	**99.98**

From the above table it is known that questionnaires were used a majority of (12) times followed with interviews and observations. In addition to this 41 other tools like creative thinking scale, log books, student attitude survey, curiosity test, critical test, advanced progressive matrices test, perception scale were also used. Altogether 62 different tools or techniques were used in these literature studies.

The following table depicts the classification based on the focused areas of study and number of the research studies reviewed.

Table No. 2.6

List showing the classification based on the focused areas of the study and the number of research studies

Sl. No.	Focused areas of the study	Number of research studies					
		In India	%	Abroad	%	Total	%
1	In relation to methods of teaching	11	50.00	09	45.00	20	47.61
2	In relation to the problems encountered during implementation of activity based methods of teaching/ projects	05	22.72	03	15.00	08	19.04
3	In relation to evaluation of the projects	03	13.63	02	10.00	05	11.90
4	In relation to curriculum transaction	01	04.54	--	--	01	02.38
5	In relation to development of teaching strategies	01	04.54	--	--	01	02.38
6	In relation to teaching learning process	01	04.54	--	--	01	02.38
7	In relation to uses of the projects	--	--	02	10.00	02	04.76
8	In relation to the orientation given to the teachers	--	--	01	05.00	01	02.38
9	In relation to the intrinsic motivation to the teachers and the students through projects	--	--	01	05.00	01	02.38
10	In relation to finding solutions in the context of completion of the projects	--	--	01	05.00	01	02.38
11	Preference of Science methods of teaching by the students	--	--	01	05.00	01	02.38
Total		**22**	**99.98**	**20**	**100**	**42**	**99.97**

From the above table it is understood that there were **11 focused areas** in the purview of the study which are relevant and imply to the present study under investigation and support its necessity for search. Out of these **11 focused areas** of study, **three (03)** areas are commonly focused in India and abroad, viz,

1. **In relation to methods of teaching**
2. **In relation to the problems encountered during implementation of activity based methods of teaching/ projects**
3. **In relation to evaluation of the projects**

Apart from this there are **five (05)** other areas of focused studies conducted independently abroad and are given as follows:-

1. **In relation to uses of the projects**
2. **In relation to the orientation given to the teachers**
3. **In relation to the intrinsic motivation to the teachers and the students through projects**
4. **In relation to finding solutions in the context of completion of the projects**
5. **Preference of Science methods of teaching by the students**

In addition to this there are **three (03)** other areas of focused studies which are exclusively conducted in India. They are given as under:-

1. **In relation to development of teaching strategies**
2. **In relation to curriculum transaction**
3. **In relation to teaching learning process**

The details of the focused areas of study are depicted through the following Venn diagram. The numbers of areas focused are represented within the parentheses.

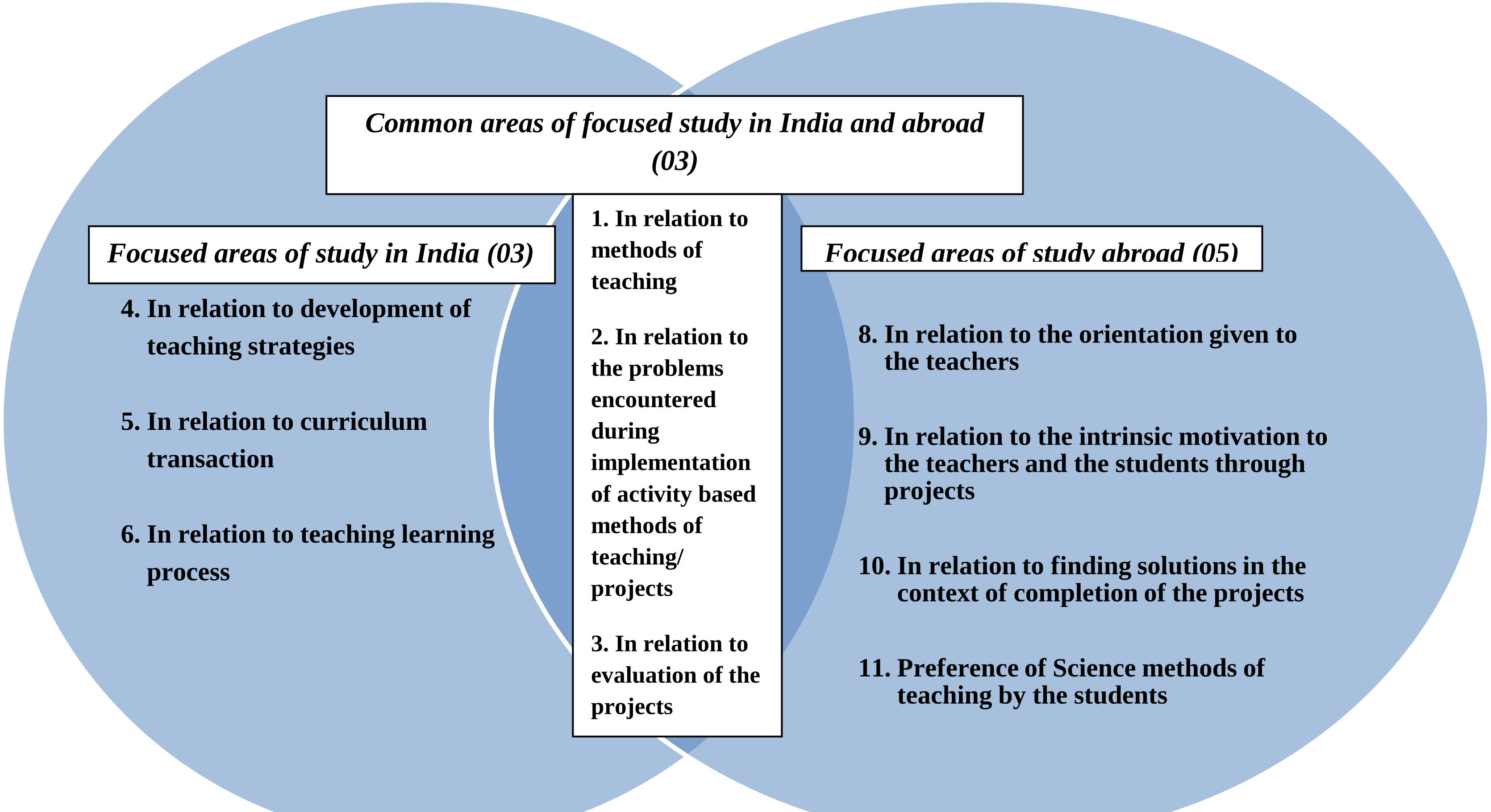

Figure 2.1
Venn diagram showing (11) focused areas of study

The tabulated analysis and the descriptive analysis of different focused areas of study are depicted under the following headings.

2.3.1 Commonly focused areas of reviewed literature conducted abroad and in India

The analysis of the research studies that are carried out abroad and in India focusing on common areas of study are displaced in tabular forms in the forth coming sections followed with discussion.

The following list shows the commonly focused areas of study abroad and in India and the number of research studies reviewed.

Table No. 2.7

List showing commonly focused areas of study abroad and in India and the number of research studies reviewed

Sl. No.	Commonly focused areas of study abroad and in India	Number of research studies					
		In India	%	Abroad	%	Total	%
1	In relation to methods of teaching	11	57.89	09	64.28	20	60.60
2	In relation to the problems encountered during implementation of activity based methods of teaching/ projects	05	26.31	03	21.42	08	24.24
3	In relation to evaluation of the projects	03	15.78	02	14.28	05	15.15
Total		**19**	**99.98**	**14**	**99.98**	**33**	**99.99**

From the above table it is depicted that there are **three (03)** areas that are commonly focused in India and abroad. These three areas are in relation to the methods of teaching, in relation to the problems encountered during implementation of activity based methods of teaching/ projects and in relation to the evaluation of projects with 20, 08 and 05 number of studies respectively.

2.3.1.1 In relation to methods of teaching

The review of literature shows that there are **20** studies, focusing their study in relevance to innovative approaches in various methods of teaching. Out of these **11** studies are from India and **09** are from abroad. All these studies are discussed with reference to the methodology of the reviewed studies in the forthcoming sections.

The following table shows the classification of studies in the focused area of methods of teaching.

Table No. 2.8

List of the reviewed studies based on the focused area of methods of teaching

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
1	**Bell, Stephanie, (2010)**	Project-Based Learning for the 21st Century: Skills for the Future	To study the effect of an innovative approach to learning that teaches a Project-Based Learning for the 21st Century: Skills for the Future	Experimental design	Students	***NA**	Students derive their own learning through inquiry. They work collaboratively to research and create projects that reflect their knowledge.
2	**Chang, Ling-Chian; Lee, Greg C. (2010)**	A Team-Teaching Model for Practicing Project-Based Learning in High School: Collaboration between Computer and Subject Teachers.	To study the effect of Project-Based Learning as a means of motivating students to learn independently	Experimental study	High school students	***NA**	During the study no class time was lost, and the subject teacher successfully conducted PBL activities. The students enjoyed the PBL activities.
3	**Kanter, David E (2010)**	Doing the Project and Learning the Content: Designing Project-Based Science Curricula for Meaningful Understanding.	To design a performance Project-Based Science Curricula (pPBSc) for Meaningful Understanding.	Experimental design	Middle grade students	***NA**	The findings provide a preliminary evidence that a performance project-based science curricula (pPBSc) incorporating these design approaches is consistent with gains in meaningful understanding.

*NA-Not available

Table No. 2.8 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
4	**Pascaul, R. (2010)**	Enhancing Project-Oriented Learning by Joining Communities of Practice and Opening Spaces for Relatedness. A multimodal approach for deep learning and social impact of the educational process	To maximize opportunities for students to share their knowledge with practitioners by joining communities of practice, and to increase their intrinsic motivation by creating conditions for student's relatedness.	Case study	College level students	(a) The development of a web-based decision support system, (b) meetings between the communities of students, maintenance engineers and academics, and (c) new off-campus group instances.	A successful achievement of the educational goals.
5	**Williams, Ashleym (2010)**	The environmental education and education for sustainability projects: inspiring and facilitating implementation.	To present ways in which environmental topics can be implemented in schools through local environmental action projects.	Experimental design	School students	Interviews and personal observations of the projects	When students are taught the skills they need to make a change for the environment and are engaged in environmental project based learning projects, they feel empowered and more ready to make a change.
6	**Zimmerman, Daniele C. (2010)**	The Project based learning for life skill building in 12th grade social studies classrooms	To help educators discern the value of Project based learning for life skill building as an instructional strategy.	A case study	Grade 12th students	Observation	The PBL method is successful in teaching and building life skills in high school classrooms, and is able to better prepare students for life after secondary education.

Table No. 2.8 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
7	**Sadeh, Irit; Zion, Michal, (2009)**	The Development of Dynamic Inquiry Performances within an Open Inquiry Setting: A Comparison to Guided Inquiry Setting	To compare the influence of open versus guided inquiry learning approaches on dynamic inquiry performances.	Experimental design	High school students	Interviews, students' inquiry summary papers, log books, reflections	Open inquiry students used significantly higher levels of performances in the criteria "changes during inquiry" and "procedural understanding". There were no significant differences in the criteria "learning as a process" and "affective points of view."
8	**Wong, Kenson Kin Hang; Day, Jeffrey Richard, (2009)**	A Comparative Study of Problem-Based and Lecture-Based Learning in Junior Secondary School Science	To compare problem based learning (PBL) and lecture-based learning (LBL) in Hong Kong secondary students' science achievement.	Experimental design	Secondary school Students	*NA	PBL is as effective as LBL in gaining the knowledge. The PBL group shows a significant improvement in students' comprehension and application of knowledge. PBL is favored for knowledge retention compared to a more conventional teaching approach.
9	**Martin-Hansen, Lisa M, (2005)**	Incorporating a coupled inquiry approach to teaching –a combination of guided-inquiry and open-inquiry	To make students learn both process and content skills through coupled inquiry approach	Experimental design	Primary, secondary and college level students	*NA	The coupled inquiry model was useful to achieve the teaching objectives while enabling the students to design their own investigations.

*NA-Not available

Table No. 2.8 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
10	**Mala, S. and Sumar, S. (2009)**	Attitude of government-aided schools and public schools science teachers towards project method	To conduct a comparative study of attitude of government-aided schools and public schools science teachers towards project method.	Survey design	Teachers	Questionnaires and interviews	There was no significant difference in the attitude of the science teachers with respect to gender, type of the school and the teaching experience. But there was a significant difference in the attitude of science teachers towards project method taking secondary classes and senior secondary classes.
11	**Smita V.P. and Manjula P.Rao (2009)**	Effectiveness of guided discovery learning on critical thinking of secondary school students	To find out the effectiveness of the guided discovery learning on critical thinking of secondary school students	Experimental design	Secondary school students	Standard Progressive Matrices Test, Critical Thinking Test	Guided discovery learning is more effective than conventional teaching in developing critical thinking of secondary school students. It was also found that boys and girls are equally benefited from guided discovery learning.
12	**Kasinath, H.M. (2000)**	The effectiveness of Inquiry Method of teaching science in fostering science process skills, creativity and curiosity	The purpose of this study was to compare the Inquiry Training Method (ITM) and conventional Method (CM) of teaching science in fostering science process skills, creativity and curiosity of the learners.	Experimental study	IX Class students	Science process skills test, verbal test of creative thinking and curiosity test.	ITM of teaching science was found to be more effective than CM in fostering science process skills, creativity and curiosity of the students.

Table No. 2.8 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
13	**Prabha, Rashmi (1992)**	The effectiveness of programmed mathematics in relation to some socio-academic variables	To seek the relationship between achievement in mathematics through programmed text and through the traditional method of teaching. To focus on the education of the parents and its influence on learning.	Experimental design	Secondary final year students	Critical test	The performance of the programmed text group was better than the traditional method group. The parent's education significantly affected the achievement in mathematics through programmed text.
14	**Shishta, Rama. (1990)**	An investigation into the effectiveness of guided discovery learning vis-à-vis the conventional approach to the teaching of scientific concepts in life sciences.	To investigate the effectiveness of guided discovery learning vis-a-vis the conventional approach to the teaching of scientific concepts in life sciences.	Experimental design	Class VII students	Advanced progressive Matrices and Achievement Test	(i) It was observed that the performance of the experimental group was superior to that of the control group on the concept achievement test in photosynthesis; (ii) it appeared that the treatment of teaching concepts of science with blended strategies and different modes of teaching had brought significant difference in the achievement of biological concepts.

Table No. 2.8 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
15	**Dighal, K.C., (1985)**	Improved method of teaching Biological Sciences in schools of Tripura and West Bengal	To explore how to make life science teaching lively, realistic and interesting to the students, (ii) to attempt scientifically the improvement of the present methods, to prepare better method, which was an extraction from existing methods, and more scientific and refined	Survey design	Class IX students	Questionnaire	There was a significant difference in the effectiveness of 'self activity method', 'life science club method', and 'audio-visual method'. 2 to 3 methods may be combined formed an improved one on the basis of their similar nature or according to the needs of a teacher. 3. Preparation of charts and models, collection of specimens through local excursions, organization of science exhibitions by the students, arrangement of film shows by the school and orientations programs for life science teachers brought better results.

Table No. 2.8 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
16	**Gangoli, S.G., and Gurumurthy, C., (1985)**	A comparative study of the effectiveness of open-ended approach of doing physics experiments versus traditional approach at higher secondary stage.	To compare knowledge and understanding in learning concepts, principles, facts, and development of observational skills.	Experimental study	Higher secondary stage students	Baqer Mehdi’s Creativity Test, Raven’s Progressive Matrices, Kuppuswamy’s SES scale, achievement and skill tests developed by the investigator	The students of guided open-ended group showed better performance in achievement tests and skill tests.
17	**Mohammad Miyan, (1982)**	A study to examine the effectiveness of methods of teaching mathematics in developing mathematical creativity	To find the comparative effectiveness of methods of teaching on mathematical creativity, convergent and divergent thinking components.	Experimental design	Class IX	*NA	The guided discovery method was most effective in enhancing originality as compared with the ‘tell and do’ and the pure discovery methods.
18	**Jha. I., (1979)**	An Experimental Comparison of Different Methods of Teaching High School Biology	To test experimentally the relative effectiveness of various methods of teaching Biology.	Experimental design	Class X students	ANCOVA, paired t-test	There was strong evidence in favor of activity-based approach in teaching school science with respect to the acquisition of knowledge, application of the scientific knowledge and development of scientific skill.

*NA-Not available

Table No. 2.8 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
19	**Sharma, N.D., (1978)**	An experimental study of teaching natural sciences at the primary level in central schools.	to ascertain the existing position of teaching natural sciences at the primary level in the central schools, and to compare the effectiveness of different methods of teaching science at the primary school level.	Experimental design	Teachers	Questionnaire	(i) Most of the teachers used traditional methods for teaching natural sciences. Some tended to make natural sciences teaching at this level activity-oriented. (ii) The teachers were not well equipped for teaching science at this level. (iii) It was admitted by most of the teachers that activity should be the basis of teaching natural sciences at the primary level. (iv) Guided activity was more effective than self activity in respect of concept formation, development of scientific attitude, acquisition of scientific knowledge, training in scientific skill and development of scientific attitude.
20	**Kamala Kanthan, T.S. (1968)**	An Experimental Study of Teaching Physics by the Traditional Problem-Solving Methods	To find the relative impact of problem-solving and traditional methods of teaching in students' gain in and retention of knowledge and abilities.	Experimental design	Class X students	*NA	The problem-solving method had positive favorable points as compared to the traditional method of teaching.

*NA-Not available

The above studies focused their attention on the area of methods of teaching. It is analyzed that these studies included project-based learning to build skill for the future (**Bell, Stephanie, 2010),** team teaching model for practicing project-based learning **(Chang, Ling-Chian; Lee, Greg C. 2010),** designing project-based curricula for meaningful understanding **(Kanter, David E 2010),** and a multimodal approach for deep learning and social impact of the educational process through project oriented learning **(Pascaul, R. 2010). Williams, Ashleym (2010)** worked for ways in which environmental topics can be implemented for sustainability projects. **Dighal, K.C., (1985)** searched for improved methods of teaching Biological Sciences in schools.

Apart from the above studies Project Based Learning was carried on for life skill building **(Zimmerman, Daniele C. 2010). Mala, S. and Sumar, S. (2009)** compared the attitude of government-aided schools and public schools science teachers towards project method of teaching. **Wong, Kenson Kin Hang; Day, Jeffrey Richard, (2009),** compared the Problem-Based and Lecture Based Learning in Junior Secondary schools. They suggested that an ongoing longitudinal study on students' interactions will further determine whether students taught through PBL develop improved learning in relation to high order skills, in a local situation which still tends to focus on factual recall but where higher skills are being demanded by systemic reform.

Other than this, **Sadeh, Irit; Zion, Michal, (2009)** conducted a study on the enquiry learning approaches like project-based learning focusing on its effectiveness over the other conventional methods of teaching and also suggested that the implementation of dynamic inquiry performances during inquiry learning may shed light on the procedural and epistemological scientific understanding of students conducting inquiries. **Martin-Hansen, Lisa M, (2005),** carried on field studies, field projects and worked on inquiry approaches of teaching to learn both process and content skills.

In addition to the above studies, **Smita V.P. and Manjula P.Rao (2009), Kasinath, H.M. (2000), Prabha, Rashmi (1992) Shishta, Rama. (1990) Gangoli, S.G., and Gurumurthy, C., (1985), Mohammad Miyan, (1982) Sharma, N.D., (1978)** compared the effectiveness of inquiry based or activity based approaches of teaching with the conventional methods in fostering science process skills, creativity and curiosity among the learners. These studies focused on the process of enhancing concepts in science and critical thinking skills.

2.3.1.2 In relation to the problems encountered during implementation of activity based methods of teaching

As depicted earlier in **table 2.7** and the corresponding list showing the commonly focused areas of study abroad and in India, there are **eight (08)** studies reviewed which focused their attention in concern with the challenges that are encountered during the implementation of activity based methods of teaching/projects. Out of these **eight studies, five (05)** researches are from India and **three (03)** are from abroad. The details of the same are displayed in tabular form followed with discussion.

The following table shows the classification of studies in relation to the problems encountered during implementation of activity based methods of teaching like project method.

Table No. 2.9

List of the reviewed studies focusing on the area of problems encountered in activity based methods of teaching

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
1	**Meerbaun-Salant, Orni; Hazzan, Orit, (2009)**	The Challenges in Mentoring Software Development Projects in the High School	To focus on the challenges in mentoring software development projects in the high school and to focus on difficulties encountered by Computer Science teachers according to Shulman's Teacher Knowledge Base Model	Survey design	High school students	Shulman's Teacher Knowledge Base Model	The main difficulties that emerged belong to the knowledge sources of Shulman's model like Content knowledge, pedagogical content knowledge (PCK) and knowledge of learners and their characteristics. Mentoring process is a complex task involving a variety of knowledge types, management activities and pedagogical aspects.
`2	**Tural, Guner; Yigit, Nevzat; Alev, Nedium, (2009)**	The Project work is the primary method which enables practicing the activities that contemporary learning theories suggest	To determine the issues encountered during project work in accordance with students' and teachers' views in secondary schools physics courses	Case study	Teachers and secondary school students	Semi structured interviews	The students who designed their own projects lacked fundamental and experimental process skills such as deciding on the project topic, observation, measuring and using the numbers, drawing conclusion and organizing and writing a report.

Table No. 2.9 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
3	**Price, Suzanne M, (1989)**	Completing a science research project using a software practicum	To focus on students' failure to engage in an active search for science research topics and to adequately research the topic prior to designing the experiment.	Experimental study	Students	Student attitude survey, a teacher guide and a student guide	The software practicum increased the student motivation and interest in the science research project and resulted in higher participation in all phases of research like searching for research topics, conducting a literature search by offering research guidance and by offering specific examples of experimental designs in the areas of science that interested students.
4	**Alexander, P. (1989)**	The problems of typical teaching behaviors of science teachers at higher secondary levels	To investigate the problems of typical teaching behaviors of science teachers at higher secondary levels	Survey design	Higher secondary level teachers	Observation schedule.	Most occurred behaviors in the science class were explaining, illustrating, asking lower order questions, repeating, classifying and comparing, the students observing and the teachers responding. The least occurred behaviors were appreciating, responding to students' questions, showing exhibits, specimens, displaying models or charts and labeling parts. There was more teacher-talk and less student-talk in the class.

Table No. 2.9 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
5	**Muddu, V., (1979)**	A Study of Prevalent Status Of Instructional Procedures in Biology in High Schools	To evaluate the facilities provided to teachers, such as laboratories, audio-visuals, etc., (ii) to find out the type of instruction adopted in teaching biology and in accordance with concepts envisaged in the syllabi, and (iii) to find out the extent to which the instructional procedures met the demands of biology syllabi in the process of reorganizing the scheme of secondary education.	Survey design	Teachers of high schools teaching biology	Questionnaire	59% of the teachers stated they did not have adequate classrooms to teach biology. For 85% of the teachers, instructional procedures followed by them were not according to the aims and objectives of biology teaching. This was due to non-availability of adequate teaching aids. (ii) Most of the teachers preferred only the lecture-demonstration method. (iii) Facilities of reference books, informative pamphlets, magazines and general books on biology were not adequately available in school libraries. (iv) In 70% of the schools there were no separate laboratories for biological sciences. (v)Teachers expressed their difficulty in conducting demonstrations and practicals in biology, because of the absence of adequately equipped laboratories, lack of leisure periods and over-crowded classrooms. (vi) Tools such as demonstration tables, bulletin board, etc., were in poor condition and were rarely used in biology instruction; availability of aids like filmstrips, projectors, microscopes, etc., were very inadequate.

Table No. 2.9 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
6	**Rajput, J.S., Gupta, V.P., and Vaidya, N., (1978)**	A Survey of Science Laboratories in the Western Region	To analyze the objectives and realization of laboratory work, time allotment for laboratory work in each subject, the assistance in the conduct of laboratory work by trained laboratory attendants and the problems in conduction of laboratory work.	Survey design	Science teachers	Questionnaire	The laboratory work outlined by the teachers was to verify the facts taught in theory classes, to develop independent work among the students and to create interest in science. The main problems faced by the teachers were: lack of free time for them to arrange for practical work, laboratory assistant being busy elsewhere, the poor quality of equipment and chemicals supplied by firms offering lowest quotations and disciplinary problems of students.

Table No. 2.9 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
7	**Pillai, K.K., (1970)**	A survey of teaching mathematics in Secondary Schools in Kerala	to study the aims of teaching mathematics in the context of socioeconomic conditions; to study the methods and techniques followed in teaching mathematics	Survey design	Heads of the institutions and teachers	Questionnaires	Many schools do not have facilities to teach graph, lack in instrument boxes and other mathematical models; reference books in mathematics are rarely found in the libraries of the schools; many teachers lack knowledge of modern trends in teaching mathematics and are not familiar with modern mathematics books and literature; seventy four percent of the teachers report that the curriculum is heavy in mathematics whole fifty eight percent feel that the methods followed do not inculcate the necessary enthusiasm and interest in the pupils.

Table No. 2.9 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
8	**Patole, N.K., (1967)**	A study of teaching of Science in rural Primary Schools—Standards I to VII	To explore the existing weaknesses of teaching sciences in primary schools and devise methods for improvement in the existing situation.	Survey design	Teachers, trainees, primary class students	Questionnaire	Only ten schools possessed a complete set of equipment for the practical demonstration of experiments; none of the schools had a separate science room; none of the schools subscribes to any periodical devoted to scientific knowledge and information; the activity based method was found superior to the traditional one.

The above studies in tabular form are discussed with reference to the methodology of the reviewed studies in the following paragraphs.

Tural, Guner; Yigit, Nevzat; Alev, Nedim, (2009), identified that the Project work is the primary method which enables practicing the activities that contemporary learning theories suggest. The focus of the study was to determine the issues encountered during the project work in accordance with students' and teachers' views in secondary schools physics courses. **Meerbaun-Salant, Orni; Hazzan, Orit, (2009),** tried to identify the challenges in mentoring software development projects in high schools and suggested that as mentoring process is a complex task involving a variety of knowledge types, management activities and pedagogical aspects, such a mentoring methodology should be defined for such complex tasks. **Price, Suzanne M, (1989**) established the effectiveness of a software practicum in completing a science research project and suggested that a software template creation would help students.

Alexander, P. (1989) examined about the problems of typical teaching behaviors of science teachers at higher secondary levels. **Rajput, J.S., Gupta, V.P., and Vaidya, N., (1978)** surveyed the Science Laboratories and **Pillai, K.K., (1970)** conducted a survey on teaching of mathematics in Secondary Schools. **Muddu, V., (1979), Patole, N.K., (1967)** explored the existing weaknesses of teaching sciences in primary schools and devised new methods for improvement in the existing situation.

2.3.1.3 In relation to evaluation of the projects

The third and the last area that was focused by the research reviewers was on evaluation methods in activity based methods of teaching/ projects. Out of f**ive (05)** studies reviewed in this area **two (02)** are from abroad and **three (03)** are from India. The details of these reviews are displayed in the following tables. The tabular form details are followed with discussion.

The following table shows the list of studies based on the evaluation methods in activity based methods of teaching/ projects.

Table No. 2.10

List of the reviewed studies based on the focused area of evaluation methods in activity based methods of teaching/ projects.

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
1	**Doppelt, Yaron, (2009)**	Infusing creative thinking competence through the design process of authentic projects by adopting new assessment methods	To infuse creative thinking competence through the design process of authentic projects by adopting new assessment methods	Experimental design	High school pupils	Creative thinking scales, observations of class activities, portfolio assessment and external matriculation assessment.	The pupils learned to document their design process. Second, pupils' projects demonstrated various levels of creative thinking skill. High-level documentation of the projects was found in pupils' portfolios.
2	**Ekpo, Johnson, (1991)**	Chemistry laboratory safety skill and practices: Student's self-evaluation in selected secondary schools in Akwa, Ibom State	(i) to assess the Chemistry laboratory safety skills by students and (ii) to assess the chemistry laboratory safety practices adopted by students.	Survey design	Senior secondary and secondary school students	Questionnaire	(i) The study indicated that more than 70% students failed to protect their eyes, face, hands and even their body too. (ii) They did not wear aprons and gloves while engaged in chemical experimentation. (iii) They had poor knowledge about identified emergency facilities and equipment. (iv) It also revealed evidence of poor experimental techniques.

Table No. 2.10 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
3	**Natarajan, M.R., (1983)**	Evaluation of District Level Science Fair and Educational Exhibitions, SCERT, Andhra Pradesh.	To evaluate the organization of district level science fairs in the districts of Andhra Pradesh and to evaluate the achievement of the objectives of the science fairs and exhibitions organized at district level.	Survey design	Teachers and students	Questionnaires	Many students felt that they benefited from the books of science and made use of their own efforts in the organization of science fairs. 2. Students felt that these fairs not only motivated them but also motivated their teachers to use innovations in the classroom. 3. Teachers as well as students felt that the science fairs helped in using local resources easily. 4. With the science fairs and organization of exhibitions, the teacher-student interaction and participation of both teachers and students increased. 5. The science of fairs and exhibitions helped in building rapport among administrators, teachers and pupils. 6. With the organization of science fairs cognitive insight of teachers and pupils increased. 7. Teachers expressed that the scheme was good and it helped them to make their teaching easier for pupils. 8. In case of organizational aspects of science fairs, 66 percent of teachers opined that winners should be given certificates but most of them favored that participants should be provided scholarships. 9. Pupils, teachers and organizers were of the view that there was a need for separate committees for arrangement of science fairs and a different committee was required for speedy judgment.

Table No. 2.10 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
4	**Mukhopadhyay, M. and Others (1981)**	The Polytechnic Curriculum Evaluation Project Gujarat.	The project had three sets of objectives pertaining to objectives and contents, teaching-learning process, and resource needs and utilization.	Survey design	The teachers and the students	Evaluation instrument	The major findings of the project were about 74 percent teachers used demonstration method, 31 percent used project method, 33 percent used case studies in teaching, 19 percent used seminars, 17 percent used games and simulation, there was need to train more teachers in project methods and case study approach and the instructional methods were not easily available.

Table No. 2.10 (Contd.)

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
5	**SCERT (Andhra Pradesh), (1980)**	Evaluation Study of State Level Science Fair and Educational Exhibition.	(i) to examine the science fair and educational exhibition with a view to evaluating creativity, (ii) to evaluate the science fair and educational exhibition from the point of view of organizers, teachers and participant pupils, and (iii) to assess the effectiveness of the science fair and educational exhibition from the point of view of teachers and students with respect to attainment of new knowledge and using innovations in teaching.	Survey design	Organizers, teachers and participant pupils	Questionnaires	1. More than 50 % teachers felt that the main themes selected for the science fair for high school and upper primary classes were clearly brought out. 2. Almost all participants felt that the science fair helped to clarify their understanding of various science concepts. 3. The organizers felt that creativity of the pupils was fully exhibited in the science fair and creativity was more in physical sciences than in life sciences. 4. The teachers felt that the science fair brought out creative talent among the students. 5. The innovations in the science fair were of high standard. 6. The teachers felt that the prizes given in the science fair were inadequate. 7. The pupil participants felt that the criteria of judgment were suitable and appropriate. 8. The organizers indicated that students who showed their talent in the state level exhibition should be given extra coaching by the state to compete for science talent examinations held at national level. 9. The organizers and the teachers felt that the science fair was very effective to learn many new concepts which otherwise could not be easily clarified in the classroom. 10. The participants felt that after the science fair the teachers used many new methods of teaching to teach concepts in science.

The above studies in tabular form are discussed with reference to the methodology of the reviewed studies in the following paragraphs.

Doppelt, Yaron, (2009), studied about infusing creative thinking competence through the design process of authentic projects requires not only changing the teaching methods and learning environment, but also adopting new assessment methods, such as portfolio assessment. It is also suggested that there is much to be learned about documenting teamwork and pupils' reflection. This research could assist researchers and teachers who are interested in assessing engineering education outcomes. **Ekpo, Johnson, (1991)** surveyed the Chemistry laboratory safety skill and practices and Student's self-evaluation in selected secondary schools.

Natarajan, M.R., (1983) and SCERT (Andhra Pradesh), (1980) evaluated the District Level and State Level Science Fair and Educational Exhibitions respectively. **Mukhopadhyay, M. and others (1981)** examined the Polytechnic Curriculum Evaluation Project Gujarat with three sets of objectives pertaining to objectives and contents, teaching-learning process, and resource needs and utilization.

2.3.2 Independently focused areas of reviewed literature conducted abroad

The reviews of the studies that are independently carried on abroad on different focused areas of study are analyzed, classified and presented in tabular forms. The tabular forms list the same and are presented hereunder.

Table No. 2.11

List showing independently focused areas of study abroad and the number of research studies reviewed

Sl. No.	Independently focused areas of the study abroad	Number of research studies	%
1	In relation to uses of the projects	02	33.33
2	In relation to the orientation given to the teachers	01	16.66
3	In relation to the intrinsic motivation to the teachers and the students through projects	01	16.66
4	In relation to finding solutions in the context of completion of the projects	01	16.66
5	Preference of Science methods of teaching by the students	01	16.66
Total		**06**	**99.97**

From the above table it is shown that there are **five (05)** focused areas of study among the reviewed studies that are conducted independently abroad. These areas of focused study are concerned with the utility of the projects; in relation to the orientation given to the teachers; in relation to enhancement of intrinsic motivation of the teachers and the students through projects; in relation to finding solutions in the context of completion of the projects; and in relation to the preference of Science methods of teaching by the students. There are two (02) studies in utility of projects and one in each of the other areas. The reviews for the above areas of focused study are presented in tabular forms followed with discussion.

2.3.2.1 In relation to uses of the projects

As shown in the **table number 2.11,** with the list showing independently focused areas of study abroad and the number of research studies reviewed**,** it is evident that among the **six (06)** studies that were carried on abroad, there are **two (02)** studies which focused their attention in the area of utility of projects. The following table shows the reviews on the basis of uses of the projects and the same is followed with discussion.

The following table shows the reviews on the focused area of uses of the projects.

Table No. 2.12

List showing the reviews on the focused area of uses of the projects

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
1	**Bahar, Mehmet, (2009)**	The relationships between pupils' learning styles and their performance in mini science projects	To investigate the relationship between pupils' learning styles and the degree of enjoyment of pupils with their performance in mini science projects	Experimental study	VIII grade students	The Grasha-Riechmann Learning Style Scale	Independent, competitive, and participant groups had relatively higher achievement scores and higher degree of enjoyment than the avoidant, dependent, and collaborative groups.
2	**Rojas-Drummond, S. M; Albarran, C. D.; Littleton, K.S. (2008)**	Collaboration, Creativity and the Co-Construction of Oral and Written Texts	To explore how primary school children "learn to collaborate" and "collaborate to learn" on creative writing projects by using diverse cultural artifacts--including oracy, literacy and ICT. To promote social construction of knowledge among the students.	Survey design	Fourth grade students	Micro genetic analysis of the quality of interactions and dialogues taking place among the peers	The work reveals the dynamic functioning in educational settings of central socio-cultural concepts like co-construction; intertextuality and intercontextuality amongst oracy, literacy and uses of ICT; collaborative creativity; development of dialogical and text production strategies and appropriation of diverse cultural artifacts for knowledge construction.

As stated earlier, only **two** (02) studies that are reviewed focused their attention in the context of utility of the projects.

Bahar, Mehmet, (2009), experimented on the utility of mini science projects in establishing the relationship between pupils' learning styles and their performance. The degree of enjoyment of pupils with their performance is also studied. **Rojas-Drummond, S. M; Albarran, C. D.; Littleton, K.S. (2008),** explored how primary school children "learn to collaborate" and "collaborate to learn" on creative writing projects by using diverse cultural artifacts like oracy, literacy and ICT. The study also focused on the promotion of collaboration, creativity and the co-construction of oral and written texts.

2.3.2.2 In relation to the orientation given to the teachers

It is evident from the **table number 2.11,** with the list showing independently focused areas of study abroad and the number of research studies reviewed, that only a single focused its attention in the area of orientation that should be given to the teachers for an effective implementation of the projects. The following table depicts this review in a tabular form followed with discussion.

The following table depicts the reviews on the basis of the orientation given to the elementary teachers in relation to implementation of projects.

Table No. 2.13

List showing the reviews on the basis of the orientation given to the teachers

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
1	**Bencze, John Lawrence, (2010)**	Promoting Student-led Science and Technology Projects in Elementary Teacher Education: Entry into Core Pedagogical Practices through Technological Design.	To provide student-teachers with expertise and motivation for promoting student-directed, open-ended project work.	Experimental design	Practicing elementary school teachers	***NA**	Self-efficacy for promoting project work increased significantly.

*NA-Not available

A **single** study was reviewed on the area of provision of orientation to the teachers in relation to implementation of projects.

Bencze, John Lawrence, (2010) conducted a study on pre service elementary teachers to orient them for Promoting Student-Led Science and Technology Projects through Technological Designs. The self-efficacy of the student-teachers was enhanced when they were provided with expertise and motivation for promoting student-directed, open-ended project work.

2.3.2.3 In relation to the intrinsic motivation to the teachers and the students through projects

As is clear from the **table number 2.11,** with the list showing independently focused areas of study abroad and the number of research studies reviewed, a single study focused its attention on the area of intrinsic motivation to the teachers and the students through projects. The following table shows the details of the same review followed with discussion.

Table No. 2.14

List showing the reviews on the area of development of intrinsic motivation amongst the teachers and the students

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
1	**Lam, Shuifong; Cheng, Rebecca Wingvi; Ma, William Y.K. (2009)**	The Teacher and the Student Intrinsic Motivation in Project-Based Learning	To study the relationship between the teacher and the student intrinsic motivation in Project-Based Learning.	Survey design	Secondary school teachers and their students	Questionnaire	Teacher intrinsic motivation predicted the student intrinsic motivation. When teachers reported higher intrinsic motivation in the program, their students tended to perceive receiving more support from them and to report higher intrinsic motivation in the learning experience.

A **single** study was reviewed in the area of providing intrinsic motivation to the teachers and the students through projects.

Lam, Shui-fong; Cheng, Rebecca Wing-vi; Ma, William Y.K. (2009) investigated the Teacher and Student Intrinsic Motivation in Project-Based Learning. The relationship between teacher and student intrinsic motivation in project-based learning was established. It was found that the teacher intrinsic motivation predicted the student intrinsic motivation.

2.3.2.4 In relation to finding solutions in the context of completion of the projects

As it is evident from the **table number 2.11,** with the list showing independently focused areas of study abroad and the number of research studies reviewed, a single study focused its attention in the area relating to the context of completion of the projects.

The following table shows the reviews in relation to the context of completion of the projects.

Table No. 2.15

List showing the reviews on the based on the focused area of finding solutions to complete projects

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
1	**Barak, Moshe; Zadok, Yair, (2009)**	Learning and the problem solving process identified among junior high school pupils participating in robotics projects	The research was guided by the following questions: (1) How do pupils come up with inventive solutions to problems in the context of robotics activities? (2) What type of knowledge pupils address in working on robotics projects? (3) How do pupils regard or exploit informal instruction of concepts in science, technology and problem solving within a project-based program?	Survey design	Junior high school students	Observations, interviews, observations of the artifacts the pupils had constructed, and analyses of their reflections on each project.	The pupils had often come up with inventive solutions to problems they tackled by intuitively using diverse kinds of heuristic searches. They encountered difficulties in reflecting on the problem solving process they had used. The study also showed that pupils are likely to benefit from implementing informal instruction on concepts in science, technology and problem solving into a project-based program.

As stated earlier, a **single** study was reviewed on the basis of finding solutions to the completion of projects.

Barak, Moshe; Zadok, Yair, (2009), presented a study about learning and the problem solving process identified among junior high school pupils participating in robotics projects in the Lego Mindstorm environment. It was examined how the pupils come up with inventive solutions to the problems in the content of completion of projects, what type of knowledge pupils address in working on with projects, how they exploit informal instruction of concepts in science, technology and problem solving within a project-based program. It suggested that this type of instruction should take place in the context of pupils' work on their projects, and adopt a qualitative approach rather than try to communicate in the class procedural knowledge learned by rote.

2.3.2.5 In relation to the preference of Science methods of teaching by the students

As it is evident from the **table number 2.11,** with the list showing independently focused areas of study abroad and the number of research studies reviewed, a single study focused its attention on the area of preferred methods of science methods of teaching. The following table shows the details of the same review followed with discussion.

The following table shows the reviews on the basis of preference of science methods of teaching by the students.

Table No. 2. 16

List showing the reviews on the preference of science methods of teaching

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
1	**Juuti, Kalle; Lavonen, Jari; Uitto, Anna; Byman, Reijo; Meisalo, Veijo, (2010)**	The Science Teaching Methods preferred by Grade IX Students in Finland.	To analyze students' actual experiences with science teaching methods and their preferences for how they would like to study science.	Survey design	Grade IX students	Use of non-parametric tests	Students interested in school science preferred more creative activities such as brainstorming and project work. Boys seemed to be more satisfied with current and traditional science teaching methods like direct teaching, solving basic problems, reading textbooks, and conducting practical work, while girls desired more discussion.

A **single** study was reviewed on the preference of science methods of teaching by the students.

Juuti, Kalle; Lavonen, Jari; Uitto, Anna; Byman, Reijo; Meisalo, Veijo, (2010) studied the prevailing condition on the students' actual experiences with science teaching methods and their preferences for how they would like to study science. Results indicated that understanding the connection between student interests and teaching method preferences, especially interpreting interested students' desire for creative activities, are important aspects for future research.

2.3.3 Independently focused areas of reviewed literature conducted in India

The reviews of the studies that are carried on in India lead the investigator to prepare the review questions and form a basis for analysis. After the analysis the tables were prepared and presented in a tabular form followed with discussion. It also lead the researcher to locate and take support from the major findings and suggestions. As stated earlier in **table number 2.6,** there are **three (03)** focused areas of study that are exclusively conducted in India. The following table displays these areas along with the number of research studies reviewed.

Table No. 2.17

List showing independently focused areas of study in India and the number of research studies reviewed

Sl. No.	Independently focused areas of study in India	Number of research studies	%
1	In relation to curriculum transaction	01	33.33
2	In relation to development of teaching strategies	01	33.33
3	In relation to teaching learning process	01	33.33
Total		**03**	**99.99**

From the above table it is known that there are **three (03)** areas of focus of study and in each area a single study was conducted. These studies are carried on in the areas relating to the curriculum transaction, development of teaching strategies, and in relation to teaching learning process.

2.3.3.1 In relation to curriculum transaction

As stated in above **table number 2.17,** above a **single (01)** study focused its attention in the area of curriculum transaction in science. The following table shows the details of the same review and it is followed with discussion.

Table No. 2.18

List showing the studies in relation to the curriculum transaction

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
1	**Umashree, P.S. (1999**)	A study on science curriculum and its transaction	To focus on instructional strategy in the intended objectives of teaching science with child centered and activity based learning approach.	Survey design	Secondary school students	***NA**	Classroom transaction is centered on the textbook. Lecture method was used in 70% of cases, lecture cum discussion method in 10% and lecture cum activity teaching strategy in 6% of the cases. Problem solving or enquiry based teaching have not been noticed at all. Learners were not assigned any project work.

*NA-Not available

A **single** was reviewed based on the curriculum transaction in science.

Umashree, P.S. (1999) studied the prevailing conditions on science curriculum and its transaction. The focus was on instructional strategies in intended objectives of teaching science with child centered activity based learning approaches.

2.3.3.2 In relation to development of teaching strategies

As stated in above **table number 2.17,** above a **single (01)** study focused its attention in the area of development of teaching strategies. The following table shows the details of this reviewed study and it is followed with discussion.

Table No. 2.19

List showing the studies in relation to the development of teaching strategies

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
1	**Adinarayan, K. (1979)**	A teaching strategy for developing appropriate skills required in students for conducting scientific investigations.	To construct learning packages suitable for average children in an ordinary classroom situation, and to determine the advantages and effectiveness of learning through the packages by individual and groups, (iii) to extend the study of the classroom situation and evaluate the outcomes (iv) to obtain evidence concerning the ability to conduct simple scientific investigations in a laboratory situation.	Experimental design	Class VII students	Individual record sheets, revision data sheet and error sheet, performance test and checklist, reaction and attitude scales	The performance of the experimental group taught through the learning packages was significantly better than that of the control group taught by the conventional method. The students had favorable reactions towards learning packages.

The above table depicts that a **single (01)** study was reviewed based on the development of teaching strategies. **Adinarayan, K. (1979)** evolved a teaching strategy for developing appropriate skills required in students for conducting scientific investigations. The foci of the study were to evolve a learning package suitable for average children and to obtain the evidence concerning the ability to conduct simple scientific investigation in a laboratory situation.

2.3.3.3 In relation to teaching learning process

As stated in above **table number 2.17,** above a **single (01)** study focused its attention in the area of teaching learning process. The details of the same are displayed in the following table and it is followed with discussion.

Table No. 2.20

List showing the studies in relation to the teaching learning process

Sl. No.	Name of the researcher/s	Title of the study	Objective/s of the study	Design of the study	Sample	Tools	Findings and conclusion
1	**Sundararajan, S., (1988**)	The teaching of biology at the higher secondary stage in Tamil Nadu	To determine the extent of awareness and the realization of the objectives of teaching biology, to find the teaching strategies employed, to identify the teaching model used, to find the problems faced by the teachers in their teaching of biology, to determine the adequacy of the practical activities organized for the +2 stage biology students, and to evaluate the physical facilities available in schools for the teaching of biology.	Survey design	Experts, biology teachers and higher secondary students	Questionnaire, Perception Scale, Inventory of Physical Facilities, Opinionnaire, Achievement Test and Attitude scale.	The major findings included the hierarchy of giving importance to knowledge, understanding, application and skills. The teachers were found to follow expository type of teaching strategies in teaching of biology. They did not encourage student centered teaching techniques. The biology laboratories were in a bad shape. A full complement of chemicals and equipment was not found in many schools and they did not have essential teaching aids, too.

Sundararajan, S., (1988) carried out a study on the teaching of Biology at the higher secondary stage. The prevailing conditions in teaching of Biology were determined in different dimensions. It included the extent of awareness and the realization of the objectives of teaching Biology, teaching strategies employed, the teaching models used, the problems faced by the teachers, the adequacy of practical activities and the physical facilities available in schools for teaching of Biology.

2.4 Discussion of the reviewed literature and its implications to the present study

From the review of **42** studies carried on for this chapter it was found appropriated to categorize **11** areas of foci of study. It can be observed that a maximum number (**20)** of studies are in relation to different methods of teaching in science. Out of these, **five** studies examined Project-Based learning for specific reasons, **11** studies compared different activity based methods of teaching involving Project-Based Learning with the customary methods of teaching and **four** studies are unique with a different approach.

However, the studies exclusively done on the Project-Based Learning are for enhancing the Skills for the Future reflecting on the essentiality of project oriented learning (**Bell, Stephanie, 2010),** Project-Based Learning with a team teaching model in collaboration with the computer teachers(**Chang, Ling-Chian; Lee, Greg C. (2010),** designing a performance Project-Based Science Curricula (pPBSc) for Meaningful Understanding (**Kanter, David E (2010),** to enhance Project-Oriented Learning for deep learning and social impact of educational process (**Pascaul, R. (2010)** and Project-Based Learning is best for building life skills for after school life **(Zimmerman, Daniele C. 2010).** It can be implied that the project based learning is inevitable as it is an essential requisite for students to reflect their knowledge resulting in successful achievement of educational goals. The purpose of learning is solved and builds the life skills after school. In addition to the reasons assigned to the significance of project-based learning, there is much to be uncovered in the various aspects of the nature of project works. In connection with the above studies, the effectiveness of guided inquiry learning was compared with the traditional methods of teaching (**Sadeh, Irit; Zion, Michal, 2009, Smita V.P. and Manjula P.Rao 2009, Kasinath, H.M. 2000, Shishta, Rama. 1990, Mohammad Miyan, 1982, Kamala Kanthan, T.S. 1968).** It was suggested by **Sadeh, Irit; Zion, Michal, 2009,** in his study that the implementation of dynamic inquiry performances during inquiry learning may shed light on the procedural and epistemological scientific understanding of students conducting inquiries.

In addition to these studies the traditional methods of teaching were compared with Problem-Based learning (**Wong, Kenson Kin Hang; Day, Jeffrey Richard, 2009),** with the achievement in mathematics through programmed text (**Prabha, Rashmi, 1992),** with **'**self activity method', 'life science club method', and 'audio-visual method' (**Dighal, K.C., 1985),** with open-ended approach of doing physics experiments at higher secondary stage (**Gangoli, S.G., and Gurumurthy, C., (1985)** with activity based approaches **(Jha. I., 1979).** The study conducted by **Williams, Ashleym (2010)** was about the environmental education and education for sustainability projects. **Martin-Hansen, Lisa M, (2005)** incorporated a coupled inquiry approach to teaching with a combination of guided-inquiry and open-inquiry. **Mala, S. and Sumar, S. (2009)** conducted a study on the attitude of government-aided schools and public schools science teachers towards project method. **Sharma, N.D., (1978)** explored the prevailing conditions of teaching natural sciences at primary level in central schools and experimented the effectiveness of different methods of teaching. It is observed from the above discussion that none of the studies have focused exclusively on the areas of presage, process and products of different activity based methods of teaching like project method.

Undoubtedly the pre service orientation or training programs are beneficial to the teachers to conduct the project works effectively **(Bencze, John Lawrence, 2010, Dighal, K.C., 1985, Mukhopadhyay, M. and Others 1981).** But the researcher had not come across any study pertaining to the in service orientation programs in relation to the conduction of the project works. In service orientation activities are need of the hour as the teachers may lack content knowledge, pedagogical content knowledge (PCK) and knowledge of learners and their characteristics (**Meerbaun-Salant, Orni; Hazzan, Orit, (2009).** This view is also supported by a study that there is a lack of fundamental and experimental process skills such as deciding on the project topic, observation, measuring, organizing and writing a report **(Tural, Guner; Yigit, Nevzat; Alev, Nedium, 2009). Price, Suzanne M, (1989)** suggested that by developing software practicum templates the student motivation and interest in the science research project may be increased resulting in higher participation in all phases of research like searching for research topics, conducting a literature search by offering research guidance and by offering specific examples of experimental designs in the areas of science that interested students. The students basically lack the skills of managing projects to a successful conclusion. As suggested by **Meerbaun-Salant, Orni; Hazzan, Orit, (2009)** a mentoring methodology should be adopted to tackle the complex task of implementation of project works. It is observed that the most occurring typical problem in teaching behaviors of science teachers at higher secondary levels included explaining, illustrating, asking lower order questions, repeating, classifying and comparing, the students observing and the teachers responding (**Alexander, P. 1989).** It is found that 85% of the teachers do not follow the instructional procedures according to the aims and objectives of biology teaching and most of the teachers prefer only the lecture-demonstration method (**Muddu, V., 1979).** Laboratories may be considered as the workshops for the activity based learning. But a dearth in the infrastructural (physical) facilities and the supporting man and material resources like lab attendants and the library may result in poor quality of activity based learning **(Rajput, J.S., Gupta, V.P., and Vaidya, N., 1978, Pillai, K.K., 1970, Patole, N.K., 1967).**

Doppelt, Yaron, (2009) focused on infusing creative thinking competence through the design process of authentic projects by adopting new assessment methods and fount that the pupils learned to document their design process. Secondly, the pupils' projects demonstrated various levels of creative thinking skill. High-level documentation of the projects was found in pupils' portfolios. There is much to be learned about documenting teamwork and pupils' reflection. This research could assist researchers and teachers who are interested in assessing educational outcomes. In an assessment of the awareness of the Chemistry laboratory safety skills and laboratory safety practices adopted by students by students it was found that more than 70% of the students had poor knowledge about identified emergency facilities and equipment. It also revealed an evidence of poor experimental techniques. The students failed to protect their eyes, face, hands and even their body. They did not wear aprons and gloves while engaged in chemical experimentation (**Ekpo, Johnson, 1991). Mukhopadhyay, M. and Others (1981)** conducted an evaluation of the Polytechnic curriculum in Gujarat pertaining to three sets of objectives viz., objectives and contents, teaching-learning process, and resource needs and utilization. It was found that only 31 percent of the teachers used project method and there was need to train more teachers in project methods and the instructional methods. Evaluation of Science Fair and Educational Exhibitions, **(Natarajan, M.R., 1983, SCERT, Andhra Pradesh, 1980)** focused on the achievement of the objectives of the science fairs and exhibitions with a view to evaluate creativity and effectiveness, from the point of view of organizers, teachers and participant pupils and to assess the attainment of new knowledge using innovations in teaching.

Umashree, P.S. (1999) focused on instructional strategy in the intended objectives of teaching science with child centered and activity based learning approach indicates that Science curriculum and its classroom transaction is centered on the textbook with only 6% of the cases with lecture cum activity teaching strategy. Problem solving or enquiry based teaching were not noticed. Learners were not assigned any project work indicating the essentiality of study of the subject under investigation. Project work triggers and enhances the levels of intrinsic motivation among the teacher and the taught (**Lam, Shuifong; Cheng, Rebecca Wingvi; Ma, William Y.K. 2009)** thereby necessitating the adoption of this approach. As studied by **Adinarayan, K. 1979** that the construction of learning packages to determine the advantages and effectiveness to conduct simple scientific investigations in a laboratory situation by individual and groups lead to a favorable reaction towards the learning packages. This gives a direction for the construction of such packages in various subjects of study which may form a template for conducting scientific investigations.

The learning styles and the performance of Independent, competitive, and participant experimental group students had developed relatively higher achievement scores and higher degree of enjoyment than the avoidant, dependent, and collaborative groups (**Bahar, Mehmet, (2009).** No studies are found in relation to the degree of appreciation of the projects constructed. The socio-cultural concepts like co-construction; intertextuality and intercontextuality amongst oracy, literacy and uses of ICT collaborative creativity; development of dialogical and text production strategies and appropriation of diverse cultural artifacts for knowledge construction are studied by **Rojas-Drummond, S. M; Albarran, C. D.; Littleton, K.S. 2008.** This lead to frame one of the objectives of the present study stating the socio economic aspects concerned with the project works.

Students interested in school science preferred more creative activities such as brainstorming and project work. Boys seemed to be more satisfied with current and traditional science teaching methods like direct teaching, solving basic problems, reading textbooks, and conducting practical work, while girls desired more discussion (**Juuti, Kalle; Lavonen, Jari; Uitto, Anna; Byman, Reijo; Meisalo, Veijo, 2010).** The results of this study indicated that understanding the connection between student interest and teaching method preferences, especially interpreting interested students' desire for creative activities, are important aspects for future research.

The broad and intensive survey conducted by **Sundararajan, S., 1988** with multiple objectives in relation to the science teaching learning process indicated that the student centered teaching techniques were not adopted. The teachers were found to follow expository type of teaching strategies in teaching of biology. In contrast to the above studies, it is also revealed that the students often came up with inventive solutions to the problems by intuitively using the diverse kinds of heuristic searches (**Barak, Moshe; Zadok, Yair, 2009)**. This type of instruction should take place in the context of pupils' work on their projects, and adopt a qualitative approach rather than try to communicate in the class procedural knowledge learned by rote.

In light of the above discussion, semi-independent and mini research projects foster a high degree of student ownership and develop scientific temper among the student community. The studies exclusively pertaining to the implementation of the project work in higher secondary level in Science stream in an earthquake prone area seem to be none. Therefore the researcher had felt an urge to take up an investigation of the subject under study.

2.5 Retrospection

This chapter is a report of the earlier research studies related to the topic under study. All the relevant researches have been reported in this chapter touching upon the area of study and findings relevant to the present study. Among the **42** studies reviewed **11** varied areas of foci are found worth appreciating. The reviews have been thoroughly studied at descriptive and analytical levels leading to a generalized comprehensive understanding touching upon the relevant points of study. The objectives of the various studies undertaken by the earlier researchers helped to identify the areas covered under the purview of the study like the effectiveness of various methods of teaching science, general hurdles encountered in the process of teaching learning in science, preferred methods of teaching science by the students. The major findings and conclusions helped to trace out the uncovered areas like the set criteria in implementing project works in Central Board Schools at higher secondary level. The other areas with a gap are the aspects related to the type, number, socioeconomic aspects of the project works, etc. The reviews have been very useful in forming the basis for the entire thinking at a conceptual level for this investigation. The suggestions made by certain reviews therein supported the significance and inevitability of taking up this project.

Chapter 3

PLAN AND PROCEDURE OF THE STUDY

<u>**Chapter III**</u>

PLAN AND PROCEDURE OF THE STUDY

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Chapter III

PLAN AND PROCEDURE OF THE STUDY

3.0 Introduction

We are living in a century which has witnessed the tremendous growth of science. It has brought radical changes into our lives. Today it is progressing at a furious pace surpassing all the miracles of mythology. There is not even a single area which is left untouched by it. By exploiting the inquisitive nature of man science is going on changing minute by minute, constructing new knowledge day by day.

In this age of knowledge construction, it is an alarming fact that in India knowledge is more received than constructed. The poor state of science education in India is reflected in the Indian Education Commission, (1964-66) report which reveals that "our science education is really in bad shape and it will become worse if we fail to reckon it with the explosion of knowledge." Science education has a significant place in school curriculum as a core subject but in fact, it had not been given due attention as it requires at primary and secondary level of schooling. It is really a matter of deep thinking especially in developing countries that science education is at stake for different reasons (Jain, M. 2004). According to Singh, R. R. (2011) Science education in India is withering due to lack of availability of resources in terms of physical as well as human resources which is affecting the quality of delivery system of curriculum.

As per the nature of science it is mostly process-based; and needs proper infrastructure and resources. In addition to this it is also an advancing subject generating immense amount of data. If this tremendous amount of knowledge is not properly handled and disseminated, there may be a critical shortage of technically qualified personnel in near future. Our schools also mostly stick to the conventional methods of teaching giving importance to receiving. But now it is the time that we bring about a sea change to this strategy. Therefore, the teachers too must devise new strategies and methods to assimilate the scientific knowledge and disseminate it among the students. Use of innovative methods of teaching can be effectively implemented in teaching science subjects so that they improve the grasping power of the students and make the subject more interesting.

Science as a subject differs from all other subjects in that it cannot and should not be taught as facts. Non-interactive exercises in science teaching following the traditional methods of only delivering cognitive connotations should be avoided. It should be participatory rather than authoritative. Concrete materials, teaching aids, environmental objects, displayed materials, science kits and supplementary reading materials which enrich the teaching-learning process must be used in science teaching. It should be taught through a process of experimentation and investigation wherein students are encouraged to do experiments and are guided in their investigations leading them to the facts. As stated earlier, the process part of science should be given more importance than the product. Theory and practice should not be mutually exclusive. There should be enough scope for observation, experimentation, discovery and individual activities. Progressive educators like Dewey (1869-1948), Montessori (1870-19532), Gandhi (1869-1948), Piaget (1896-1980) and Vygotsky (1896-1934) gave importance to the child-centered teaching and stressed the need for activity methods and experimental pedagogy as compared to the conventional methods.

For the most meaningful learning to occur, independent study, individual writing, student-centered projects, and oral reports should be the major features of instruction. There will be times when students are interested in an in-depth inquiry of a topic and will want to pursue a particular topic for study. This undertaking of a learning project can be flexible: the investigation can be done by an individual student, a team of two, a small group, or the entire class. The project is a relatively long-term investigative study from which students produce something called culminating presentation. It is a way for students to apply what they are learning. The culminating presentation is a final presentation that usually includes an oral and written report accompanied by a hands-on item of some kind (e.g., a display, play or skit, book, song or poem, multimedia presentation, diorama, poster, maps, charts and so on).

Looking into the significance of undertaking the innovative methods of teaching in science, the study “Present Status of Implementation of Project Work in CBSE Schools at Higher Secondary Level in Kachchh District,” with the following objectives is taken up.

1. **1.** To study the set criteria for implementation of project work in CBSE schools.
2. **2.** To study the practices of implementation of project work in CBSE schools at higher secondary level in terms of
   - The orientation given to the students and the teachers
   - The number and variety of projects given to the students in relation to the content matter of each subject
   - The problems encountered by the teachers and the students
   - The evaluation procedures
   - Preservation and maintenance of the projects
   - Further utility of the projects in life by the students
3. **3.** To study the students' reflections about the project work in relation to
   - availability of time
   - usefulness of the projects
   - interest
   - socio economical aspects related to the projects
4. **4.** To judge the present practices in the context of set criteria for implementation of project work

The plan and procedure that were adopted for the present study are discussed ahead.

3.1 Research Methodology

According to Kothari C. R. (1996), research methodology is a way to systematically solve the research problem. It is a science that deals with the various steps that are generally adopted by a researcher in studying his or her research problem along with logic behind it. The truth is that, successful completion of a research work without proper planning becomes not only difficult but also impossible. The selection of a method and the specific design appropriate to the research problem will depend upon the nature of the problem and the kind of the data. Research methodology includes the details of the research design, the population and the sample selected, tools designed and/or adopted, the data collection procedures and the statistical techniques applied.

As per the nature of the present study, i.e., the implementation of the project work in CBSE based schools at higher secondary level in Kachchh district, the descriptive research study is found to be appropriate to achieve its objectives.

3.1.1 Research Design

A design of the study to the researcher is like a blue print to an architect. It provides the researcher an opportunity for meaningful interpretations of the results with the help of the analysed data.

The design of the present study is a descriptive survey. Descriptive survey determines and describes the way things are. It provides necessary and valuable information to the organizations whose operations are closely related to the subject under study. The purpose of present survey is to reveal the present scenario of implementation of the project work in Kachchh district, Gujarat to furnish the evidence for future planning and decision making to bring betterment in its present state and future perspective.

3.1.2 Population

The population is the group of interest to the researcher, the group to which she or he would like the results of the study to be generalized. Generalizability is the extent to which the results of one study can be applied to other populations or situations.

The population for the present study includes all the schools affiliated with the CBSE and where +2 level Science Stream is available in the Kachchh district during the academic year 2009-10. The teacher population includes all the teachers those who taught Science stream students at +2 level in these schools. The student population includes all the students those who studied with Science stream at +2 level in the same schools.

The following table shows the list of the entities for defining the population.

Table No. 3.1

List of the entities for defining the population

Entity	Defining the Population
Grade	+ 2 level (XI and XII)
School Type	All the CBSE Schools where Science Stream is available (07 schools)
Geographical Area	Kachchh District, Gujarat
Academic Year	2009-10
Teachers	All the teachers teaching at + 2 level in Science Stream (31)
Students	All the students studying with Science stream in higher secondary sections

The population details are clearly defined in the above table.

3.1.3 The Sample

Sampling is the process of selecting a number of individuals for a study in such a way that it represents the larger group from which it is selected i.e., the population. The purpose of sampling is to gain information about the population by using the sample. Selecting the sample and determining the size of the sample are very important steps in conducting a research study. The representativeness of the sample determines the meaningfulness and generalizability of the results. For descriptive research, it is common to sample 10 to 20% of the population, but in reality the appropriate sample size depends on the specific type of the descriptive research involved and the size of the population studied.

It may be made clear here that the network of CBSE schools includes Government schools including Kendriya Vidyalaya Sangathan (Central Government Schools), Jawahar Navodaya Vidyalaya (Residential schools), Government and Government aided schools and independent private schools. As stated earlier, the present study deals with the implementation of the project work in the CBSE based schools in higher secondary sections where Science stream is available in Kachchh district. Looking into the aim of the study, all the schools in Kachchh district which are affiliated with the CBSE and where higher secondary Science stream sections are available in the academic year 2009-10 are included in the sample. The detailed list of these schools is presented in the table number 3.2 in the forthcoming sections.

The following table gives the details regarding the schools in Kachchh district affiliated with the CBSE and where Science stream at higher secondary level was available during the academic year 2009-10. The list also shows the corresponding teacher strength at higher secondary level and the student strength in class XI.

Table No. 3.2

Actual sample for the study

Sl. No.	Name of the School	Teacher Strength	Student Strength in Class XI
1	KV No. 1 AFS, Bhuj, Kachchh	04	42
2	KV No.2 Army, Bhuj, Kachchh	05	33
3	KV, IFFCO, Gandhidham, Kachchh	05	24
4	KV, Naliya, Kachchh	05	22
5	Adani DAV Public School, Mundra, Kachchh	03	04
6	Global India International School, Ganchidham, Kachchh	05	07
7	White House Public School, Haripar, Bhuj, Kachchh	04	15
Total		**31**	**147**

From the above table it is learnt that there are **seven** (07) schools affiliated with the CBSE and where Science stream was available at higher secondary level in Kachchh district during the academic year 2009-10. It is also learnt from the above table that the total strength of the teachers and the students is **31** and **147** respectively.

3.1.4 Tools for the Data Collection

To carry out any type of research investigation, the pertinent data about the topic of the study must be collected. Various tools which adopt different methods and procedures are to be developed to aid in the acquisition of the data. These tools employ distinctive ways of describing and quantifying the data. As the descriptive studies often seek information that is not already available, the development of appropriate instruments is usually needed.

The present study being a descriptive survey detailing about the implementation of the project work, it was imperative to analyze the documents that were relevant to the research that is undertaken. Lincoln and Guba (1985) defined a document as "any written or recorded material" not prepared for the purposes of the evaluation or at the request of the inquirer. One of the purposes of analyzing the documents is to describe the prevailing educational practices or conditions (Best, J. W. & Kahn, J. V., 1989). In documentary analysis, the following may be used as sources of data: records, reports, printed forms, letters, books, periodicals, syllabi, themes or other academic work.

Descriptive data are also usually collected by questionnaire, interview, telephone or observation. Other than the document study, two separate questionnaires were also constructed by the researcher to collect the data from the teachers and the students.

The details of the objectives and corresponding tools that have been adopted for the data collection are given in the following table.

Table No. 3.3

List of the objectives and the corresponding list of the tools

Sl. No.	Objectives	Tools
1	To study the set criteria for implementation of project work in CBSE schools	Document Analysis
2	To study the practices of implementation of project work in CBSE schools at higher secondary level and to study the teachers' reflections about the same	Questionnaire for the Teachers
3	To study the practices of implementation of project work in CBSE schools at higher secondary level and to study the students' reflections about the same	Questionnaire for the Students
4	To judge the present practices in the context of the set criteria for implementation of project work	Documents and the Questionnaires

From the above table it is clear that the objectives of the study and the corresponding tools to achieve these objectives are listed. The details about these tools are given in the following sections.

3.1.4.1 Documents in Relevance to the Set Criteria in Implementation of Project Work in CBSE Schools

The Documents formed an important source of data that were relevant to achieve the first objective of the study: the set criteria for implementation of project work in CBSE Schools. As stated above, for achieving this objective, different types of documents that have discussed the issues pertaining to the research topic under study were considered. In order to have an intensive understanding, these documents were thoroughly analyzed from the academic years 2003-04 to 2011-12 in order to understand the policy of implementation. The analysis was concerned with the explanation of the status of the said phenomenon.

The following table shows the list of the documents that were analyzed for the present study.

Table No. 3.4

List of the documents that were analyzed for the present study

Sl. No.	Type of the Documents
1	CBSE Circulars
2	KVS Dispatches
3	CBSE Guidelines for the Jawaharlal Nehru National Science Exhibition for School Children
4	Compendium
5	Annual Reports, NCERT
6	CBSE Curriculum for Senior Secondary Sections in Science Stream
7	Textbooks
8	Teachers' Handbooks
9	Manuals
10	NCERT School Kits

It is evident from the above table that the analysis solely dealt with the list of the documents and focused on the issues of investigation. The details pertaining to each of documents are given in the next chapter.

3.1.4.2 Questionnaire for the Teachers

Apart from the accumulation of the documents, the researcher also constructed a questionnaire for the teachers to collect their reflections about the practices of implementation of project work in CBSE schools at higher secondary level. Various aspects of implementation of project work were kept in view while preparing the initial draft of the questionnaire. It was framed to obtain the responses for the preliminary information on the demography of the teacher like name, designation, name of the school, gender and age, educational qualifications, classes and the subjects taught, and the teaching experience. In addition to this the questionnaire was to obtain the reflections of the teachers on various aspects of the second objective such as orientation and guidance given to the teachers; identification and selection of the projects; availability of the resources and problems encountered and the evaluation procedures adopted in project evaluation and to study the actual practices of implementation of project work in CBSE schools at higher secondary level.

The tool so designed was submitted to a group of experts to judge the adequacy, content validity and appropriateness of the items in the context of the study. Later on all the comments given by these experts were pooled together and incorporated in the tool for its finalization. Thus the necessary modifications were made and the tool was finally drafted. Then it was ready for administration on the sample.

The questionnaire designed for the teachers included both the closed ended and the open ended questions. The sample questions along with the specified objective are given in the following table. A sample of this questionnaire is enclosed in the appendix **D**.

Table No. 3.5

List of sample questions for the teachers and the corresponding objective

Sl. No.	Objective	Sample questions	
		Closed ended	**Open ended**
1	Problems encountered during project work implementation	Item No.14 (a) Which problems hinder your implementation of the project work? Please encircle your option/s. i Individual differences ii Time aspect iii Evaluation aspects iv Cultural aspects v Social aspects vi Economic aspects vii If other than these, please specify ______________________	Item No. 15 (b) Please clarify which problems are faced by the students in development of the projects. ______________ ______________ ______________ ______________ ______________
2	Evaluation procedures	Item No. 10 (a) Which criteria do you consider while evaluating the projects? Please encircle your option/s. i Content ii Novelty iii Application iv Expression v Qualitative aspect vi Quantitative aspect vii Objective based criteria viii Subjective based criteria ix If other than these, please specify ________________	Item No. 12 (d) How would you like to improve upon the current system of evaluation of the projects? Please mention. ______________ ______________ ______________ ______________ ______________ ______________

The items framed in the questionnaire helped the researcher to gain sufficient amount of data on the specific dimensions of the research topic. They helped the researcher to have a wide and in depth understanding about the implementation of the project work in schools.

A request letter to the subject expert, a list of the experts and a copy of this tool for the teachers are enclosed at the end of the thesis in appendices **A**, **B** and **D** respectively.

3.1.4.3 Questionnaire for the Students

In order to achieve the third objective i.e., to study the practices of implementation of project work in CBSE schools at higher secondary level and to study the students' reflections about it, the researcher constructed another questionnaire for the students.

The initial draft of the questionnaire was designed keeping in view the objective of the study: To study the practices of implementation of project work in CBSE schools at higher secondary level and to study the students' reflections about the same. The tool so designed was submitted to a group of experts to judge the adequacy, content validity and appropriateness of the items in the context of the study. Later on all the comments given by these experts were pooled together and incorporated in the tool. Thus the necessary modifications were made and the tool was finally drafted. Now it was ready for administration on the sample.

The data details of preliminary information like name, date, class, gender and the number of projects done in different science subjects were collected through responses to the questionnaire. It included both the closed ended and the open ended questions. The sample questions along with the specified objective are given in the following table.

Table No. 3.6

List of sample questions for the students and the corresponding objective

Sl. No.	**Type of the questions (Open ended/ closed ended)**	**Sample question**	**Objective**
1	Open ended	Item No. 14 (c) Please explain how you proceed with, in development of the projects? **Subject** / **Your procedure to develop the projects** Mathematics Physics Chemistry Biology Computer Science Biotechnology If any other ( )	Development of the projects
2	Closed ended	Item No. 10 Are the projects useful for improving your studies? Yes/No	Utility of the projects to the students
		Item No. 18 Do you get financial support in development of the projects? Yes/No	Socio-economic aspect
		Item No. 15 (b) Do you need any special period in your timetable to complete the projects? Yes/No	Time limit

Implementation can be understood better by considering the aspects such as guidance given during project development; problems encountered all through project advancement and the evaluation procedures adopted. Therefore the questionnaire included the items pertaining to these areas too. This immensely helped the researcher to gain an insight into the research topic. The list of the subject experts and a copy of this tool are enclosed at the end of the thesis in the appendix **E**.

3.1.5 Procedure for the Data Collection

The data collected for the present study are in three forms:

- documents reflecting the practices of implementation of project work in CBSE schools,
- reflections of the teachers on the practices of implementation of project work in CBSE schools and
- reflections of the students on practices of implementation of project work in CBSE schools.

In order to study the set criteria for implementation of the project work at +2 level, the relevant documents were mainly surfed from the internet on the CBSE and the NCERT and the associated web sites.

The heads of the concerned institutions were requested (Appendix **C**) to give permission for data collection. With their consent the data were collected from the teachers and the students. The investigator administered the tool personally under natural conditions and got the data. The teachers and the students responded to the evaluation instruments, i.e., the questionnaires. The details of the data analysis and interpretation are given in the next chapter.

The data were analyzed by employing the statistical techniques like frequency and percentages wherever necessary. .

3.1.5.1 Collection of the Documents in Relevance to the Set Criteria in Implementation of Project Work in CBSE Schools

The documents reflecting on the various aspects of implementation of project work in CBSE schools were collected from the CBSE, the NCERT, the KVS and the Department of Secondary and Higher Secondary Education, under the Ministry of Human Resources Department web sites. The objectives of the study were kept in view while collecting the documents.

The archives (collection of documents or records) of CBSE website have a store of all the documents/circulars from the year 2003 to till the date. These circulars have been dispatched to all its affiliated schools. The researcher had gone through all these circulars systematically and downloaded the documents pertaining to the subject under study. Apart from this the researcher had also collected CBSE Circulars; KVS Dispatches; CBSE Guidelines for the Jawaharlal Nehru National Science Exhibition for School Children; Compendium; Annual Reports, NCERT; CBSE Curriculum for Senior Secondary Sections in Science Stream; Textbooks; Teachers' Handbooks; Manuals and NCERT School Kits.

When the researcher had gone to collect the data from the teachers and the students, copies of some of the readily available documents in relation to the subject were also collected from the office of the respective heads of the institution. All these helped to develop an insight into the set criteria for the implementation of the project work and substantiated the first objective.

The list of the documents that were analyzed finds a place in the following chapter of analysis and interpretation. Copies of each of the same are enclosed in the appendices from **F to I**. A list of the sites surfed for collection of the data can be found at the end of the thesis under bibliography section.

3.1.5.2 Data Collection from the Teachers and the Students

Initially, the researcher consulted the heads of the institution stating the objective of the study. The heads were requested to give consent to gather the data from the teachers and the students. Thus with the prior permission and as per the date and the time given by the heads of the institution the data were collected. The time period for this data collection fell in the months of November, December, 2009 and January, 2010. The researcher personally visited all the schools and collected the data from both the teachers as well as the students.

Before collecting the data, the researcher stated the objective of the study and requested the teachers to respond to all the items in the questionnaire and return. The researcher ensured that all the items of the questionnaire were duly filled in and were returned.

Similarly before collecting the data from the students, the researcher stated the objective of the study and instructed them to fill in all the items of the questionnaire and return. The researcher had further ensured that all the students had responded to the items and had returned the questionnaire.

3.1.6 Data Analysis

The data being mainly qualitative in nature were subjected to the descriptive analysis. All the documents in relevance to the project work were analyzed for the content. The content analyses of these documents helped the researcher to gain an insight into the set criteria for the implementation of the project work in the CBSE schools. In order to arrive at the findings of the study the teachers' and the students' reflections were classified, tabulated and subjected to both the qualitative and quantitative analysis. Percentages and frequencies were calculated wherever necessary.

3.2 Retrospection

The present chapter discussed about the methodology of the research work that was carried on. It included the details of the research design, population and the sample. In addition to this, the details pertaining to the different tools and the procedures adopted for the collection of the data were discussed at length. Based on the nature of the study, a descriptive survey design was chosen for the study. The details of the data analysis and the interpretation are given in the following chapter.

Chapter 4

ANALYSIS AND INTERPRETATION OF THE DATA

Chapter IV

ANALYSIS AND INTERPRETATION OF THE DATA

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Chapter IV

ANALYSIS AND INTERPRETATION OF THE DATA

4.0 Introduction

Analysis of data means studying the organized material in order to discover the inherent facts. The data are studied from as many angles as possible to explore the new facts. Once the research data have been collected and the analysis has been made, the research proceeds with the stage of interpreting the results. The process of interpretation is stating what the results show. Good, Barr and Scates, (1941) suggest four helpful modes to get started on analyzing the gathered data:

1. To think in terms of significant tables that the data permit
2. To examine carefully the statement of the problem and earlier analysis and to study the original records of the data
3. To get away from the data and to think about the problem in layman terms or to actually discuss the problem with others
4. To attack the data by making various statistical calculations

As stated earlier in chapter three, the data obtained for the present study were in the form of documents and responses of the teachers and the students on two separate questionnaires on the implementation of the project work in higher secondary schools of the Kachchh district, Gujarat.

Consequently, this chapter is basically designed by categorizing the data under the following four broad areas.

- the documents in relevance to the set criteria in implementation of project work in CBSE schools,
- the data obtained from the teachers' questionnaire,
- the data obtained from the students' questionnaire and
- judging the present practices in the context of the set criteria for implementation of the project work with relevance to documents and the questionnaires.

The data were analyzed as per the above categorization and presented below.

4.1 Particulars of the Information Gathered

The first broad area of categorization was on the study of the documents in relevance to the set criteria in implementation of project work in CBSE schools. Accordingly, the documents were collected from the CBSE and NCERT websites. Content analysis of these documents which are in the form of CBSE Circulars; KVS Dispatches; CBSE Guidelines for the Jawaharlal Nehru National Science Exhibition for School Children (JNNSEC); Compendium for schools; Annual Reports, NCERT; CBSE Curriculum for Senior Secondary Sections in Science Stream; Teacher Handbooks, Textbooks of Senior Secondary Level in Science Stream; Manuals and NCERT School Kits was carried on to focus on the set criteria for implementation of the project work..

There were two questionnaires which were designed with an intention to collect data from the teachers and the students. Prior to the administration of the questionnaires, the purpose and the implication of the study were relayed to the sample assuring its utility and confidentiality.

The second broad area of categorization was on the data acquired from the teachers' questionnaire. This data were collected by administering questionnaires on the selected teacher sample. The details of this data are analysed and interpreted with respect to the demographic facts of the teachers; objectives, identification, selection of the project work; orientation and guidance given to the teachers; development of the project work; number and variety in project work; time limit for project work completion; availability of the resources; utility of the project work; problems encountered in development of the project work; evaluation procedures adopted in the project work; preservation and maintenance of the project work and project work as a method of teaching.

The third broad area of categorization included the data obtained from the students' questionnaire. This data were analyzed and interpreted with respect to the objective, identification, selection, assignment, orientation and guidance, development, number, variety, time limit, socio-economic aspects, availability of the resources, utility, interest and appreciation, problems encountered, evaluation procedures, preservation and maintenance and some expressions on improvement of the project work.

The fourth and the last broad area of categorization included judging the present practices in the context of the set criteria for implementation of the project work with relevance to documents and the questionnaires.

As stated above, the following sections of this chapter focus on the content analysis of the documents and the reflections of the teachers and the students in implementation of the project work. The analyzed data are presented in the form of tables wherever necessary. This in turn is followed with the interpretation.

4.2 Analysis of the Documents in Relevance to the Set Criteria in Implementation of Project Work in CBSE Schools

The Documents formed the primary source of data to achieve the first objective of the study, i.e. to study the set criteria in implementation of project work in the CBSE Schools. These documents were obtained from the CBSE and the NCERT websites. Accordingly different types of documents pertaining to this particular issue of the research topic were considered for analysis. For an intensive understanding of the current research area these relevant documents were thoroughly analyzed commencing from May, 2003 to May, 2012.

The following table gives details of the list of the documents that were analyzed for the present study.

Table No. 4.1

List of the documents analyzed

Sl. No.	Type of the Documents
1	CBSE Circulars
2	KVS Dispatches
3	CBSE Guidelines for the Jawaharlal Nehru National Science Exhibition for School Children
4	Compendium for schools
5	Annual Reports, NCERT
6	CBSE Curriculum for Senior Secondary Sections in Science Stream
7	Textbooks of Senior Secondary Level in Science Stream
8	Teacher Handbooks
9	Manuals
10	NCERT School Kits

From the above table it is apparent that 10 different types of documents were scrutinized in order to substantiate the first objective. The analysis was mainly concerned with the explanation of the status of the said phenomenon i.e. implementation of the project work. The details of each type of the document are separately analyzed and interpreted in the following sections.

4.2.1 CBSE Circulars

The Central Board of Secondary Education was set up to serve the educational institutions more effectively, to be responsive to the educational needs of those students whose parents were employed in the Central Government and had frequently transferable jobs. The prime focus of the Board is on

- innovations in teaching-learning methodologies by devising student-friendly and student- centered paradigms
- skill learning by adding job-oriented and job-linked inputs
- regularly updating the pedagogical skills of the teachers and administrators by conducting in service training programmes, workshops etc.

According to the Pocket Oxford English Dictionary (2009), ‘Circulars’ are the letters distributed to a number of people. They are the advertisements (usually printed on a page or in a leaflet) intended for wide distribution. In order to fulfill its objectives the CBSE issues circulars on various agenda to all the Heads of the institutions affiliated to it. These circulars are displayed and updated on its website from time to time.

The year wise list of all the circulars in concern with the research study from May, 2003 to 02nd May, 2012 is analyzed and displayed chronologically in the following sections. Copies of all these circulars are enclosed in the appendices **F1 to F9**, **G, H and I** at the end of the thesis.

The following table shows the list of the circulars for the academic year 2003-04.

Table No. 4.2

List of the project work relevant CBSE circulars in the academic year 2003-04

Sl. No.	From	To	Subject	Reference	Circular No.	Dated	Remark
1	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Project and practical work in Accountancy for class XII	No. CBSE/ ACAD/)3	19	28.08.2003	Guidelines to the teachers to deal with the Project work and the Practical work

It is evident from the above table that only **one** circular was issued by the CBSE to all its affiliated Heads of the institutions during the academic year 2003-04. The above circular is enclosed in the appendix **F1**at the end of the thesis.

This circular with number 19 and with reference number CBSE/ACAD/) 3, dated 28.08.2003 focused on the subject of provision of guidelines for project work and practical work in Accountancy for class XII. It gave an overview of the scope of work and how the teachers are expected to deal with units while teaching and evaluating the students. However, the project work would include 20 marks which are distributed as follows:

Table No. 4.3

Table showing the distribution of marks in project work in Accountancy

Sl. No.	Nature of Work	Marks	Remarks
1	File work	04	---
2	Written work	12	Consists of two application oriented problems of 6 marks each on ratios and cash flows
3	Viva	04	---
Total		**20**	---

It may be noted from the above table that the distribution of marks for the project work are divided under three parts, viz. file work carrying four marks, written work carrying 12 marks and the viva carrying four marks.

Supplementing the above circular, the NCERT had also published these guidelines under the title "Practical Work on Computerized System in Accountancy and Project Work in Accountancy". These guidelines are made available to the schools on payment of Rs. 30.

It is interesting to note that this circular detailed the expected project work for the students of class XII in Accountancy subject. The students are supposed to study at least three types of problems. The main objective behind all these problems is to enable the students to prepare the financial statement involving real life business situations and analyze and derive at meaningful information for taking decisions relating to investment, expansion, financing, etc.

The following table shows the list of the circulars released during the academic year 2004-05.

Table No. 4.4

List of the project work relevant CBSE circulars in the academic year 2004-05

Sl. No.	From	To	Subject	Reference	Circular No.	Dated	Remark
1	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Regional level and National level CBSE-INTEL Science Exhibition Competition	CBSE/DIR/) ACAD)/ Text/2004	23	30.04.2004	Jawaharlal Nehru National Science Exhibition organized by NCERT and exhibition on Science Projects in collaboration with Intel India, the theme being Science and Technology in the Changing World with six sub themes
2	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Alternatives to home work-reg	NO.D(A)/ PA/2005	05/2005	25.01.2005	To provide opportunities to the students to use the time available at home
3	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Guidelines to Project work in Social Sciences	NO.D(A)/ PA/2005	07/2005	04.02.2005	Guidelines for effective implementation of Project work in Social Sciences
4	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Regional Level CBSE Intel Science Exhibition competition	CBSE/DIR/ (ACAD)/ Sc.Exh./2005	15/2005	07.03.2005	Main theme being Recent Trends in Science and Technology with six sub themes

It is ascertained from the above table that **four** circulars were released by the CBSE to all its affiliated Heads of the institutions during the academic year 2004-05 which are enclosed in the appendix **F2**.

From the above list, the **first** circular bearing the number 23 with reference number CBSE/ DIR/) ACAD)/ Text/2004, dated 30.04.2004 focused on the subject of Regional Level and National Level CBSE-INTEL Science Exhibition Competition. This circular stated that the CBSE has been taking several initiatives to provide additional academic inputs to bring greater academic vitality among its affiliated schools. Since, 2004 was celebrated as the year of 'Scientific Awareness', the Board had decided to organize Regional Level and National Level CBSE-INTEL Science Exhibition Competition. Accordingly this competition was organized on Science Projects in collaboration with Intel India. The selected exhibits from different schools had to ultimately participate in the Jawaharlal Nehru National Science Exhibition for Children (JNNSEC) organized by the NCERT, New Delhi in the month of November, 2004.

The theme of the above exhibition was 'Science and Technology in the Changing World'. This theme encompassed the following six sub themes.

- Food and Health
- Energy
- Information-technology
- Industry
- Transport and communication
- Biotechnology

The circular also notified the key parameters for the competition which were read as follows:

a. Every participating school would be represented by not more than two exhibits/projects and two/three students. The exhibits/models might include working models or simulations/schematic designs. The students might be studying in any of the classes from IX-XII.
b. Every participating school would submit an advance report/synopsis on the project/model in the enclosed format on any one of the given sub-themes. The format of the report/ synopsis was enclosed along with the registration form.

c. The participating school would pay a nominal fee of Rs. 100 (Rupees One Hundred) per exhibit towards registration fee in the form of a demand draft in favor of the Regional Officer, CBSE payable at the respective centre. Besides, the participating school would bear the entire expenditure for lodging/ boarding/ travelling expenses that would incur during participation in the Science Exhibition.

d. The said exhibition would be organized at Regional/National level by CBSE. The selected few schools at the National Level would be nominated to participate in the annual Jawaharlal Nehru Science Exhibition organized by NCERT in the month of November, 2004.

The models/exhibits might include:

- Working model to demonstrate
- Schemes/designs of devices or machines
- Simulations/schematic designs
- Indigenous designs of devices or machines
- Schemes/designs to reduce production cost
- Working models of equipment to control and measure
- Improved/improvised models
- Applications of basic principles
- Models of equipment/devices/gadgets/techniques
- Innovative/inexpensive designs and techniques.

It might be noted that every participating school should prepare the model/exhibit on any one of the sub themes which might satisfy any one or more of the above parameters.

In fact, that was the first CBSE-INTEL Science Exhibition, wherein the Regional and National Science Exhibitions would be organized by the CBSE and the JNNSEC would be organized by the NCERT.

The **second** circular bearing the number 05/2005 with reference number NO.D(A)/ PA/2005, dated 25.01.2005 had introduced the concept of alternatives to home work. The objective of this concept was to provide opportunities to the students to use the time available at home for enhancing their emotional rapport with family and to address to certain core issues like admiration for nature, appreciation of aesthetics, eco-sensitivity, communication skills, etc. The skills are ought to be identified either through activities, role-plays or **projects** which could be made a part of co scholastic activities also.

The **third** circular bearing the number 07/2005 with reference number NO.D(A)/ PA/2005, dated 04.02.2005 forwarded a copy of the guidelines for effective implementation of project work in Social Sciences. It stated that the Social Science subject brings the students closer to one's environment, society and the intricate network of the life processes. It enables them to understand the process of social change and the role they can play towards this change. The details of the guidelines are specified under the following headings:

a. Project work requirements

The Project Work in Social Science entailed the following requirements-

1. The project work would be of five marks in each of the classes IX and X.
2. In class IX, the students would do two projects of which one should be related to Disaster Management, out of the list of projects specified.
3. In Class X, the students would do any one project out of the list of projects specified.
4. The list of projects was only suggestive. Teachers might devise their own projects suited to the social, cultural and economic, environmental conditions and common hazards of their locality.

b. Preparation and submission of project report

At the end of the stipulated term each student would prepare and submit her/his project report. The following essentials were required to be fulfilled for its preparation and submission-

1. The total length of the project report will be 15-20 pages.

2. The project report would be handwritten and credit would be awarded to the original drawings, illustrations and creative use of the materials.
3. The project report would be presented in a neatly bound simple folder.
4. The project report would be developed in the following sequence:
    1. Cover page showing project title, student information, school and year
    2. List of the contents
    3. Acknowledgements and preface (acknowledging the institution, offices and libraries visited and persons who have helped)
    4. Introduction
    5. Chapters with suitable headings
    6. Planning and activities to be done during the project, if any
    7. Conclusions (summary and suggestions or findings, future scope of study)
    8. Bibliography
    9. All photographs and sketches would be labeled related to the theme
    10. Appendix (if needed)
    11. Teacher's report
    12. Initial preface page with an initial of the teacher
    13. At the completion of the evaluation of the project, it would be punched in the centre so that the report cannot be reused but is available for reference only
    14. The project report would be returned after evaluation. The school might keep the best reports.

c. Scheme of evaluation

The following were the salient features of scheme of evaluation of the project work:

1. The projects would be evaluated internally and continuously
2. All the concerned Social Science teachers in consultation with each other would share evaluation of the projects

3. Topics covered by the project work would be included in the examination/tests
4. Questions based on the conclusions of the project would be given as a test (oral or written) of 10 minutes duration on one fixed day after the submission of the report.

d. Allocation of marks

Total marks would be allocated over the different aspects in the following manner (for class IX).

Table No. 4.5

Allocation of marks to the project work in Social Science

Sl. No.	**Aspects**	**Marks**
1	Initiative, cooperativeness and participation	01
2	Content accuracy and research work	01
3	Creativity and originality	01
4	Analysis of different situations and different perspectives	01
5	Viva or written test for content assimilation	01
Marks for one project		05
Total marks for two projects (for Class IX)		10
Total marks for internal evaluation (for class IX/X)		5 (10 divided by 2 for class IX)

e. Proforma for the Teacher's Report

The teacher's report in the given Proforma would be attached at the end of the report.

Table No. 4.6

The Project Evaluation Proforma in Social Science

Project Evaluation Proforma
Name of the School ____
Address ____
Name of the Student _______________________________________
Roll No. ____________________ Class _________ Section ______
Teacher's Remarks
1. Initiative, cooperativeness and participation ____________________
2. Aesthetic presentation, visual appeal, expression and neatness _________
3. Content accuracy, creativity, originality, analysis of different perception, performance in the oral/written tests ________________________
4. Date of submission __________
5. Total marks _______________
6. Overall remarks _____________________________________
7. Teacher's signature ____________________ Date ___________

f. Monitoring of implementation of project work in school

It is very essential that the project work in Social Science be implemented in the school in the right manner and spirit.

Out of the two projects that are to be done, one can be given for summer vacation. However, the student should select the topic in the beginning of the new session. Methodology of study and research work should be completed before the vacation and during vacation the project can be systematically organized for presentation and preparation for viva. The second project can be done in school. Approximately 30 periods can be allotted for project work, which will enable the students to do the project under the supervision of the teacher.

The **fourth** circular bearing the number 15/2005 with reference number CBSE/ DIR/ (ACAD)/ Sc.Exh./ 2005, dated 07.03.2005 paid attention to the issue of Regional Level CBSE Intel Science Exhibition Competition. It stated that the response and participation of the schools in the first Regional Level CBSE Intel

Science Exhibition all over the country was immensely encouraging and satisfying. These exhibitions aimed at sensitizing the learners to the applications of Science and Technology in today's society and increasing the awareness of its role in the service of mankind. The main theme was Recent Trends in Science and Technology. This theme included the following six sub themes.

- Agriculture
- Energy and its Conservation
- Industrial Development and Environment
- Educational Technology
- Technology in Health
- Mathematics Modeling

The models or the exhibits or the projects might include the 'Research-based investigatory study projects' in addition to the list of the exhibits of the earlier year. The key parameters for the competition were the same as those of the previous year, except the working models or research based projects.

The registration form (Form A) along with the brief report/synopsis (Form B) and the demand draft was to be submitted to the respective regional office within the stipulated time. Brief information about the themes and the sub themes was enclosed for the reader's convenience and reference.

The Registration Form (Form A) for the CBSE-INTEL Science Exhibition included the name of the school, CBSE affiliation number, complete postal and e-mail address, school phone number and fax number, title of the model/exhibit(s) amount of the details of the draft, signature of the Principal with school seal and date. The Proforma for research based project report/synopsis (Form B) which was to be filled in if the school was to submit a research based project should include the details on the title of the project, name of the sub theme, objective of the project, brief description of the project, further scope, unique features of the project. Finally a declaration was to be stated and signed by the participants that the research project had been originally designed by them and had not been copied from any source.

The following table gives the details of the circulars released during the academic year 2005-06.

Table No. 4.7

List of the CBSE circulars in relevance to the project work for the academic year 2005-06

Sl. No.	From	To	Subject	Reference	Circular No.	Dated	Remark
1	CBSE, Delhi	All Heads of institutions affiliated to CBSE	School based evaluation in Social Science at secondary stage	Acad./Dir(Acad.)/ 2005	26/05	25.05.2005	Details of the salient features of the school based evaluation scheme in Social Science at secondary stage
2	CBSE, Delhi	All Heads of institutions affiliated to CBSE	School for Project Work Evaluation in Social Sciences	Acad./Dir(Acad.)/ 2005	26/05	25.05.2005	Details of the criteria laid down in the guidelines in evaluating different aspects of internal evaluation i.e. term/unit tests, assignments and project work

It is apparent from the above table that **two** circulars were released by the CBSE to all its affiliated Heads of the institutions during the academic year 2005-06. A copy of each of these circulars is enclosed in the appendix **F3**.

Referring to the previous circulars issued on the above subject, the circular number 26/05 with the reference number Acad./Dir(Acad.)/2005, dated 25.05.2005 reiterated on the salient features of the school based evaluation scheme. It focused on the Social Science subject in particular with reference to the implementation of the scheme of evaluation for the ensuing class X examination to be held in the year 2006. The details of the circular regarding the evaluation of the project work were as follows:

1. A total of twenty marks would be allotted for internal evaluation as per the following details:
    - Tests (formative and summative) 10 marks
    - Assignments – school and home assignments 05 marks
    - Project work 05 marks
2. Regarding the evaluation of formative tests, the teachers were expected to give a variety of oral and written questions for recapitulation, review and diagnostic purposes. The purpose was not to assess learning but to identify learning gaps, deficiency in teaching and to bring improvement in teaching-learning process. The tests would be conducted in stress free, non-threatening environment to help the student in revising the learnt concepts.
3. Regarding assignments, it was suggested that for recording purpose, every month, and well-planned assignments might be given to the students in the components of History, Geography, Civics, etc. Assessment could be made on a 5-point rating scale.
4. Regarding evaluation of project work, five marks would be assigned for the project work done by the students in the academic session. The Board had already sent the detailed guidelines regarding evaluation of project work; vide circular number 7/2005 dated 4th Feb. 2005. For class IX, a student was required to do any two projects out of which one would be compulsorily on Disaster Management. In class X, the students would do any one project. It might be pointed out that the project work in no case would be voluminous and must be restricted within 9 to 15 pages of standard A-4 size and it would be original, creative and innovative.

Allocation of marks was the same as stated in the earlier circular (Number 7/2005 dated 04.02.2005).

5. Schools were requested to keep the records of internal assessment along with the project files which were prepared by the students and these would be made available for inspection. The Board would be sending its observers to the schools for the purpose.
6. It might be noted that all the schools were required to send roll number wise marks statement with respect to the internal evaluation to the Board. This marks statement would clearly reflect breakup of marks into different components of internal evaluation.

The purpose of introducing internal evaluation was emphasized to distress learning and to make it more relevant, useful and enjoyable. The objective of entire exercise was to ensure that the students were enthusiastically involved in the learning process.

The **second** circular with number 26/05 and with reference number Acad./Dir(Acad.)/ 2005, dated 25th May, 2005 focused on the evaluation of project work in Social Sciences. It drew the attention on the circular no. 07/2005 issued on 4th February, 2005. It restated that the schools should seriously follow the laid down guidelines in evaluating different aspects of internal evaluation i.e. term/unit tests, assignment and project work and maintain proper assessment records.

It also stated that the project work was an important aspect of internal evaluation wherein children were helped to do and learn on their own by going through the documents, collecting relevant materials and analyzing them to arrive at their own findings and conclusions. The schools would continue to assign the projects to students based on the guidelines and topics specified. They might also ensure that the total length of the Project report would not be more than 12-15 (size A4) foolscap size handwritten pages. Evaluation would be strictly in terms of the criteria laid down in the guidelines. The Board would be very shortly sending the revised topics/themes for project for classes in IX and X to be followed during the current academic session 2006-07.

The following table gives the details of the list of the CBSE circulars released in association with the project work in the academic year 2006-07.

Table No. 4.8

List of the CBSE circulars in relevance to the project work in the academic year 2006-07

Sl. No.	From	To	Subject	Reference	Circular No.	Dated	Remark
1	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Schools should seriously follow the laid down guidelines	ACAD/EO (COM)/2006	13	23.06.2006	Seriousness in evaluating different aspects of internal evaluation like project work; new topics/themes for project for IX and X for 2006-07
2	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Revised guidelines, topics/themes for Project Work in Social Science for classes IX and X	ACAD/EO (COM)/2006	18	21.07.2006	Revision in guidelines, topics/themes for Project Work in Social Science for classes IX and X
3	CBSE, Delhi	All Heads of institutions affiliated to CBSE	CBSE Science Exhibition 2007-Promoting Creativity and Innovation	CBSE/EO (Science) /Sc.Exh. /2007/ 145-9144	16	14.03.2007	Organizing regional level and National level Science Exhibitions with main theme Science and Technology for sustainable development with **five** sub themes

It is obvious from the above table that **three** circulars were issued by the CBSE during the year 2006-07. The above given circulars are enclosed in the appendix **F4.**

The **first** circular with number 13 and with reference number ACAD/EO(COM)/2006, dated 23.06.2006 dragged the attention of all the Principals to the CBSE office circular bearing the number 07/2005 issued on 4th February, 2005 wherein the guidelines for project work evaluation in Social Sciences were issued to the schools. It was reiterated that schools should seriously follow the laid down guidelines in evaluating different aspects of internal evaluation i.e. term/unit tests, assignments and project work and maintain proper assessment records. Seriousness should be revealed in evaluating different aspects of internal evaluation like project work. It restated that the project work was an important aspect of internal evaluation. Therefore it should be strictly followed in terms of the criteria laid down in the guidelines.

The **second** circular with number 18 and with reference number ACAD/EO(COM)/2006, dated 21.07.2006 was in continuation with the above circular number 13. It forwarded a copy of the revised guidelines to be followed on internal evaluation in Social Science Part III: Project Work, for classes IX and X during the academic session, 2006-07. It requested for the circulation of these guidelines amongst the teachers concerned for the effective implementation of the project work in Social Science.

This circular detailed the internal evaluation scheme for 20 marks that were distributed as given below:

Table No. 4.9

Allocation of marks on different areas of evaluation in Social Science

Sl. No.	Part	Area of evaluation	Marks
1	Part 1	Class tests, term tests, etc	10
2	Part 2	Assignments	05
3	Part 3	Project work	05
Total			**20**

The circular deeply discussed about the need for introducing the project work in Social Science as an alternative mode of learning in enabling the students to become independent thinkers. It further gave guidelines on Part 3 pertaining to the evaluation of project work. The details of the same are given below.

A. Requirements for project work

B. Preparation and submission of project report
C. Scheme of evaluation
D. Allocation of marks
E. Criteria for project work evaluation
F. Monitoring of project work in school

Need for introducing project work in Social Science was being felt for quite some time. Many schools had also expressed their desire to have projects in Social Science for enhancing students' understanding about different concepts, principles and generalizations inherent in the subject. This would also introduce an alternative mode of learning in class rooms to increase student's participation in the process of learning and enabling them to become independent thinkers. It was expected that by introducing project work, learning would become more contextual, relevant, contemporary and centered on 'Learning to Be.'

The project work in Social Science entailed the following requirements.

1. The project work will be of five marks in each of classes IX and X.
2. The topics for project work were specified in the guidelines.
3. However, the list of projects was only suggestive. Teachers and students through mutual discussion could devise their own projects suited to the social, cultural and economic conditions and common environmental issues of their locality.
4. In class IX, students would do two projects of which one should be related to Disaster Management and the other from the list of projects specified.
5. In class X, students would do any one project.

At the end of the stipulated term each student will prepare and submit her/his project report. Following essentials were required to be fulfilled for the preparation and submission of the Project Report.

1. The total length of the project report would not be more than 15 written pages of foolscap size (A-4 size).
2. The project report would be handwritten and credit would be awarded to original drawings, illustrations and creative use of materials.

3. The students should continuously discuss with the teacher and prepare a draft before finalizing the report.
4. The project report would be presented in a neatly bound simple folder.
5. The project report would be developed and presented in the order given below.
    - **Cover page** showing project title, student information, school and year
    - **List of contents** with page numbers
    - **Acknowledgements** (acknowledging the institution, offices and libraries visited and persons who have helped)
    - **Project Overview** mentioning the purpose, aim, methodology and experiences while doing the project
    - **Chapters** with relevant headings
    - **Summary and conclusions** based on findings
    - Planning and activities to be done during the project presentation, if any giving a calendar of activities
    - **Bibliography** should include the title, pages referred, author, publisher, year of publication and if a website the name of the website with the specific website link which was used
    - All the photographs and sketches should be labeled and acknowledged.
    - **Teacher's evaluation report**
6. Teachers would initial the Project preview page
7. On completion of the evaluation of the project, it would be punched in the centre so that the report cannot be reused but is available for reference only.
8. The Project report would be returned to the students after evaluation. The school might keep **five reports** each representing different levels from Class IX and X for record.

The following are the salient features of the scheme of evaluation of the project work.

1. The projects would be evaluated internally and continuously.
2. All the concerned Social Science teachers in consultation with each other should share evaluation of the projects.
3. Questions based on the conclusions of the project would be given as a test (oral or written) of 10 minutes duration after the submission of the project.

The total marks would be allocated over the different aspects of the Project Work in the following manner.

Table No. 4.10

Distribution of the marks on different aspects of the project work

Sl. No.	Aspects	Marks
1	Content accuracy and originality	2
2	Presentation and creativity	1
3	Process of Project Completion : Initiative, cooperativeness, participation and punctuality	1
4	Viva or written test for content assimilation	1
Marks for one project 10/5		5
Total marks for 2 projects in Class IX/1 Project in class X		10/5
Total marks for internal evaluation (class IX/X)		5

The following would be the criteria for evaluating Project Work.

Table No. 4.11

Criterion details for evaluation of the project work

Sl. No.	Criterion	Explanation of the criterion
1	Content accuracy and originality	Reads original sources and chooses content from books and internet
2	Presentation	Presents report with original thoughts and opinions supported by facts.
3	Process of Project Completion	Chooses topics on one’s own, shares information willingly, interacts with teachers and peers willingly, takes responsibility
4	Viva Voce	Answers of all questions in written or oral form should • Be relevant and appropriate • Reflect original thinking • Reveal confidence in believing in the work done

The teachers’ report in the given proforma would be attached at the end of the report.

Table No. 4.12

Details of the project evaluation proforma

Project Evaluation Proforma

School's Name ____________________________________

Address ____

Student's Name ____________________________________ Roll No.__________

Class _______________ Section ___________

Teachers' Assessment

1. Content accuracy and originality
2. Presentation and creativity
3. Process of project completion
4. Viva – Voce'
5. Overall remarks____
6. Teacher's signature______________________ Date________________
   with school stamp

It was very essential that monitoring of implementation of the project work in Social Science be done in schools in the right manner and spirit. The student should select the project topic or theme in the beginning of the new session. The project preparation time for the student including discussion should be about four months and sufficient time must be available for evaluation by the teacher.

The **third** circular with number 16 with reference number CBSE/ EO(Science)/ Sc.Exh./ 2007/145-9144, dated 14.03.2007 paid attention on organizing Regional Level and National Level Science Exhibitions for the year 2007. It stated that one of the major initiatives taken by the Board is the organization of the Regional Level and National Level Science Exhibitions and there had been overwhelming response in the past for these exhibitions. The schools had been participating with great enthusiasm. This circular also stated the objectives of organizing Science exhibition which are listed as follows:

- To promote interest of students in the subject of science and develop a scientific temper
- To create awareness about the role of Science and Technology as a major instrument for achieving goals of self-reliance and socio-economic development

- To highlight the applications of scientific concepts and technological advancements in the fields of agriculture, energy, industry, health, natural resources, transport, communication, computers, Bio-technology, Nano-technology and many other emerging fields
- To create awareness about the role of Science and Technology in producing good quality material for use of society
- To develop awareness amongst the learners about the importance of Science and Technology in the national development vis-a-vis the global changes
- To provide opportunity to students to give shape to their creative ideas and innovations

The circular also declared the main theme of the exhibition along with its sub themes. The main theme and the sub themes are given below.

Main theme: Science and Technology for Sustainable Development

Sub themes:

- Food and Agriculture
- Industry and Environment
- Energy
- Educational Technology and Mathematical modeling
- Transport and Communication

The circular also stated the various aspects that needed attention for participation in the proposed exhibition. These aspects are given as under.

a) Every participating school would prepare a maximum of two exhibits / projects.

b) The school team might be represented by one/ two students per exhibit and one escort teacher. The participating students might be studying in any of the classes from IX to XII.

c) Every school / team would have to bear all the expenses related to participation in the event.

d) The exhibit/ project might be either

  i) An investigation - based study/ project

  ii) A working model

e) The exhibit/ model/ project might include

   - A working model to demonstrate a concept, principle or a process.
   - An indigenous design of a machine or a device
   - An innovative/inexpensive design or technique
   - Application of basic principles of science/technology
   - Scheme/design of the device/technique to reduce the production cost
   - An investigatory study

f) The request for participation in the enclosed registration form along with the registration fee of Rs. 400/- in the form of a demand draft in favor of the Regional Officer, CBSE payable at respective Regional office should be sent to the concerned Regional officer.

g) The last date for registration for participation in the event was May 15, 2007.

h) The first stage of the exhibition would be held at two different centers in every region at identified venues.

i) The selected best fifteen exhibits/ schools at the Regional level would be eligible to participate in the National level exhibition.

j) The actual dates for Regional level competition would be informed individually to the participating schools as well as through CBSE website www.cbse.nic.in

k) Brief information about the main theme and sub-themes was enclosed for reference. The participating school might prepare the exhibit/ project on any one of the sub-themes satisfying one or more of the stated parameters.

l) Maximum emphasis should be given to investigation-based innovative projects of students to kindling curiosity and interest in the subject.

m) Attractive awards/ cash prizes would be given to the exhibits/students that were among the best twenty models at the National level.

It also enclosed suggestive guidelines for the preparation of exhibits, models and projects. It proclaimed that the teachers and the students were free to develop exhibits based on their own ideas of their choice related to different sub-themes.

The following table gives the details of the CBSE circulars released during the academic year 2007-08.

Table No. 4.13

List of the CBSE circulars in relevance to the project work for the academic year 2007-08

Sl. No.	From	To	Subject	Reference	Circular No.	Dated	Remark
1	CBSE, Delhi	All Heads of institutions, CBSE	Topics/themes for Project Work in Social Science for Class X	ACAD/ EO(COM)/ 2007	24/07	14.05.2007	Revision of topics/themes for project work in Social Science for class X
2	CBSE, Delhi	All Heads of institutions affiliated to CBSE	CBSE Science Exhibition 2008	CBSE/EO(Sc)/ Sc.Ex./2008	10/08	07.03.2008	Guidelines for Science Exhibition 2008, theme being Science and Technology and Planet Earth, with **six** sub-themes

It may be evident from the above table that **two** circulars were issued in the year 2007-08 which were in relevance to the issue of project work. A copy of each of the above circulars is enclosed in the appendix **F5.** The content details of these circulars are given below.

Owing to the introduction of the new curriculum and textbooks, the center of attention of the **first** circular with number 24/07 and with reference number ACAD/EO(COM)/2007, dated 14.05.2007 was to revise the topics/themes for project work in Social Science for Class X for the academic session 2007-08. Along with the list of the suggested projects in Social Science a list of the websites and reference books was also provided for a ready reference for the students. An illustration of the same is given below on two areas of India and the Contemporary World II.

The first area of India and the Contemporary World II was concerned with the Nationalism in Europe and India and the second area was concerned with the Evolution and significance of the symbols associated with India's freedom movement.

The topics of project work on Nationalism in Europe and India stressed the need to compare the policies and methods used by Otto von Bismarck and Sardar Vallabhai Patel in unification of Germany and integration of States of India respectively. The reports were expected to include

- Condition of Germany before 1871 (unification)
- Condition of India immediately after 1947
- Why the need for unification in both the places
- Emergence of Bismarck and Sardar Patel, their brief life history
- Their role in unification and integration.
- Similarities and differences between the methods adopted by the two leaders
- How did the unification affect the growth of the respective countries.

In this regard the following websites were to be referred by the teachers and the students as per the instructions given in the circular.

http:/en.wikipedia.org/wiki/Otto_von_Bismark
http://www.cyberessays.com/History/73.htm
http://www.cyberessays.com/History/73.htm
http://www1.bartleby.com/65/bi/BismarckO.html
http://en.wikipedia.org/wiki/Political_integration_of India

Any European History book on 19^{th} century and Integration of States by V.P. Menon were to be referred.

The second area was concerned with the evolution and significance of the symbols associated with India's freedom movement. The project works were expected to focus on the following aspects.

- Need for symbols in general and during Freedom struggle
- Evolution of the symbols over a period of time. (Any two symbols out of the flag, a song, an object like the Charkha, a khadi, a novel, a place a newspaper like Harijan etc. may be selected).
- The impact of symbols on common people during the course of the freedom movement – how and in what occasions were they used
- How did they help in the making of the Indian nation-did they give a sense of identity?
- What do these symbols mean to you today?
- Design a symbol for 21st century reflecting its nationhood-Explain the symbol

The following websites could be referred by the teachers and the students in this regard seperately for Flag, Sabarmati Ashram and Khadi as per the instructions of the circualar.

Flag:

http://www.geocities.com/dakshina_kan_pa/art 16/flag1.htm

http://brilliantgnorance.blogspot.com/2005/08/history-of-indian-flag.html.

Sabarmati Ashram:

http://en.wikipedia.org/wiki/Sabarmati_Ashram

http://www.mkgandhi.org/gandhiyatra/sabarmati.htm

http://www.indcast.com/ms/ASHRAM%20HISTORY.htm

Khadi:

http://en.wikipedia.org/wiki/Khadi

http://www.kvic.org.in/v4/khadi.asp

The **second** circular with number 10/08 and with reference number CBSE/EO(Sc)/Sc. Ex./2008, dated 7.3.2008 paid attention on the issue of organizing the CBSE Science Exhibition 2008. With the objective of providing active learning experiences and in order to promote creativity and innovativeness in learners, the Board had been organizing Regional Level and National Level Science Exhibitions since 2005. The main theme was Science and Technology and Planet Earth and the sub-themes were as follows:

- Water Management
- Agriculture and Food
- Energy Resources
- Disaster Management
- Mathematical Modeling
- Educational Technology

The key parameters for participation in the proposed exhibition remained the same as stated in the previous circular. However, if the number of participating schools from a particular state were large, the number of venues might be increased further and the exhibition could also be held at an additional venue in that state.

Percentage wise distribution of marks for the main criteria for judging the exhibits would be as given below.

Table No. 4.14

Allocation of marks on the main criteria for judging the exhibits

Sl. No.	Criterion	Percentage of marks
1	Students' own creativity and imagination	20
2	Originality and innovation in the exhibit/ model	15
3	Scientific thought/ principle/ approach	15
4	Technical skill/ workmanship/ craftsmanship	15
5	Utility/ educational value for layman, children	15
6	Economic aspect, portability, durability	10
7	Presentations like demonstrations and explanation	10
Total		**100**

New curriculum and text books were prescribed by the NCERT in the year 2007-08. Therefore the topic and themes for the project work were revised in Social Science. Accordingly a list of suggestive projects along with a list of websites and books for reference were pronounced in the circulars. India and the Contemporary World II was an illustrative area for project work that was suggested along with expected points of focus.

The following table depicts the details of the CBSE circulars issued during the year 2008-09.

Table No. 4.15

List of the CBSE circulars in relevance to the project work in the academic year 2008-09

Sl. No.	From	To	Subject	Reference	Circular No.	Dated	Remark
1	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Guidelines in Sociology (Code no. 039) subject for Project Work and Marks distribution for class XI for the academic session 2008-09	ACAD/EO (COM)/2008	14/08	15.04.2008	Details of guidelines for assessing Project Work in Sociology for class XI and class XII
2	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Approach to internal evaluation of Disaster management, unit 5 of Social Science, class X, March 2008 examination of Board	ACAD/EO (COM)/2008	20/08	14.05.2008	Details of the revised marks distribution for internal evaluation of Disaster Management in Social Science, class X, March 2008 examination of Board
3	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Strengthening of the Mathematics Laboratory activity work in classes III to VIII	CBSE/008	38/08	30.09.2008	Lists activities based on different concepts included in the syllabus for every class to Mathematics Laboratory
4	CBSE, Delhi	All Heads of institutions affiliated to CBSE	CBSE Science Exhibition 2009	CBSE/Sc.Exh./ Cons./2009	08/09	23.03.2009	Main theme: Science and Technology for Global Sustainability, with **six** sub themes

It is apparent from the above table that **four** circulars were issued during the year 2008-09. The above circulars are enclosed in the appendix **F6.** The content details of the same are given in the following paragraphs.

The **first** circular with number 14/08 and with reference number ACAD/EO(COM)/2008, dated 15.04.008, focused on the issue of providing the guidelines in Sociology (Code no.039) subject for project work for class XI for the academic session 2008-09. This circular stated that upon consequent revision of syllabus as per National Curriculum Framework 2005 the new textbooks in Sociology were introduced in class XI in the year 2006-07 and in class XII in the year 2007-08. It was, therefore, decided to introduce Practical Project Work in Sociology for 20 marks in class XI for the academic year 2008-09. It complementary theory paper would consist of 80 marks. The same pattern of 20 marks practical project work and 80 marks theory would be introduced in class XII in the subsequent year both of which would be externally evaluated.

This circular also included the scheme of examination for class XI in 2008-09 and for class XII 2010 and onwards (academic session 2009-10) along with detailed guidelines on various components, conduct of the activity and evaluation of the projects for both Class XI and class XII. The apportionment of the 20 marks prescribed for the Practical Project Work which would be evaluated by the external examiner for three hours was as follows:

Table No. 4.16

Allocation of marks for different criteria for the practical project work in Sociology

Sections	Criteria for evaluation		Marks
A	Project (undertaken during the academic year at school level)		**07**
	i	Statement of the purpose	2
	ii	Methodology/Technique	2
	iii	Conclusion	3
B	Viva-based on the project work		**05**
C	Research Design		**08**
	iv	Overall format	1
	v	Research question/hypothesis	1
	vi	Choice of technique	2
	vii	Detailed procedure for implementing of technique	2
	viii	Limitations of the above technique	2
Total (A+B+C)			**20**
B & C to be administered on the day of the external examination			

The above distribution of marks comes into practice for Class XI from the session ending examination 2009 onwards and for Class XII from the session ending examination 2010 onwards.

The **second** circular with number 20/08 and with reference number ACAD/EO(COM)/ 2008, dated 14.05.2008 had paid attention to the approach to internal evaluation of Disaster Management, Unit 5 of Social Science, class X, for the March 2008 examination of Board. It detailed the distribution of the revised marks for internal evaluation on Disaster Management.

In this connection, reference was made to circular no.15/08 dated 11.04.2008 intimating the Board's decision to evaluate Disaster Management in Social Sciences of class X through projects from the academic session 2008-09 and the Board Examination 2009 in Social Science of class X. The Board has further decided that in addition to Project Work, Disaster Management would be evaluated through assignments also. Accordingly the distribution of the revised marks over the three components was as follows:

1. Tests – Formative and Summative 10 marks
2. Assignments – Class and Home 04 marks
3. Project Work 06 marks

The detailed guidelines in this regard included tests in the form of formative and summative evaluation for 10 marks which would not include testing of theory in disaster management. The second aspect included class and home assignments. Hereafter, the students were expected to do four different assignments in Social Science in Class X during an academic session, out of which one assignment would be from Disaster Management. This assignment could be from the suggested activities in the textbook or through using diagrams, pictures, comprehension of texts and descriptions given in all the seven chapters of the CBSE textbook, 'Together Towards a Safer India, Part III'. This assignment should be from any chapter other than that selected by the student for project work.

Every student had to compulsorily undertake one project on Disaster Management. A list of topics for project work was enclosed for ready reference. These projects had been carefully designed so as to –

a) Create awareness in learners,
b) Enable them to understand and co-relate all aspects of the Disaster Management,
c) Relate theory with the practice,
d) Provide hands on experience.

In order to realize the expected objectives completely, it would be required by the Principals to muster support from various local authorities and organizations like the Disaster Management Authorities, Relief, Rehabilitation and the Disaster Management Departments of the States, Office of the District Magistrate/ Deputy Commissioners, Fire Service, Police, Civil Defence etc. in the area where the schools are located.

The textbook entitled "Together Towards a Safer India, Part III", by CBSE so far in use for theory examination is the recommended primary source for successfully carrying out the project work. The teachers must ensure judicious selection by students of projects covering a maximum number of listed projects.

The revised distribution of marks over different aspects related to Project Work was as follows:

Table No. 4.17

Distribution of revised marks over different aspects related to the project work

Sl. No.	Aspects	Marks
1	Content accuracy and originality	2
2	Presentation and creativity	1
3	Process of Project Completion : Initiative, cooperativeness, participation and punctuality	1
4	Viva or written test for content assimilation.	2
Total marks for project in Class X		**6**

The projects carried out by the students in different topics should subsequently be shared among themselves through interactive sessions such as exhibitions, panel discussions, etc. All documents pertaining to assessment under this activity should be meticulously maintained by concerned schools. A Summary Report should be prepared and recorded highlighting:

- objectives realized through individual or group interactions;

- calendar of activities;
- innovative ideas generated in this process ;
- list of questions asked in viva voce.

The teachers and students should note that the projects and the models should be prepared from eco friendly products without incurring too much expenditure. The Project Report should be handwritten by the students themselves and comprise of not more than 15 foolscap pages. The record of the project work should also be kept for a period of six months for verification, if any. The list of the topics/themes for project work on Disaster Management included a note to the teachers to supplement the implementation of the project work.

The **third** circular with number 38/08 and with reference number CBSE/008, dated 30.09.2008 had focused on the subject of strengthening of Mathematics Laboratory activity work. It made clear that the concept of Mathematics Laboratory was introduced by the CBSE in its affiliated schools in the year 2003. Every school was advised to establish a Mathematics Laboratory in order to promote teaching learning of the subject through activity work and hands on experiences. It was also suggested that the concept might be introduced from class III to class X.

With the objective of implementation of the concept of Mathematics Laboratory in the right earnest, activity and project work were made an integral part of the prescribed syllabus at secondary stage. As result, the scheme of internal assessment in Mathematics was introduced in class X examination from the academic year 2006-07. A series of initiatives including publication of guidelines to schools on Mathematics Laboratory for classes IX and X giving detailed activities and suggestive project work, were taken by the Board during this period. Additional guidelines had also been provided in the form of circulars issued from time to time and through orientation programs for Mathematics teachers. Schools had also been asked to ensure greater objectivity in internal assessment in the subject vide circular number 02/07 dated 10th January, 2007. It was expected that every care was being taken by the schools to implement Board's policies in the true spirit and make learning of Mathematics more joyful and fun-filling.

In order to strengthen the concept of Mathematics Laboratory further, specific syllabus related activities in the subject had now been identified for classes III to VIII with the help of practicing teachers. The latest NCERT textbooks had been kept as the base for generation of ten activities based on different concepts included in the syllabus for every class. Care was taken to ensure that the teachers and students were able to perform these activities with relative ease. No expensive materials were required to perform these activities and these do not increase the curricular load in the subject. The list of all these activities for classes III to VIII was enclosed with the circular for ready reference. The Board expected that the listed activities would be performed by the students of respective classes from the current academic session 2008-09. Additional supplementary material related to these activities was also being developed and would be made available to schools shortly.

The **fourth** and the last circular with number 08/09 and with reference number CBSE/Sc.Exh./ Cons./2009, dated 23.03.2009 paid attention on the subject of organization of CBSE Science Exhibition 2009. It recapped again that all children are naturally curious to know and learn. They learn through interaction with the natural environment, material things and people around them and construct new knowledge based on their existing ideas and variety of new active learning experiences provided to them.

Therefore with the objective of providing such experiences, the Board had initiated a variety of meaningful steps to strengthen Science education at school level. One such step refers to the organization of Science exhibitions at Regional Level and National Level. These exhibitions are aimed at promoting students' interest in the subject as well as provide common platform to them to give shape to their creative and innovative ideas. Based on the past experiences and an encouraging and enthusiastic response from the schools, the Board had again decided to announce the conduct of this event for the year 2009-10. The guidelines for preparation of Exhibits and Projects in the form of importance of every sub-theme in the context of main theme and a number of suggestions for designing the exhibits/projects were given. However, these were only suggestive guidelines. Participants were free to design exhibits based on their own expertise, experience and choice.

The main theme was Science and Technology for Global Sustainability. It encompassed six sub themes. They were as follows.

- Agriculture and Food Security
- Harnessing Energy
- Conservation of Natural Resources
- Combating climate changes
- Disaster Management
- Mathematical modeling

The key aspects of organization of the exhibition were in relation to the number and nature of exhibits, expenses and team representation. Each team could be with a maximum of two students per exhibit and one escort Science Teacher. It also included details of registration form and fee; and details of the exhibition dates and venue. The percentage wise evaluation criteria were also displayed in the circular which was similar to the criteria displayed in the earlier circular.

A brief write-up about the main theme and sub-theme was enclosed for reference. The participating schools might prepare the exhibits/projects on any one of the sub-themes satisfying one or more of the stated parameters. As usual greater emphasis was given to investigation based innovative projects to kindle curiosity, originality and creativity in the students. Attractive awards/cash prizes were ensured to the exhibits/students that were among the best twenty models at the national level.

The following gives the details of the CBSE circulars released during the year 2009-10.

Table No. 4.18

List of the CBSE circulars in relevance to the project work during the academic year 2009-10

Sl. No.	From	To	Subject	Reference	Circular No.	Dated	Remark
1	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Participation in Regional Level CBSE Science Exhibition-2009	CBSE/Cons /2009	*NA	02.07.2009	Planning of the travel schedule
2	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Examination Reforms and Continuous and Comprehensive Evaluation (CCE) in the Central Board of Secondary Education (CBSE)	No. CBSE/ACAD /2009	39	20.09.2009	Guidelines of CCE
3	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Continuation of cir. No 42	CBSE/EO(SD)/ CIRCULAR/ 2009	62	30.11.2009	Modified Design of Question Paper for Class IX

*****NA-Not available

It is noticeable from the above table that there were **three** circulars that were released during the year 2009-10. A copy of each of the above circulars is enclosed in the appendix **F7.** The content details of the same are given in the following paragraphs.

The **first** circular with reference number CBSE/Cons/2009, dated 02.07.2009 paid attention on participation in Regional Level CBSE Science Exhibition-2009 and planned the travel schedule. This circular was in response to the application for participation in Regional Level CBSE Science Exhibition 2009, from various schools. It informed about the date and venue of the exhibition in their respective region. The travel schedule of the participating team might be planned accordingly. The schools were requested to note the details of participation, like number of members in a team, planning the travel schedule, expenses during the travel, ensuring provision of facilities for display of the exhibits (approximate 6'X3'space), time and dates of the exhibition, parameters of evaluation of the exhibits like originality, scientific principle, technical skill, utility, economic viability and presentation. The participating students were advised to be well prepared for proper explanation and presentation. The projects/ exhibits were expected to be supported with Charts/ Reports and other support materials.

A brief write-up of the model/exhibit within three typed pages including the title**,** objective/aim, scientific principle involved, material used, figure, working investigation/findings, approximate cost, utility and further scope of the project etc. along with the names of the participants and the school with complete address was to be submitted to the Principal of Venue School.

The **second** circular with number 39 and with reference number CBSE/ACAD/2009, dated 20.09.2009 focused on Examination Reforms and provision of guidelines of Continuous and Comprehensive Evaluation (CCE) in the CBSE. Discussing the significance of evaluation it affirmed that evaluation is an indispensable part of the educational process as some form of assessment is necessary to determine the effectiveness of teaching learning processes and their assimilation by learners.

Quoting from (NCF-Position paper on Examination Reforms) it acknowledged that external examinations 'are largely inappropriate for the 'knowledge society' of the 21st century and its' need for innovative problem solvers', Questions if not framed well, "call for rote memorization and fail to test higher-order skills like reasoning and analysis, lateral thinking, creativity and judgment. External exams make no allowance for different types of learners and learning environments and induce an in-ordinate level of anxiety and stress".

This calls for a functional and reliable system of School-Based Evaluation. Therefore, it is necessary to look at the holistic assessment of a learner which also includes co scholastic area of Life Skills, Attitudes and Values, Sports and Games as well as Co-Curricular activities. The CCE scheme aims at addressing this in a holistic manner. Consequently, the CCE scheme brings about a paradigm shift from examination to effective pedagogy.

In the light of the above background, surveys and consultations with various stakeholders across the country and the given mandate of CBSE, the Board, on the advice of the Ministry of Human Resource Development, Government of India has decided to introduce the new Scheme.

According to the new scheme, the weightage of the school based assessment would remain the same as per past practice, i.e. 20% each in the subjects of Science, Social Science and Mathematics. The new Grading system would be introduced at Secondary School level (for Classes IX and X) effective from the academic year 2009-10.

This new scheme would help the learners and parents to

- Reduce the stress and anxiety
- reduce the dropout rate
- focus on learning rather than teaching
- emphasis on conceptual clarification through experiential learning
- develop holistic personality by also focusing on the co-scholastic aspects
- prepare the students for life by making students physically fit, mentally alert and emotionally balanced
- give more time on their hands to develop their interests, hobbies and personalities
- make an informed choice about subjects in Class XI
- motivate learning in a friendly environment

- equip students with Life Skills especially Creative and Critical thinking skills, social skills and coping skills which will keep them in a good stead when they enter into a highly competitive environment later on

Teacher training workshops would be conducted to create awareness regarding the Board's Scheme and address their concerns. The CBSE is committed to the enhancement of quality in school education and it plans to empower schools to assess the students without compromising on any quality parameter. The above scheme needs to be explained in detail to the parents, teachers and students to create awareness and to sensitize them.

The CCE in classes IX and X is intended to provide holistic profile of the learner through evaluation of both Scholastic and Co-Scholastic areas spread over two terms each during two academic years. Each term will have two Formative assessments and one Summative assessment for evaluation of Scholastic areas.

Formative assessment is a tool used by the teacher to continuously monitor student progress in a non-threatening and supportive environment. It is highly recommended that the school should not restrict the Formative assessment to only a paper-pencil test. There are other means of testing such as through quizzes, conversations, interviews, oral testing, visual testing, **projects,** practicals and assignments. The Summative assessment is the terminal assessment of performance at the end of instruction.

In addition to the scholastic areas, co-scholastic areas like Life Skills; Attitudes and Values; Participation and Achievement in activities involving Literary and Creative Skills, Scientific Skills, Aesthetic Skills and Performing Arts and Clubs; and Health and Physical Education would also be evaluated.

The **third** circular with number 62 and with reference number CBSE/EO(SD)/ CIRCULAR/2009, dated 30.11.2009 in continuation of circular number 42 paid attention to the modified design of question paper for class IX. Accordingly the formative assessment three and four would include the following:

I. Written Assessment based on Theory
II. Practical Assessment based on CBSE curriculum 2009-2011
III. Continuous Assessment in the following suggested areas :

a) Home Assignments/Class Assignments
b) Class Response/oral assessment/quiz
c) Seminar
d) Symposium
e) Group Discussion
f) Group Activity preferably in groups of 4-5 students. Suggested areas

- Investigatory/Experimental Projects
- Action Plan
- Survey
- Assessment on worksheets based on field trips

The home assignments/class assignments and class response/oral assessment/ quiz are normal modes of formative assessment. In addition to these seminars, symposium, group discussion, group activity preferably in groups of 4-5 students might be taken up. Further some suggested areas for formative evaluation might be in the form of **investigatory/experimental projects,** action plan, survey and assessment on worksheets based on field trips.

The students might be asked to do the investigatory/ experimental projects which include collection of data, analysis and interpretation of data, observation, conclusion and inference. Experimental projects include identifying problem, making hypothesis, testing/ experimenting, observation, analysis and interpretation, conclusion and inference, making a theory. The areas of assessment might include inquisitiveness, observational skill, thinking skill (logical, rationale), analytical, application of knowledge, comprehension and understanding (viva-voce), computing skills, drawing conclusions and experimental skills.

The completed **project work** might be presented in the form of written project reports; charts or models; power point presentations and survey analysis. Accordingly, the projects could be evaluated on the basis of the rationale of the project; inquisitiveness; observation skill; thinking skill; analytical ability; application of knowledge; drawing conclusions and presentation style.

The following table gives the details of the CBSE circulars released during the academic year 2010-11.

Table No. 4.19

List of the CBSE circulars in relevance to the project work during the academic year 2010-11

Sl. No.	From	To	Subject	Reference	Circular No.	Dated	Remark
1	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Organization of CBSE Science Exhibition 2010	CBSE/Sc.Exh./ Cons./2010	19	21.04.2010	Details about Organization of CBSE Science Exhibition 2010, with Science, Technology and Society theme and **six** sub themes
2	CBSE, Delhi	All Heads of institutions affiliated to CBSE	IGNITE 2010	CBSE/EO(SD)/ IGNITE/2010	35/10	23.07.2010	Details of the IGNITE 2010
3	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Participation in Regional Level CBSE Science Exhibition-2010	CBSE/Cons/ 2010/	*NA	29.07.2010	Details of participation in Regional Level CBSE Science Exhibition-2010, copy of letter sent to every participating school

*NA-Not Available

From the above table it is obvious that **three** circulars were issued in the year 2010-11. A copy of each of the above circulars is enclosed in the appendix **F8.** The analysis of these circulars is carried on and is presented below.

The **first** circular with number 19 with reference number CBSE/ Sc.Exh./ Cons./2010, dated 21.04.2010 focused on the issue of organization of CBSE Science Exhibition 2010. It declared the details of the main theme and the subthemes of the exhibition. It proclaimed that besides creating scientific literacy; the key expectations from teaching-learning of science at school stage include developing questioning and enquiring skills, acquiring process skills, developing problem-solving and decision-making skills and promoting scientific temper in the learners and helping them to understand and appreciate close inter-relationship between Science, Technology and Society. This demands interactive, participatory, hands-on, innovative and creative learning experiences to be provided to them.

In order to suffice the above aims, the Board had been initiating and organizing Science Exhibitions at Regional and National Levels which provide a common platform to schools, teachers and students to give shape to their creative and innovative ideas.

The main theme of the Science Exhibition 2010 was Science, Technology and Society. It encompassed the following sub themes:

- Climate change-causes and consequences
- Green energy
- Biology in Human Welfare
- Information and Communication Technology
- Mathematics and Everyday life
- Science and Technology in Games and Sports

The key aspects of the exhibition might be kept in mind for participation. This includes details of the number of the exhibits, expenses to be borne, nature of the model/exhibits, composition of the team, details of the registration form and fee, dates and venue of the exhibition, evaluation criteria, details of the write up, preferences and emphasis in selection of the projects, awards and cash prize. It was informed to pass on the details to the science faculty and the students.

The **second** circular with number 35/10 with reference number CBSE/EO(SD) /IGNITE /2010, dated 23.07.2010 paid attention to the schedule of IGNITE 2010. The present document declared IGNITE 2010 as a Nationwide Campaign to harness the creative and innovative spirit of school children by National Innovation Foundation (NIF) and Central Board of Secondary Education (CBSE).

The CBSE had successfully launched IGNITE 2007, IGNITE 2008 and IGNITE 2009 in collaboration with National Innovation Foundation (NIF) and Honey Bee Network with an attempt to harness the creative and innovative talent of school children. The main feature of this project was to promote innovative thinking a pervasive characteristic of all children. As a value addition, the project has served as a stress reducing feature of regular curriculum transaction and an activity to promote original thinking and problem solving ability. This venture had a remarkable response from the students, teachers and the parents. While 961 entries were received during IGNITE 2008 the number rose to 1344 from 21 states in the IGNITE 2009 campaign. Encouraged by such an overwhelming response the collaborative project “IGNITE 2010”, is being taken forward by the Board in the new academic session 2010-11.

The schedule for the IGNITE 2010 was pertaining to the date of announcement of the competition, date of submission of entries, call for entries from students as per the following categories:

I. Technological ideas to solve any problem in day to day life
II. Real life technological projects demonstrating innovative ways of solving problems or reducing drudgery or generating efficiency or conserving resources (projects demonstrating application of known scientific concepts or theories will not be accepted).
III. Traditional knowledge practices documented from elders in and around one’s family.
IV. Information about some other innovators in the neighborhood

Each entry should be accompanied with a certificate from parents and teachers saying that the idea / innovation has been developed and documented by the student concerned entirely on his / her own without any guidance or support from them.

The awards would be announced and given away on October 15, 2010, the birthday of Hon’ble former President of India, Dr. A.P.J. Abdul Kalam. This day was being celebrated as Children’s Creativity and Innovation Day.

NIF would provide support for patenting and incubating innovative projects into products in all deserving cases. NIF has already filed patents for first award winner in IGNITE ’07, and selected winners of the IGNITE ‘08 and IGNITE ‘09 competitions. Many award winners have been interviewed at the national and international level also.

The focal point of the **third c**ircular with reference number CBSE/Cons/2010/, dated 29.07.2010 was on participation in Regional Level CBSE Science Exhibition-2010. This document detailed the region wise schedule of the Regional Level CBSE Science Exhibition, 2010 to be held in the month of August, 2010. It also enclosed a copy of letter that was sent to every participating school with complete information on venue, date and travel schedule of the participating team. In addition to this the following guidelines were given to the participating schools.

a) The participating students must be accompanied by one escort teacher.
b) The participating teams would have to make their own travel and stay arrangements at venue city.
c) Travel and lodging/boarding expenses would be borne by the participating team/school.
d) Every team should report to the venue school Principal one day in advance (Morning) and ensure the space and other facilities required for the display of the exhibit. The model should be arranged and set in all respects well in time one day in advance. The school name and title of the exhibit should also be displayed properly. The teams are advised to bring all necessary materials like bed-sheet, markers, cello-tape, all-pins, and drawing pins, gum stick etc. for proper display of the exhibit.
e) The travel plans might be made accordingly.
f) The exhibit/model would be evaluated by a team of subject experts for selection for National Level Exhibition. Both or at least one of the members of the team should always be present at the exhibit for explanation to the visitors. The major parameters of evaluation of exhibits include originality, scientific principle, technical skill, utility, economic viability and presentation. The participating students should be well prepared for proper explanation and presentation.

g) As far as possible, one exhibit should not require more than 6'X3' (approx.) of space for display. The project/exhibit must be supported with Charts/Reports and other support materials.

h) Brief write-up of the model/exhibit should be displayed by the team. The write-up should include the title, objective/aim, scientific principle involved, material used, figure, working investigation/findings, approximate cost, utility and further scope of the project etc., along with the name of the participants and the school with complete address. The write-up should be submitted to the Principal of Venue School or the organizers on the days of reporting at venue exhibition and should not exceed three typed pages.

The following table gives the details of the CBSE circulars released during the academic year 2011-12.

Table No. 4.20

List of the CBSE circulars in relevance to the project work during the academic year 2011-12

Sl. No.	From	To	Subject	Reference	Circular No.	Dated	Remark
1	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Organization of CBSE Science Exhibition 2011	CBSE/ Sc.Exh.JS acad/2011	31	18.04.2011	Details of the exhibition with the theme: Science and Technology for challenges in Life and six sub-themes
2	CBSE, Delhi	All Heads of institutions affiliated to CBSE	*NA	CBSE/ Academic/ Circular/ 2011	34/2011	26.04.2011	Details of evaluation scheme for Physics practical examination for 2013 Board examination
3	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Participation in Regional Level CBSE Science Exhibition-2011	CBSE/JS (Acad.)/ 2011	*NA	July, 2011	Details of participation in regional level CBSE science exhibition

*****NA-Not available

Table No. 4.20 (Contd.)

Sl. No.	From	To	Subject	Reference	Circular No.	Dated	Remark
4	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Organization of CBSE Science Exhibition-2012	CBSE/Sc. Exh/ Cons/2012	5/2012	25.04.2012	The main theme for this year's exhibition is: Science , Society and Environment and has six sub-themes
5	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Clarification in Evaluation Scheme for Class XI and XII Practical Examination in Physics (code 042)	CBSE/EO (SD)/ 2012/ Dated:	6/2012	27.04.2012	Details of Evaluation Scheme for Class XI and XII Practical Examination in Physics
6	CBSE, Delhi	All Heads of institutions affiliated to CBSE	Guidelines for Project Work in Business Studies for Classes XI and XII w.e.f. the academic session 2012-13 and the Board Examination 2013.	ACAD/ CBSE/ EO(C)/ 2012	9/2012	02.05.2012	Detailed guidelines for Project Work for perusal of the Business Studies teachers

From the above table it is observable that **six** circulars were issued in the year 2011-12. A copy of each of the above circulars is enclosed in the appendix **F9.** An analysis of these documents was carried on and displayed in the following paragraphs.

The **first** circular with number 31 with reference number CBSE/Sc.Exh.JS acad/2011, dated 18.04.2011 focused its attention on the organization of CBSE Science Exhibition 2011. The theme of the exhibition was declared along with its sub themes. The purpose of Science exhibition was to develop scientific attitude in the young generation of our country to make them realize the interdependence of science, technology and society and the responsibility of the scientists of tomorrow. These objectives might be achieved by presenting the exhibits as an exciting experience of creativity of children, innovations through improvisations of science kits, and various devices and models for providing solutions to many present and future socio-economic problems particularly those confronted in the rural areas, using available materials and local resources.

The exhibitions would help children and teachers to learn from each other experiences and motivate them to design and develop something new and novel. It wouldl also provide a medium for popularizing science and increasing awareness among the public towards it. The objectives of organizing science exhibitions were briefly put as follows:

- stimulating interest in science and technology and inculcating scientific spirit in younger generations;
- exploring and encouraging scientific and technological talent among children;
- inculcating in them a sense of pride in their talent;
- providing exploratory experiences, encouraging creative thinking and promoting creative thinking and promoting psychomotor and manipulative skills among children through self devised exhibits or models or simple apparatus;
- encourage problem solving approach and developing the appropriate technologies, especially for rural areas and integrating scientific ideas with daily life situations;
- popularizing science among masses and creating an awareness regarding the role of science and technology in socio-economic and sustainable growth of the country.

The main theme for the Science Exhibition 2011 was Science and Technology for Challenges in Life. The sub themes were as follows:

- Bio-diversity-Conservation and Sustenance
- Agriculture and technology
- Green Energy
- Transport and Communication
- Community health and Environment
- Mathematical modeling

The document also detailed the key aspects of the exhibition for participation. The importance of each sub-theme in the context of the main theme and number of ideas for development of exhibits were also given. However, these ideas were only suggestive. Participants were free to develop exhibits based on other related ideas of their choice.

The registration form for the CBSE Regional Level Science Exhibition, 2011 included the details of the name of the school, complete address and contact numbers, region, title of the Exhibits/Projects, sub-theme of the exhibit, details of registration fee/ draft number and date, amount and Bank, brief write up of the Exhibit/ Project so as not to exceed 200 words including the scientific principle involved, method/ procedure followed, unique features of the exhibit, applications in different domains of life, and further scope of the exhibit/ project.

The **second** circular with number 34 /2011 and with the reference number CBSE/ACADEMIC/CIRCULAR/2011/ dated 26.04.2011, focused on the issue of the note under "Practicals" for Class XI and Class XII which might be respectively read as follows.

In class XI practical it might be noted that every student would perform at least 15 experiments (8 from Section – A and 7 from Section B). The activities mentioned should only be for the purpose of demonstration by the teachers. A total of at least 6 activities (3 each from each of the two sections) need to be demonstrated. Similarly in class XII practical it might be noted that every student would perform at least 15 experiments (7 from Section – A and 8 from Section B). The activities mentioned should only be for the purpose of demonstration by the teachers. A total of at least 6 activities (3 each from each of the two sections) need to be demonstrated. One project, of three marks, is to be carried out by the students.

A summary of the above details are analyzed and tabulated below.

Table No. 4.21

Details of experiments and activities in class XI and class XII Practicals

Sl. No.	Class	Sections			
		A		B	
		Experiments	Activities/ Demonstrations	Experiments	Activities/ Demonstrations
1	XI	08	03	07	03
2	XII	07	03	08	03
Total		**15**	**06**	**15**	**06**

The scheme of evaluation of practical examination for class XI and class XII is slightly modified and given as under.

Table No. 4.22

Details of practical examination evaluation scheme for class XI and class XII

Sl. No.	Evaluation Scheme for			
	Class XI	Marks allotted	Class XII	Marks allotted
1	Two experiments one from each section	8+8 Marks	Two experiments one from each section	8+8 Marks
2	Practical record [experiments and activities]	06 Marks	Project record [experiments and activities]	4+2 Marks
3	Record of demonstration experiments	03 Marks	Project	03 Marks
4	Viva on experiments and activities	05 Marks	Viva on experiments and project	05 Marks
Total		**30 Marks**	**Total**	**30 Marks**

The marks allotted to record of demonstration experiments was reduced by one mark, whereas the marks allotted to the viva on experiments and activities was increased by one mark. Similarly six marks allotted to the project record [experiments and activities] were split as four and two.

The **third** circular with reference number CBSE/JS (Acad.)/2011, dated in July 2011 released the details for participation in Regional Level CBSE Science Exhibition, 2011. The guidelines to the participating schools in the Regional Level

CBSE Science Exhibition 2011 were discussed at length. It stated that individual letters would be also sent to all the participating schools.

It insisted the schools to make their own travel schedule of the team and plan accordingly. The schools were requested to note the following points in that regard.

a) The participating students might be accompanied by one escort teacher.
b) The teams would make their own travel and stay arrangements.
c) Travel and lodging/boarding expenses would be borne by the participating team/school.
d) Every team would report to the venue Principal one day in advance (Morning) and ensure the space and other facilities required for the display of the exhibits. The models should be arranged and well set in all respects the previous day itself. The school name and title of the exhibit should also be displayed properly. The teams were advised to bring all necessary materials like bed-sheet, markers, cello-tape, all-pins, drawing pins, gum stick etc. for proper display of the exhibit.
e) The timings of the exhibition would be from 9.00 am to 5.00 pm on two days of the exhibition. The students from other schools are also likely to visit the exhibition and get benefited.
f) The exhibit/model would be evaluated by a team of subject experts for selection for National Level Exhibition. Both or at least one of the members of the team should be always present near the exhibit for explanation to the visitors. The major parameters of evaluation of exhibits include originality, scientific principle, technical skill, utility, economic viability and presentation. The participating students should be well prepared for proper explanation and presentation.
g) As far as possible, one exhibit should not occupy more than 6’x3’ (approximate) of space for display. The project/exhibit must be supported with Charts/Reports and other support materials.
h) The participants were required to submit a brief write-up of the model/exhibit displayed by the team. The write-up should include the title, objective/aim, scientific principle involved, material used, figure, working investigation/findings, approximate cost, utility and further scope of the project etc. along with the name of the participants and the school

with complete address. The write-up was to be submitted to Principal of the venue school or the organizers on the days of exhibition and should not exceed three typed pages.

i) The confirmation about participation and exact requirements for display of exhibit should be sent to the venue of Principal well in advance for smooth functioning of the exhibition.

The **fourth** circular with number Acad-5/2012 and with the reference number CBSE/ Sc.Exh/Cons/2012 dated 25.04.2012, paid attention on the subject of organization of CBSE Science Exhibition, 2012 at the Regional Level and the National Level. Amongst the many initiatives taken up by the CBSE, the organization of Science Exhibitions at Regional and National levels every year is one among them. These exhibitions intend to provide a medium for popularizing Science and increase awareness among the stakeholders about close relationship between Science, Technology and Society. The main objectives of organizing Science exhibitions could be summarized as:

- Promoting interest in Science and Technology among younger generation.
- Encouraging scientific and technological creativity among students and inculcating a sense of pride in their talent
- Providing exploratory experiences, encouraging creative thinking and promoting psychomotor skills among school students through self designed models or simple apparatus.
- Encouraging problem solving approach and developing appropriate technologies, especially for rural areas and integrating scientific ideas with daily life situations.
- Popularizing Science and technology among masses and creating an awareness regarding its impact on socio-economic and sustainable development of the country

The main theme of the exhibition would be Science, Society and Environment and the sub-themes were as follows.

- Agriculture and Food Security
- Energy-Resources and Conservation
- Health

- Environmental Issues and Concerns
- Mathematics and Everyday life
- Disaster Management

The key aspects of the exhibition were reemphasized to be kept in mind for participation. Greater emphasis was to be given to investigation-based innovative projects to kindle scientific method and scientific approach in the students. The detailed guidelines in the form of a brief write up were enclosed for preparation of the exhibits and the models. The participating teams might prepare the exhibits/projects on any one of the sub-themes satisfying one or more of the stated parameters. Attractive awards/cash prizes were to be given to exhibits/students who present the best twenty models at the National Level.

The above information might be brought to the notice the science faculty in the school and the students. The registration form contained the preliminary details of the participating school. It focused the attention for a brief write up of the exhibit/project not exceeding 200 words. The write up should include the following.

1. Scientific Principle involved
2. Method/ Procedure followed
3. Unique features of the exhibit
4. Applications in different domains of life
5. Further scope of the exhibit/ project

The **fifth** circular with number Acad-6/2012 and with reference number CBSE/EO (SD)/ 2012/, dated 27.04.2012 focused on the issue of clarification in Evaluation Scheme for Class XI and XII Practical Examination in Physics (Code 042). The following clarification in this regard was to be immediately brought to the notice of all the concerned.

The record of **Class XII** which was to be submitted by the students, at the time of their annual examination, had to include

- Record of at least 15 Experiments [with a minimum of 7 from section A and 8 from section B], to be performed by the students.
- Record of at least 6 Activities [with a minimum of 3 each from section A and section B], to be demonstrated by the teachers.

- The Report of the project, to be carried out by the students.

The record of **Class XI** which was to be submitted by the students, at the time of their annual examination, had to include

- Record of at least 15 Experiments [with a minimum of 8 from section A and 7 from section B], to be performed by the students.
- Record of at least 5 Activities [with a minimum of 2 each from section A and section B], to be performed by the students.
- Report of at least two demonstration experiments, to be carried out by the teacher.

Table No. 4.23

Details of experiments and activities in class XI and class XII practical records

Sl. No.	Class	Sections			
		A		B	
		Experiments	Activities/ Demonstrations	Experiments	Activities/ Demonstrations
1	XI	08	02/03	07	03/02
2	XII	07	03	08	03
Total		**15**	**06**	**15**	**06**

The evaluation scheme for class XI and class XII is displayed in the following table.

Table No. 4.24

Details of evaluation scheme and marks distribution for class XI and class XII

Sl. No.	Evaluation Scheme for			
	Class XI	Marks allotted	Class XII	Marks allotted
1	Two experiments one from each section	8+8 Marks	Two experiments one from each section	8+8 Marks
2	Practical record [experiments and activities]	06 Marks	Project record [experiments and activities]	06 Marks
3	Record of demonstration experiments	02 Marks	Project	03 Marks
4	Viva on experiments and activities	06 Marks	Viva on experiments and project	05 Marks
Total		**30 Marks**	**Total**	**30 Marks**

It was requested to delete the words; (for the purpose of demonstration only) given along with the heading ‘Activities’ in each of the Section A and Section B of the class XI Physics Practical syllabus.

The **sixth** circular with number Acad-9/2012 and with reference number ACAD/CBSE/ EO(C)/ 2012, dated 02.05.2012 released guidelines for project work in Business Studies for Classes XI and XII for the academic year 2012-13. It was requested to refer to the Business Studies syllabus for Classes XI and XII pertaining to the Board Examination year 2013 which provides 10 marks for project work in both the classes at senior school level. The Board had brought out guidelines for project work for perusal of the Business Studies teachers. Those were to be brought to the notice of concerned teachers and students.

In this connection, a copy of the guidelines for project work in Business Studies for Classes XI and XII were enclosed. These guidelines were on

- the details of the effectiveness of the project work in Business Studies for class XI and XII,
- introduction,
- objectives,
- guidelines for teachers for class XI and class XII and
- a detailed list of the topics separately for class XI and class XII.

The teachers were expected to help the students to identify any one project from the list given below.

Table No. 4.25

List of the projects for class XI and class XII in Business Studies

Sl. No.	List of the projects for Class XI	List of the projects for Class XII
1	Field Visit	Elements of Business environment
2	Case Study on a Product	Principles of Management
3	Aids to Trade	Marketing Management
4	Stock Exchange	---
5	Import / Export Procedure	---

The objectives of doing the project work in Business Studies were stated as follows.

- to develop a practical approach by using modern technologies in the field of business and management;
- to get an opportunity for exposure to the operational environment in the field of business management and related services;
- to inculcate important skills of team work, problem solving, time management,
- to provide scope for information collection, processing, analyzing and synthesizing relevant information to derive meaningful conclusions;
- to get involved in the process of research work;
- to demonstrate his or her capabilities while working independently and
- to make studies an enjoyable experience to cherish.

The teachers were to interact, support, guide, facilitate and encourage students while assigning projects to them. They were requested to ensure that the project work assigned to the students whether individually or in group were to be discussed at different stages right from assignment to drafts review and finalization. Students should be facilitated in terms of providing relevant materials or suggesting websites, or obtaining required permissions from business houses, malls etc for their project. The 16 periods assigned to the project work should be suitably spaced throughout the academic session. The teachers MUST ensure that the students actually go through the rigors and enjoy the process of doing the project rather than depending on any readymade material available commercially outside.

The teachers should follow the following steps.

1. Students must take any one topic during the academic session.
2. The project may be done in a group or individually.
3. The topic should be assigned after discussion with the students in the class and should then be discussed at every stage of submission of the draft/final project work.
4. The teacher should play the role of a facilitator and should closely supervise the process of project completion.

5. The teachers must ensure that the student's self esteem should go up, and he/she should be able to enjoy this process.
6. The project work for each term should culminate in the form of Power Point Presentation/Exhibition/Skit before the entire class. This will help in developing ICT and communication skills among them.
7. The teachers should feel pride in the fact that they have explored the different dimensions of the project in an innovative way and their students have put in genuine work.

At the end of the stipulated term, each student would prepare and submit his/her project report. The following essentials are required for the preparation and submission of the project report.

1. The total project would be in a file format, consisting of the recordings of the value of shares and the graphs. The total length of the project would be of 25 to 30 pages.
2. The project would be handwritten.
3. The project would be presented in a neat folder.
4. The project report would be developed in the following sequence-
    - Cover page should include project the title, student information, school and year
    - List of contents
    - Acknowledgements and preface (acknowledging the institution, the news papers read, television channels viewed, places visited and persons who had helped)
    - Introduction
    - Topic with suitable heading
    - Planning and activities done during the project, if any
    - Observations and findings while conducting the project/field visit
    - News paper clippings to reflect the changes of share prices
    - Conclusions (summarized suggestions or findings, future scope of study)
    - Photographs if any
    - Appendix (if needed)
    - Teacher's observation/report

- Teacher’s signature
- Preface page with teacher’s initial

5. At the completion of the evaluation of the project, it would be punched in the centre so that the report cannot be reused but is available for reference only
6. The projects would be returned after evaluation. The school may keep the best projects

The projects would be assessed and marks would be allocated on the following heads.

Table No. 4.26

List of different aspects of project assessment for class XI and class XII in Business Studies

Sl. No.	Aspects of Assessment	Marks Allotted
1	Initiative, cooperativeness and participation	1 Mark
2	Creativity in presentation	1 Mark
3	Content, observation and research work	2 Mark
4	Analysis of situations	2 Mark
5	Viva	4 Mark
Total		**10 Marks**

A comprehensive perception on the implementation of the project work was obtained by analyzing the content of the circulars which were released from May, 2003 to May, 2012. The year wise number of circulars issued within these years is tabulated and presented as follows.

Table No. 4.27

The number of CBSE circulars analyzed in each academic year

Sl. No.	Year	Number of CBSE Documents
1	2003-04	01
2	2004-05	04
3	2005-06	02
4	2006-07	03
5	2007-08	02
6	2008-09	04
7	2009-10	03
8	2010-11	03
9	2011-12	06
Total		**28**

From the above table it is learnt that a sum of **28** circulars was content analyzed for studying the set criteria in implementation of the project work. Copies of all these circulars are enclosed at the end of the thesis in the appendix section from **F1 to F9**.

4.2.2 KVS Dispatches

In continuation with the study of the CBSE Circulars, the Kendriya Vidyalaya Sangathan (KVS) Dispatches were also scrutinized for tracing the relevant concerns in set criteria for implementation of the project work. Accordingly, the following sections focused their attention on this particular document, presenting the list of the KVS dispatches followed with their content analysis.

According to the Pocket Oxford English Dictionary (2009), Dispatches are official written messages that are sent off to a destination for a purpose. The Kendriya Vidyalaya Sangathan periodically releases such dispatches in order to monitor the activities of all its Vidyalayas.

The KVS is a premier organization in India administering "Kendriya Vidyalayas" (KV) (Central Schools). These schools have come to be known as centres of excellence in the field of secondary and senior secondary education. All Kendriya Vidyalayas are affiliated to the Central Board of Secondary Education. The objectives of the KVS are stated as follows:

- To cater to the educational needs of the children of transferable Central Government employees including Defense and Para-Military personnel by providing a common programme of education
- To pursue excellence and set pace in the field of school education
- To initiate and promote experimentation and innovativeness in education in collaboration with other bodies like the Central Board of Secondary Education and National Council of Educational Research and Training etc.
- To develop the spirit of national integration and create a sense of "Indianness" among children

The KVS Dispatches which were released from 2007 to 2010 and which were under the jurisdiction of the present study were analyzed and interpreted in the following sections.

The following table displays the KVS dispatches that were scrutinized for the present study. A copy of each of these dispatches is enclosed in the appendix **G.**

Table No. 4.28

List of the KVS Dispatches in relevance to the implementation of the project work

Sl. No.	From	To	Subject	Reference	Dated	Remark
1	KVS, New Delhi	The AC, KVS, All Regional offices	State Level Science Exhibition for Children 2007-08	F 59-1/07 -KVS (Acad)	20.07.2007	Organizing Jawaharlal Nehru Science Exhibition for children, 2007-08 with main theme Science and Technology and Planet Earth, with **six** sub-themes
2	KVS, A'bad	The Principal, KVs, A'bad region	State Level Science Exhibition for Children 2007-08	F 62-2/Sci Exh/07/ KVS(AR) /Acad	03.08.2007	Organizing State Level Science Exhibition for Children 2007-08, theme being Science and Technology and Planet Earth
3	KVS, Gandhinagar	The Principal, KVs, A'bad Region	Amendment in Article 106(A) & (C) of KVS Education Code	F.64-1/2007 -08/KVS(AR)	04.02.2008	Promotion rules and amended articles, 106(A) & (C) of KVS Education Code
4	KVS, Delhi	The AC, KVS, All regional offices	State Level Science Exhibition for children 2008-09-reg	F.110365-01 /2008- KVSHQ /Acad (Science Exhibition)	11.08.2008	Details of theme and sub themes (06) of the exhibition—Science and Technology for Global Sustainability

Table No. 4.28 (Contd.)

Sl. No.	From	To	Subject	Reference	Dated	Remark
5	KVS, A'bad region	The Principal, KVs, A'bad region	State Level Science Exhibition for children 2008-09-reg	F.120361/ 1/2008/ KVS RO AHMD	19.08.2008	Details of time schedule for conducting in-house Science Exhibition
6	KVS, Reg. Office, Lucknow	The AC, KVS, Regional office	36th Jawaharlal Nehru KVS State Level Science Exhibition-2008	Not available	08.09.2008	Detailed information regarding the exhibition from the host KVS (Lucknow Region)
7	KVS, RO, Guwahati	The Principal, KVs, Guwahati	State Level Science Exhibition for children 2009-10.	No .F. 1-13 /2008-KVS (GR)	13.08.2009	Details of Vidyalaya level, Regional Level and KVS National Level venue and date schedules
8	KVS, Delhi	The AC, KVS, All regional offices	Examination Reforms and Continuous and Comprehensive Evaluation (CCE) in KVS in class IX for the Academic Session 2009-10-reg	F.11016/1/2009/ KVSHQ/Acad	20.10.2009	Details of Examination Reforms and Continuous and Comprehensive Evaluation (CCE) in KVS in class IX
9	The Asst. Comm. KVS, RO	The Principal, KVs, RO	KVS State Level Science Exhibition for Children 2010-2011-reg	F.110365/1/2010-KVS(HQ)/Acad	09.07.2010	Details of written test on General Topics of Science and Science quiz

Year wise distribution of all the KVS dispatches analysed is displayed in the following table.

Table No. 4.29

The number of KVS Dispatches analyzed in each academic year

Sl. No.	Year	Number of KVS Dispatches
1	2007	02
2	2008	04
3	2009	02
4	2010	01
Total		**09**

It is learnt from the above table that **nine** KVS dispatches were studied from the year 2007 to 2010.

The **first** KVS dispatch with reference number F 59-1/07-KVS(Acad), dated 20.07.2007 focused on the subject of State Level Science Exhibition for Children 2007-08. It declared that the KVS has been regularly participating in the Jawaharlal Nehru Science Exhibition for Children, organized by the NCERT. That year the theme of the exhibition was "Science and Technology and Planet Earth". Six sub themes were identified which are given below.

- Water Management
- Agriculture and food
- Energy Resources
- Disaster Management
- Mathematical Modeling
- Educational Technology

In addition to the preparation of exhibits on the sub-themes, the schools were alerted that a Science Quiz Competition would be organized for the participants. The details of the competition were given in the following manner.

- On the first day there would be a written test on General topics of Science consisting of 50 objective type questions in different branches of Science and the time given would be 40 minutes. Two students deputed by each region would participate in the written test.

- Based on the performance of the test, four regional teams would be selected for Quiz Competition.
- In the Quiz Competition there would be ten rounds of questions on different themes and live demonstration with one separate round of rapid fire questions.
- In this competition 1^{st}, 2^{nd} and 3^{rd} position holders would be awarded prizes/certificates.

In the same year a new component for the Science Exhibition was included for encouraging the teachers to develop teaching and technological aids/models in various subject areas including Mathematics. Accordingly, each region would send three best teaching and technological aids/models developed by teachers to the Assistant Commissioner-cum-Coordinator to the National Science Exhibition at the venue Vidyalaya. These teaching aids/models would be sent along with the escort teachers coming with the students for the National Science Exhibition. It was to be ensured that the teachers bringing the teaching aids/models should be able to demonstrate and explain the teaching aids/models during the Science Exhibition. Accordingly, the preference should be given to those teachers for escorting the students who have developed these teaching aids/models.

The dispatch also gave instructions for the write-ups. It stated that all the write-ups were to be prepared in the prescribed formats. The diagrams, photographs and write-ups should be neat, clean and sufficiently detailed.

The coordinator of KVS level exhibition was expected to select only three exhibits for each of the six sub-themes and forward their write-ups totaling 18 (3x6=18) before 31.10.2007 for their onward transmission to NCERT. Jawaharlal Nehru Science Exhibition would be organized by the NCERT in 2008. Copies of the detailed guidelines received from NCERT were attached to be sent to each Kendriya Vidyalaya.

The **second** KVS dispatch with reference number F 62-2/Sci Exh/07/KVS(AR) /Acad, dated 03.08.2007, reiterated on the subject of the previous dispatch i.e. organization of the State Level Science Exhibition for Children 2007-08. It detailed the theme of the exhibition along with the sub themes. It did make a mention of the Science Quiz competition and the teaching and technological aids/models developed by teachers. The schedule of the Science Exhibition at Vidyalaya Level, Cluster Level and Regional Level Competition were enclosed.

It was instructed that the Vidyalaya Level Science Exhibition would be conducted on or before 20.08.2007. The Principal after the completion of the competition would arrange the following:

1. Would select one exhibit under each sub theme
2. Would select two students for quiz
3. Would select three best teaching and technological aids/models developed by teachers.

The students would be escorted preferably by two Science Teachers. The girls are to be escorted by lady escort. It was cautioned that the students should not be escorted by contractual Teachers, Group Ds, Lab Attendant and Lab Assistant. The total number of participants shall be 06+02=08 (01 student per exhibit, 02 for quiz). Accordingly, the number of escort teachers shall be 02. The Proforma III, IV and V were to be duly filled in for further necessary action. The write-ups in duplicate were to be submitted to the Venue of the Cluster Level Competition. Each Vidyalaya would send a report on Vidyalaya Level Science Exhibition to the Regional Office.

Cluster Level Competition

The cluster level competition would be conducted on 27-08-2007 in different clusters as per the given schedule. Each Cluster In charge after the exhibition would arrange for the following.

1. Would select two exhibits under each sub theme
2. Would select two students for quiz
3. Would select three best teaching and technological aids/models developed by the teachers
4. Would inform the results of the competition to the participating vidyalayas and the Regional Office
5. Would report on the necessary arrangements made for escorting the students to the venue of the Regional Level Science Exhibition and back

The total number of participants would be 12+2 = 14 (01 student per exhibit and 02 for quiz) and the number of escort teachers would be 02.

Regional Level Competition

The Regional Level Competition would be held on 30-08-2007. The teams would report one day in advance and would arrange the exhibits in the rooms allotted to them on the same day. The Principal of the venue school would arrange the following after the conduct of the exhibition.

1. Would select three exhibits under each sub-theme and would send their write ups in the prescribed Proforma to the Assistant Commissioner cum Coordinator of National Science Exhibition
2. Would select two students for quiz
3. Would select three best teaching and technological aids/models developed by teachers
4. Would send the result of the competition to all the KVs and to the Regional Office. A report would also be sent to the Regional Office.
5. Would also make necessary arrangements for sending the participants duly escorted by the teachers to take part in the National Science Exhibition and back

The total number of participants from the region should not exceed 20, i.e. 18+2 = 20 and the number of escort teachers would be 02 again.

The Venue Principal of the Cluster and Regional Level were expected to make proper boarding and lodging arrangements. A detailed letter might be sent to all the KVs well in advance highlighting the location of the Vidyalaya and distance from the railway station and bus stand and other details required. It was mandatory for all the Vidyalayas to participate. The Principals were expected to encourage the students and the teachers to take part in science exhibition to promote their creativity and scientific skills. Certificate would also be distributed for Cluster and Regional Level participation. Travelling Allowance and the Dearness Allowance would be paid as per the KVS norms.

The **third** KVS dispatch with reference number F.64-1/2007-08/KVS(AR), dated 04.02.2008 focused on the subject of Amendment in Article 106 (A) and (C) of

KVS Education Code. A copy each of KVS (HQ) letters with number F.28-66/2005-KVS (Acad) dated 7.1.2008 and of even number dated 24.1.2008 were forwarded for necessary information.

The Article 106 (A) and (C) in its amended form mentioned the following which might be noted carefully for further necessary action.

The Article 106 (A) claimed that the final assessment of a pupil would be based on his total achievement of a maximum of 100 marks in each subject which would be distributed as under:

Table No. 4.30

Allocation of marks for tests and assignments in final assessment

Sl. No.		Test/assignments	Marks
1	i	Class work and homework assignment: (session ending only)	05
2	ii	Projects/Practical (session ending only)	05
3	iii	Unit Test (5x3)	15
4	iv	Half Yearly examination	25
5	v	Session Ending Exams	50
		Total	**100**

It was affirmed that only grades would be awarded for (i) and (ii) above in the first two terms and quantified evaluation would be done for (i) and (ii) in the final term based on the work of the student during the whole year. Further grades would be awarded to students in non-scholastic subjects like Work Experience, Physical Education, Music, Yoga, etc. on the basis of their performance in the particular activity throughout the session.

The Article 106 (C) stated that a student should secure overall 33% to be promoted. Thus each student should necessarily obtain at least 33 marks out of 100 in continuous and comprehensive examination and session ending examination taken together. There would be no awarding of comparative position/rank in section/class based on aggregate marks. It was specially marked that however, for making any subject wise/class analysis of the achievement/performance of the teachers, marks obtained at the half yearly/session ending examination would only be considered.

It was further clarified that it was mandatory for every student to appear at all the examinations, unit test, half yearly and session ending examinations in order to be eligible for promotion in addition to his/her obtaining marks of 33% as aggregate percentage in all subjects separately.

The **fourth** KVS dispatch with reference number F.110365-01/2008-KVSHQ/Acad (Science Exhibition), dated 11.08.2008 focused on the subject of State Level Science Exhibition for Children 2008-09. Reiterating the regular participation of the KVS in the Jawaharlal Nehru Science Exhibition for Children, this dispatch sent the detailed guidelines for the same. Accordingly the theme and the sub themes of the exhibition were declared. The theme of the exhibition was Science and Technology for Global Sustainability and the identified six sub themes were as follows:

- Agriculture and Food Security
- Harnessing energy
- Conservation of Natural Resources
- Combating Climate changes
- Disaster Management
- Mathematical Modeling

In addition to the preparation of exhibits on the sub-themes, there would be a Science Quiz competition for the participants. For encouraging the teachers to develop teaching and technological aids and models in various subject areas including Mathematics, the component of teaching aid in the Science Exhibition would continue. Further the instructions for write-ups were to be prepared in the prescribed forms. The diagrams, photographs and write-ups should be neat, clean and sufficiently detailed.

The coordinator of KVS level exhibition would select only three exhibits for each of the six sub themes and forward their write ups totaling 18 (3x6 = 18) on or before 31.10.2008 for their onward transmission to NCERT. The Jawaharlal Nehru Science Exhibition would be organized by NCERT in 2009. A copy of the detailed guidelines was attached for distribution among KVs.

The **fifth** KVS dispatch with reference number F.120361/1/2008/KVS RO AHMD, dated 19.08.2008 focused on the subject of State Level Science Exhibition for Children 2008-09. Referring to the earlier KVS (HQ) letter 110365-01/2008/KVS (HQ)/Acad dated 11.08.2008 it restated that the KVS had been regularly participating in the Jawaharlal Nehru Science Exhibition for Children organized by the NCERT. The theme of the exhibition for the year 2008-09 was already declared as Science and Technology for Global Sustainability. For further details on sub themes and guidelines the schools were advised to log on to the NCERT website.

The **sixth** KVS Dispatch with nil reference number, dated 08.09.2008 paid attention on organization of the 36th Jawaharlal Nehru KVS State Level Science Exhibition – 2008 on 22nd and 23rd September, 2008 at Kendriya Vidyalaya Aliganj, Lucknow. The detailed information regarding the Exhibition was given as follows.

1. **Reporting:** All the Regional contingents were requested to report at the venue latest by 21st Sept, 2008 (FN).
2. **Location**: KV Aliganj, Lucknow is about 12 kilometers from Lucknow Junction Railway Station. It is located in sector 'J' in Aliganj adjacent to 'Q' sector crossing.
3. **Season, climate and temperature:** Lucknow is pleasant after 15th September 2008 with a slight warm weather on sunny days. The maximum temperature is 38^{o}C and minimum 24^{o}C. Chances of rain cannot be over ruled. Summer clothes will suffice for the purpose.
4. **Exhibition:**
    1. Each region is required to come with three models/exhibits from each sub theme i.e. eighteen models/exhibits
    2. Each contingent would comprise of twenty participants inclusive of two participants for the quiz competitions.
    3. Each region would be provided with sufficient bed sheets. Concerned contingent must bring necessary materials for display on bed sheets. Nailing on the walls would not be allowed under any circumstances.

4. The requisition of electrical points and size of the table for the display may be sent in advance so as to enable the venue authorities to provide the materials required on time.

5. **Quiz:**
    1. There would be a written test on general topics of Science consisting of 50 objective type questions to be answered in 40 minutes on first day.
    2. On the second day, six best teams (performance wise in the test) would be participating in a stage quiz of ten rounds inclusive of audio/visual rounds and rapid fire rounds.
6. **Reception at Railway Station:** A team of teachers/students with KVS placards/banners would be available at both the railway stations of Lucknow junction on 20th Sept., 2008 evening and on 21st Sept., 2008 since morning to assist and guide the contingents to the venue.
7. **Contact numbers**
8. **Teacher's activity:** The teachers of each participating region had to develop teaching and technological aids and models in various subject areas including Mathematics. The teacher himself/herself had to report for the demonstration of the techno aids/models. He/she had to submit the write-up prepared strictly in accordance with the prescribed performa A and B in duplicate
9. **Identity card:** Each participant and escort would be provided an identity card at the venue. Hence every contingent is required to bring one passport size photograph for the purpose.
10. **DA charges:** No DA would be charged on 21st and 23rd September, 2008. If any contingent is arriving before and staying afterward, Rs. 100 + 20 per head/day will be charged towards boarding and lodging.

The **seventh** KVS dispatch with reference number F.1-13/2008-KVS(GR)/dated 3.08.2009, focused on the subject of organizing the State Level Science Exhibition for Children 2009-2010 with the theme Science, Technology and Society. It reaffirmed that KVS has been regularly participating in the Jawaharlal Nehru Science Exhibition for Children organized by the NCERT. In order to ensure meaningful and effective participation, it had been decided to organize exhibition at Vidyalaya and Regional level.

The conditions for selection of exhibits for participation at each level were predetermined as under.

Only one potentially good exhibit under each sub-theme might be selected by every KV for participation in the Regional Exhibition. Accordingly, 03 exhibits for each sub theme would be selected from the Regional level and sent for participation in the Kendriya Vidyalaya Sangathan Level Science Exhibition. Their Write-ups were to be sent to the venue Assistant Commissioner-cum-Coordinator of KVS National Level Exhibition. Ultimately, the total number of participants from each KVS Region for "KVS National Level Science Exhibition" would not exceed 20.

The identified six sub themes for the exhibition were as follows:

- Climate Change-Causes and Consequences
- Green Energy
- Biology in Human Welfare
- Information and Communication Technology
- Mathematics and Everyday life
- Science and Technology in Games and Sports

In addition to the preparation of exhibits on the sub-themes listed above, there would be Science Quiz Competition for the participants. For encouraging the teachers to develop teaching and technological aids and models in various subject areas including Mathematics, the component of teaching aids in the Science Exhibition would continue.

The **eighth** KVS dispatch with reference number F.ll016/1/2009/KVSHQ/ Acad, dated 20.10.2009 focused on the subject of Examination Reforms and Continuous and Comprehensive Evaluation (CCE) in KVS in Class IX for the Academic Session 2009-2010. It cited that it had already circulated instructions vide circular number CBSE/ ACAD/2009 (39) dated 20th September 2009, CBSE/ ACAD/2009 (40) dated 29th September 2009 and CBSE/ ACAD/2009 (42) dated 12th October 2009 (http://cbse.nic.in/circulars/cir42-2009.pdf) on the subject cited above. In response to the above the KVS had decided to introduce Continuous and Comprehensive Evaluation (CCE)) from the Academic Session 2009-2010 in Class IX as per the guidelines issued by CBSE vide aforesaid circulars.

As per circular number the CBSE/ACAD/2009 (42) dated 12.10.2009; the scheme of the examination for the session 2009-2010 was given as follows:

Table No. 4.31

Details of the CCE scheme of the examination for the session 2009-10

<table>
<tr><td rowspan="3">First Term (April-Sept)</td><td>Formative Assessment 1</td><td>10%</td><td colspan="3">Unit Test</td></tr>
<tr><td>Formative Assessment 2</td><td>10%</td><td colspan="3">Project/Assessment</td></tr>
<tr><td>Summative Assessment 1</td><td>20%</td><td colspan="3">(Half yearly examination)</td></tr>
<tr><td rowspan="7">Second Term (Oct-March)</td><td>Formative Assessment 3</td><td>10%</td><td colspan="3">Pen paper Test (Unit Test)</td></tr>
<tr><td rowspan="5">Formative Assessment 4</td><td rowspan="5">10%</td><td colspan="3">This would include testing items such as assignments/projects/practicals/oral testing/interview/quiz/conservation etc. weightage for various items included in this assessment test will be as under:</td></tr>
<tr><td>1</td><td>Assignment</td><td>30%</td></tr>
<tr><td>2</td><td>Projects, practicals, presentation, tour reports</td><td>30%
(in case subjects involving practicals, only practicals would be considered)</td></tr>
<tr><td>3</td><td>Oral testing, interview, quiz, conversation, public speaking</td><td>40%</td></tr>
<tr><td>Total</td><td colspan="2">100% reduced to 10%</td></tr>
<tr><td>Summative Assessment 2</td><td>40%</td><td colspan="3">Summative assessment test (Session ending examination)</td></tr>
</table>

It may be interpreted form the above table the project work has been given 20% of weightage, 10% in each of the formative assessments 2 and 4. This aggregated to the session ending examination.

The **ninth** KVS dispatch with reference number F.110365/1/2010-KVS(HQ)/Acad dated 9.7.2010 focused on the subject of KVS State Level Science Exhibition for Children 2010-2011. It claimed that the KVS schools had been regularly participating in the Jawaharlal Nehru Science Exhibition for Children, organized by NCERT. The theme of the exhibition was Science and Technology for Challenges in Life. It covered the following six sub themes.

- Biodiversity: Conservation and Sustenance
- Agriculture and Technology
- Green Energy
- Transport and Communication
- Community Health and Environment
- Mathematical Modeling

It was instructed that all write-ups be prepared in the prescribed formats as given in NCERT guidelines. The diagrams, photographs and write-ups should be neat, clean and sufficiently detailed.

The Coordinator of KVS Level Exhibition would select only three exhibits for each of the six sub themes and forward their write ups totaling 18 (3x6=18) for their onward transmission to NCERT. The Jawaharlal Nehru Science Exhibition would be organized by the NCERT in 2011. A copy of the detailed guidelines was attached for further distribution among KVs.

4.2.3 NCERT Guidelines for the Jawaharlal Nehru National Science Exhibition for School Children (JNNSEC)

The NCERT organizes National Level Science Exhibition i.e., the Jawaharlal Nehru National Science Exhibition for School Children (JNNSEC) once in an academic year to showcase the talent of the children in Science and Technology. The intention behind the organization of this exhibition is to encourage, popularize and inculcate the scientific temper among the children.

The first Science Exhibition was jointly organized under the banner of the National Science Exhibition for Children in 1971, by the NCERT and the University Grants Commission (UGC) at Delhi. From 1972 to 1978, the Jawaharlal Nehru Memorial Fund collaborated with the NCERT in its efforts to popularize Science Exhibitions by jointly sponsoring the National and State Level Science Exhibitions. To coincide with the birth centenary celebrations of Jawaharlal Nehru in 1988, the

National Science Exhibition was renamed as Jawaharlal Nehru National Science Exhibition for Children.

These National Science Exhibitions are organized with the objectives of:

- Exposing and encouraging scientific talent among children,
- Making children realize the relevance of Science and Technology to society, as well as their responsibilities as scientists and technologists of tomorrow,
- Developing creative thinking, a habit of exploration and promoting life skills among children through self devised models of simple apparatus.
- Stimulating interest in science and inculcating scientific temper in the younger generation,
- Encouraging the problem-solving approach and the development of appropriate technology, especially for rural areas and integrating scientific ideas/principles related to daily life situations,
- Inculcating an aesthetic sense and team spirit among the participants.
- Popularizing science among the masses and creating an awareness of the role of science in the socio-economic growth of the country,
- Developing appropriate techniques for communication of science.

As the present study is concerned with the issue of implementation of the project wok, the details of the Jawaharlal Nehru National Science Exhibition for School Children (JNNSEC) were considered from the year 2003 onwards. The exhibits in these exhibitions are mostly in the form of projects and models. Therefore year wise details of these exhibitions are listed, analysed and interpreted in the following paragraphs.

The following table shows the list of the JNNSEC guidelines with the details of the themes and the sub themes from 2003-04 to 2012-13.

Table No. 4.32

List of the JNNSEC guidelines showing the details of the themes and the sub themes from 2003-04 to 2005-06

Sl. No.	**Academic year**	**Ordinal Number and Year of JNNSEC**	**Theme**	**Sub themes**	
				Number	**Titles**
1	2003-04	31st JNNSEC-2004	Science and Technology in the Changing World	06	• Food and Health; • Energy; • Information Technology; • Industry; • Transport and Communication; • Biotechnology
2	2004-05	32nd JNNSEC-2005	Recent Trends in Science and Technology	06	• Agriculture; • Energy and its Conversation; • Industrial development and environment; • Educational Technology; • Technology in Health; • Mathematical Modeling
3	2005-06	33rd JNNSEC-2006	Science and Technology for Sustainable Development	05	• Food and Agriculture; • Industry and Environment; • Energy; • Educational Technology and Mathematical Modeling; • Transport and Communication

Table No. 4.33

List of the JNNSEC guidelines showing the details of the themes and the sub themes from 2006-07 to 2008-09

Sl. No.	Academic year	Number and Year of JNNSEC	Theme	Sub themes	
				Number	Titles
1	2006-07	34th JNNSEC-2007	Science and Technology and Sustainability Development	05	• Food and Agriculture; • Industry and Environment; • Energy; • Educational Technology and Mathematical Modeling; • Transport and Communication
2	2007-08	35th JNNSEC-2008	Science and Technology and Planet Earth	06	• Water Management; • Agriculture and Food; • Energy Resources; • Disaster Management; • Mathematical Modeling; • Educational Technology
3	2008-09	36th JNNSEC-2009	Science and Technology for Global Sustainability	06	• Agriculture and Food Security; • Harnessing Energy; • Conservation of Natural Resources; • Combating Climate Changes; • Disaster Management; • Mathematical Modeling

Table No. 4.34

List of the JNNSEC guidelines showing the details of the themes and the sub themes from 2009-10 to 2011-12

Sl. No.	Academic year	Number and Year of JNNSEC	Theme	Sub themes	
				Number	Titles
1	2009-10	37th JNNSEC-2010	Science and Technology and Society	06	• Climate Change—Causes and Consequences; • Green Energy; • Biology in Human Welfare; • Information and Communication Technology; • Mathematics and Everyday Life; • Science and Technology in Games and Sports
2	2010-11	38th JNNSEC-2011	Science and Technology for Challenges in Life	06	• Biodiversity; • Conservation and Sustenance; • Agriculture and Technology; • Green Energy Transport and Communication; • Community Health and Environment; • Mathematical Modeling
3	2011-12	39th *JNNSMEE-2012	Science, Society and Environment	06	• Agriculture and Food Security; • Energy-Resources and Conservation; • Health; • Environmental Issues and concerns; • Mathematics and Everyday life; • Disaster Management

*JNNSMEE – Jawaharlal Nehru National Science, Mathematics and Environment Exhibition for Children

Table No. 4.35

List of the JNNSEC guidelines showing the details of the themes and the sub themes for the academic year 2012-13

<table>
<tr><th rowspan="2">Sl. No.</th><th rowspan="2">Academic year</th><th rowspan="2">Number and Year of JNNSEC</th><th rowspan="2">Theme</th><th colspan="2">Sub themes</th></tr>
<tr><th>Number</th><th>Titles</th></tr>
<tr><td>1</td><td>2012-13</td><td>40th
*JNNS & EEC - 13</td><td>Science and Society</td><td>06</td><td>• Industry
• Natural Resources and their conservation
• Transportation and communication
• Information and education technology
• Community Health and Environment
• Mathematical Modeling</td></tr>
</table>

*JNNS & EEC - Jawaharlal Nehru National Science and Environment Exhibition for Children

A copy of the 39th Jawaharlal Nehru National Science, Mathematics and Environment Exhibition (JNNSMEE) for Children 2012 is enclosed as a sample at the end of the thesis in the appendix **H.**

It may be noted from the above tables that the central theme for the State Level Science Exhibition for Children varies from year to year. The NCERT provides the guidelines for preparing the models around the central theme and the sub-themes. Different regions participate with 100s of talented budding scientists who present a scientific bonanza of exclusive projects, working models and exhibits. All these focus light on the main theme and the sub themes. Other governmental and nongovernmental agencies, besides NCERT, put up their stalls. Informative material is brought out for free distribution to the participating students, teachers and visitors which includes

- i Folders (English/Hindi) highlighting the salient features of the exhibition including the aims and objectives of holding Science exhibitions in popularizing Science,
- ii List of Exhibits (English/Hindi), and
- iii Structure and Working of Science Models, describing the highlights of some of the models.
- iv Educational kits

The exhibitions are associated with pre exercises on procuring information and confirmation on circular release date; level of the exhibition; themes; sub themes; guidelines; Proforma-A (Registration); Proforma-B (format for project report/synopsis); number of exhibits; number of participants; evaluation procedures; organization of science quiz, poster making competition, seminar, film shows, book exhibition, lectures, participation of other scientific/ industrial organizations during the exhibition; awards/cash prizes to the winners; certificates; travelling and dearness allowances; details of next participation events like Rashtriya Vaignanik Sammelan/ Indian Science Congress.

In order to have an in depth knowledge on these exhibitions, the 39th Jawaharlal Nehru National Science, Mathematics and Environment Exhibition (JNNSMEE) for Children 2012 was considered for a comprehensive understanding and has been enclosed in appendix **H** at the end of the thesis.

4.2.4 Compendium for Schools

In continuation with understanding the phenomena of implementation of the project work, the Compendiums published by the CBSE were also studied. According to the Pocket Oxford English Dictionary (2009), Compendium is a concise summary or abridgement. It is a publication containing a variety of work.

The list of the compendium studied and analyzed for this research purpose is given below.

Table No. 4.36

List of the Compendium for the schools

Sl. No.	Compendium
1	CBSE Update-Compendium of CBSE Circulars, April 2005
2	CBSE Update Compendium of CBSE Circulars Volume - 1
3	CBSE Update Compendium of CBSE Circulars Volume - 2
4	Learning by Doing, Compendium of Science activities, Class VI
5	Learning by Doing, Science Activity Book, Class VIII

It may be learnt from the above table that five Compendiums were studied for the present research. A scrutiny of these compendiums revealed that there were two different areas of focus by which they were categorized as under.

1. The first category centered its attention on the publication of the circulars under the title, 'CBSE Update-Compendium of CBSE Circulars' and
2. the second category paid attention to the Science activities under the title, 'Learning by Doing, Compendium of Science activities'.

The CBSE publishes the Compendium of circulars issued to schools every five years. In 2005, 'CBSE Update-Compendium of CBSE Circulars' was published with six themes, viz., New Subjects, Changes in Curriculum, Evaluation, Support Materials and Publications, General and Enrichment Activities. In covered 67 circulars.

Owing to the sheer number of circulars issued from 2005 to 2011, it was imperative to update it by including the important circulars issued on various subjects. The second publication of Compendium is available in two volumes and had been divided as per the themes. Volume I covered three sections, Section A, focusing on the CCE and Reforms, Section B, paying attention to the Introduction of New Subjects and Section C, focusing on Enriching curriculum (Going beyond Curriculum). Volume II continued with Section C of Volume I and covered Section D focusing on Examination, Section E focusing on Academic, Section F focusing on Capacity Building of Teachers. Volume I covered 126 circulars whereas Volume II covered 101 circulars.

The circulars enclosed in the Compendium in relation to the implementation of the project work were as follows.

1. Project and Practical work in Accountancy for class XII
2. Alternatives to Homework
3. Guidelines to Project work in Social Science
4. Use of Mathematics Laboratory in Schools
5. Restructuring of Science practical work
6. Regional level CBSE Intel Science Exhibition
7. Continuous and Comprehensive Evaluation Regarding
8. Strengthening formative Assessment in affiliated schools under Continuous and Comprehensive Evaluation
9. Introduction of Environmental Education as a compulsory subject in schools from Class I to Class XII
10. Guidelines in Sociology (Code No. 039) subject for Project work and Marks distribution for class XI for the academic session 2008-09
11. Revised design of the Sample Question papers in the subject of Mathematics for classes X and XII March 2008 Examination
12. School for Project work Evaluation in Social Sciences
13. Publication of the document 'Science is Doing' – an activity book for Class VII

However, the above mentioned circulars of the Compendium have been analysed and presented under 4.2.1 section on CBSE Circulars. It is a handy reference and the utility of this publication is enhanced by continuous addition of new circulars to this collection.

The second category of compendium is 'Learning by Doing, Compendium of Science activities for classes VI and class VIII'. Science is being taught in schools in a very mechanical way. Students are confined to their textbooks, the topics and the contents included therein. They are hardly encouraged to observe, explore, look for patterns or analyze the everyday experience occurring around them. Mere rote memorization of concepts is leading children towards a stressful existence. The National Curriculum Framework (NCF) 2005 aptly says, "The fact that learning has become a source of burden and stress on children and their parents is an evidence of a deep distortion in educational aims and quality". To correct this, the NCF has proposed to connect knowledge to the school outside school and to ensure that learning shifts away from rote methods. Therefore the objective of these Compendiums was to meet the diverse needs of the learners as well as help the students enjoy learning and have fun during their learning experiences.

The flow of activities runs from the statement of the objective, introduction to the activity, materials required for the activity, procedure/steps to be followed in the activity, interpretation/explanation about the inference of the activity, outcome of the activity by raising a question as what has been learnt, initiating brainstorming to think something more about the activity. These small steps of learning by doing reflect on development of scientific attitude of the students.

4.2.5 Annual Reports, NCERT

The Annual Report endeavors to present the highlights of what has been attempted in a year, to take stock of the present stage of the major programmes and schemes and to give some indication of the future proposals. The NCERT also releases its Annual Report with details of the prominent initiatives that its Departments have taken up in a year along with the details of the forthcoming protocols.

Established in 1961, the NCERT had continuously been engaged in promoting reforms and developments in school education system at the national level. The Council had expanded its operations over years in response to the demands of the school education system focusing on several areas of critical importance. To inculcate the culture of innovation and experimentation in school education and teacher education, the NCERT conducts several programmes like Jawaharlal Nehru

National Science Exhibition, All India Children's Educational Audio-Video Festival and All India Competition on Innovative Practices and Experiments in Education for School and Teacher Education Institutions.

The **sixth** chapter of the Annual Reports usually focuses on the initiatives of the Department of Education in Science and Mathematics (DESM). The main functions of the department are to undertake research, development, training, evaluation and extension activities related to Science, Mathematics and Environmental Education for all levels of the school education. A significant area of the department's work had been development of syllabi, textbooks and other instructional materials in Science, Mathematics and Environmental Education. To facilitate quality of student evaluation in schools the department developed exemplar problems in Science and Mathematics for secondary and higher secondary stages. Every year the department organizes the Jawaharlal Nehru National Science Exhibition for Children (JNNSEC), which is the culmination of the series of Science Exhibitions for Children organized at District, Zonal and State Levels.

The major intention to refer the Annual Reports was to collect previous year's data on organization of the Science Exhibitions at State level (SLSEEC) and at National Level (JNNSEC). In this connection, the details of the initiatives and the programs organized by the DESM from the year 2006 to 2011 are analysed and displayed in the following sections.

As stated earlier, the organization of the science exhibition is one of the major functions of the DESM. During such exhibitions, many initiatives and programs are also organized.

Table No 4.37

List of the Annual Reports, NCERT and its initiatives

Sl. No.	Year	Initiatives
1	Annual Report 2006-07	• A training program was organized on Design, Development and Use of Equipment Model for hands-on-minds-on Experiences • Under the project, Centre for Popularization of Science, write-ups on different Science Park exhibits were prepared
2	Annual Report 2007-08	• Eminent Computer Scientist Dr. Vijay Bhatkar, delivered a lecture and enthusiastically interacted with the participants. • Dr. A.K. Singh from Water Technology Center, Institute of Agriculture Research India, New Delhi delivered a lecture on 'Making Each Drop Count' and discussed with the students. • Under the project, Centre for Popularization of Science, 'Science Park' and 'Energy Park' were established. • A Science Quiz Competition and Poster Making Competition were held on Global Warming. • Local eminent scientists were invited to lecture and to interact with the participants
3	Annual Report 2008-09	• In order to popularize Science, a list of the exhibits, structure and working of the Science models, a publicity folder on JNNSEC-2008 and information on educational kits were published and distributed to all the participants, students, teachers and the visitors.
4	Annual Report 2009-10	• Environmental Education related activities were held
5	Annual Report 2010-11	• The initiative of development of 'Project Book on Environmental Education' for the higher secondary stage was taken up. • Organization of National Young Environmentalists Meet was held as a follow up program from 15 to 18 February, 2011. • One day seminar on Popularization of Science was held. • Organization of one day educational tour.

As marked in the above table, the DESM developed a project based syllabus in 2010-11, for Environmental Education at the higher secondary stage as per NCF –

2005. Based on this a Teacher's handbook on Environmental Education was developed. As the handbook contained only exemplar projects it was made imperative to develop a separate project book that would contain a wide range of projects. This project book would provide ample options to the students and teachers in the selection of the project to be undertaken. The project book is under publication.

In one of its extension activities, the National Young Environmentalists Meet was organized by the NCERT, New Delhi at Bharati Vidyapeeth Univeristy, Pune from 15 to 18 February, 2011. In fact it was a follow up program of the JNNSEC – 2010. The prospective delegates identified by an expert committee were informed about the venue, duration and were invited to attend the meet. About 50 student-participants and their guide teachers attended the meet. The keynote address was delivered by eminent Ecologist Professor Madhav Gadgil. He emphasized the role students that they can play in developing the bio-diversity register of the country. During the meet, the participants presented their projects in three parallel sessions. There were also lectures on the following areas.

- i selection and presentation of projects
- ii importance and conservation of wild life
- iii development of educational toys from wastes

Delegates were also taken for an educational trip to Western Ghats forest and a milk storage plant. A quiz competition was also held amongst the twelve identified groups on bio-diversity of India. An interactive participatory lecture was held on "Wonders of Wilderness of India". The meet concluded with distribution of certificates of participation.

4.2.6 CBSE Curriculum for Senior Secondary Sections in Science Stream

The CBSE reserves the right to amend the syllabi and courses as and when it deems necessary. Curriculum updating is a continuous process; as such the Board brings out the revised curricula every year. It is obligatory for the school and the students of a particular year to follow the syllabi, courses and the books prescribed by it for that year. No deviation from the ones prescribed is permissible.

The details of the CBSE Senior School Curriculum in Science Stream are analyzed and interpreted in the forthcoming sections. Exclusively Class XI Science

Curriculum (Mathematics, Physics, Chemistry, Biology and Computer Science) has been focused for a comprehensive understanding of implementation of the project work.

Table No. 4.38

List of the CBSE Curriculum books referred

Sl. No.	Curriculum books referred
1	Senior School Curriculum 2010 Vol-1 (Main subjects)
2	Senior School Curriculum 2012 Vol-1 (Main subjects)

The Senior School Curriculum 2010 Vol-1 (Main subjects), was effective from the academic session 2008-2009 of class XI for the Board Examination to be held in 2010. It may be noted here that in the same year the data for the present study was collected.

The subject of Science plays an important role in developing well-defined abilities in cognitive, affective and psychomotor domains among the children. It augments the spirit of enquiry, creativity, objectivity and aesthetic sensibility. At this transition stage, from secondary to senior secondary the common subject of Science begins to emerge as independent disciplines of Physics, Chemistry and Biology. Therefore, the students should be exposed to experiences as well as modes of reasoning that are typical of the subject.

The syllabus in the subject of **Mathematics** has undergone changes from time to time in accordance with growth of the subject and emerging needs of the society. Senior secondary stage is launching stage from where the students go either for higher academic education in Mathematics or for professional courses similar to Engineering, Physical and Biosciences, Commerce or Computer Applications. The present Senior School Curriculum had been designed in accordance with National Curriculum Framework 2005 and as per guidelines given in Focus Group on Teaching of Mathematics which is to meet the emerging needs of all categories of students.

The curriculum at this stage primarily intends to help the students to acquire knowledge and critical understanding, particularly by way of motivation and visualization of basic concepts, terms, principles, symbols and mastery of underlying processes and skills. It aims at enhancing the capacity of students to employ Mathematics in solving day-today life problems and studying the subject as a separate discipline. The course structure includes Sets and Functions; Algebra; Coordinate Geometry; Calculus; Mathematical Reasoning; Statistics and Probability. The recommended textbooks are Mathematics Part I and part II for Class XI, published by the NCERT.

As stated earlier, the senior secondary stage of school education is a stage of transition from general education to discipline-based focus on curriculum. The present syllabus in **Physics** keeps in view the rigour and depth of disciplinary approach as well as the comprehension level of learners. Due care has also been taken that the syllabus is not heavy and is at the same time comparable to the international standards. The salient features of the syllabus included emphasis on basic conceptual understanding of the content. Besides, the syllabus also attempted to strengthen the concepts developed at the secondary stage to provide firm foundation for further learning in the subject. It is also made a note to develop process skills and experimental, observational, manipulative, decision making and investigatory skills in the learners. The course structure included Physical World and Measurement; Kinematics; Laws of Motion; Work, Energy and Power; Motion of System of Particles and Rigid Body; Gravitation; Properties of Bulk Matter; Thermodynamics; Behavior of Perfect Gas and Kinetic Theory of gases; Oscillations and Waves.

Every student would perform 10 experiments (05 from each section) and 08 activities (04 from each section) during the academic year under the practical section. Two demonstration experiments must be performed by the teacher with participation of the students. The students would maintain a record of these demonstration experiments. The details of the experiments and activities under different sections are given as under.

Table No. 4.39

Nature of the practical work in Physics

Sl. No.	**Section**	**Nature of the practical work**	
		Experiments	**Activities**
1	A	05	04
2	B	05	04
Total		**10**	**08**

The recommended textbooks are Physics Part – I and II, for Class XI, published by the NCERT.

Higher secondary is the most crucial stage of school education because at this juncture specialized discipline based, content-oriented courses are introduced. Students reach this stage after 10 years of general education and opt for **Chemistry** with a purpose of pursuing their career in basic sciences or professional courses like Medicine, Engineering, Technology and study courses in applied areas of Science and Technology at tertiary level. Therefore there is a need to provide the learners with sufficient conceptual background of Chemistry, which will make them competent to meet the challenges of academic and professional courses after the higher secondary stage. The new updated curriculum was based on disciplinary approach with rigour and depth taking care to include new areas like synthetic materials, bio-molecules, natural resources, industrial chemistry.

The broad objective of teaching Chemistry at this stage was to help the learners to promote understanding of basic facts and concepts in chemistry while retaining the excitement of Chemistry. The course structure included some Basic Concepts of Chemistry; Structure of Atom; Classification of Elements and Periodicity in Properties; Chemical Bonding and Molecular Structure; States of Matter: Gases and Liquids; Thermodynamics; Equilibrium; Redox Reactions; Hydrogen; S-Block Elements; Organic Chemistry: some Basic Principles and Techniques; Hydrocarbons; Environmental Chemistry. The evaluation scheme of examination for practical included 30 marks (10 for Volumetric Analysis; 06 marks for Salt Analysis; 04 marks for Content Based Experiment; 05 marks for Class Record and Viva; 05 marks for Investigatory Project).

Table No. 4.40

Allocation of marks on different areas of evaluation in Chemistry practical

Sl. No.	Areas of evaluation in Chemistry practical	Marks
1	Volumetric Analysis	10
2	Salt Analysis	06
3	Content Based Experiment	04
4	Class Record and Viva	05
5	Investigatory Project	05
Total		**30**

Scientific investigations involving laboratory testing and collecting information from other sources might be carried on project work for 10 periods. A few suggested projects were as under.

- Checking the bacterial contamination in drinking water by testing Sulphide ion
- Study of the methods of purification of water
- Testing the hardness, presence of iron, fluorine, chloride etc. depending upon the regional variation in drinking water and the study of causes of presences of these ions above permissible limit (if any)
- Investigation of the foaming capacity of different washing soaps and the effect of addition of sodium carbonate on them
- Study of the acidity of different samples of the tea leaves
- Determination of the rate of evaporation of different liquids
- Study of the effect of acids and bases on the tensile strength of fibers
- Analysis of fruit and vegetable juices for their acidity

It is also suggested that any other investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher. The recommended textbooks are Chemistry Part I and II for Class XI, published by the NCERT.

The present syllabus in **Biology** reinforced the ideas introduced in the lower classes while the students learn new concepts besides getting an exposure to contemporary areas of the subject. The syllabus also aims at emphasizing the underlying principles that are common to both animals and plants as well as highlighting the relationships of Biology with other areas of knowledge. The format of the syllabus allowed a simple, clear, consequential flow of concepts without any jarring jumps. The syllabus also stressed the connection of the study of Biology to real life problems, use of biological discoveries/innovations in everyday life – environment, nature, medicine, health and agriculture.

The syllabus also focused on reducing the curriculum load while ensuring that ample opportunities and scope for learning and appreciating basic concepts of the subject continues to be available within its framework. It was also expected to promote understanding of the basic principles of Biology. The core structure included

Diversity in Living World; Structural Organization in Animals and Plants; Cell: Structure and Function; Plant Physiology; Human Physiology. The practical included 30 marks out of which 20 marks wee for Experiments and Spotting; 05 marks for Record of One Investigatory Project and Viva based on the Project; 05 marks for Class Record and Viva based on Experiments. The details of the same are presented in the given below table form.

Table No. 4.41

Allocation of marks on different areas of evaluation in Biology practical

Sl. No.	Areas of evaluation in Biology practical	Marks
1	Experiments and Spotting	20
2	Record of One Investigatory Project and Viva based on the Project	05
3	Class Record and Viva based on Experiments	05
Total		**30**

The recommended textbook was a Textbook in Biology for Class XI, published by the NCERT.

In addition to the Mathematics, Physics, Chemistry and Biology, Computer Science was also one of the basic subjects which could be opted at +2 level. The learning objectives of the **Computer Science** are as follows.

- To develop logic for problem solving
- To understand the concept of Object Oriented Methodology
- To implement Object Oriented Programming using C++
- To understand the concept of working with Relational Database
- To understand basic concept of algebra of logic
- To understand and explore the world of communication and networks
- To understand the concept of Web Services
- To understand localization issues.

In addition to the above the student was expected to be proficient in the following.

- Identification of a computer system
- Problem solving using object oriented programming

- Designing an efficient logic using object oriented approach for solution development handling
- Database handling
- Logic circuit designing
- Network concepts and Web Services

The course structure included Computer Fundamentals; Programming Methodology; Introduction to C++; Programming in C++. The practical in Computer Science included 30 marks for four sections. 10 marks for Programming in C++; 10 marks for Project Work; 05 marks for Practical File; and 05 marks for Viva Voce based on the Syllabus covered in class XI and Project developed by the student. The details of the same are presented below.

Table No. 4.42

Allocation of marks on different areas of evaluation in Computer Science practical

Sl. No.	Areas of evaluation in Computer Science practical	Marks
1	Programming in C++	10
2	Project Work	10
3	Practical File	05
4	Viva Voce based on the Syllabus covered in class XI and Project developed by the student	05
	Total	**30**

Under the project work, the students could solve problems related to String, Number and Array Manipulation. In addition general guidelines on initial requirement, developing an interface for user (it is advised to use text based interface screen), developing logic for playing the game and developing logic for scoring points the students were advised to focus on the following.

1. Memory Game: a number guessing game with application of 2 dimensional arrays containing randomly generated numbers in pairs hidden inside boxes.
2. Cross ‘N Knots Game: A regular tic-tac-toe game
3. Hollywood/hangman: A word guessing game
4. Cows ‘N Bulls: A word/number guessing game

It is advised to take up similar projects in other domains in a group of 1 or 2 students. The general guidelines for projects for class XI were given as under.

- The academic course in Computer Science included one project in each year. The purpose behind this was to consolidate the concepts and practices imparted during the course and to serve as a record of competence.
- A group of two students/three students as team might be allowed to work on project.
- Project content for class XI could be selected from the topics mentioned in syllabus or domains on the similar lines.
- Theme of the project can be
  - Any subsystem of a system software or tool
  - Any scientific or a fairly complex algorithmic situation
  - Business oriented problems like Banking, Library Information System, Hotel or Hospital Management System, Transport Query System
  - Quizzes/games
  - Tutor/Computer Aided Learning Systems
- The aim of the project was to highlight the abilities of Algorithmic Formulation, Modular Programming, Optimized Code Preparation, Systematic Documentation and other associated aspects of Software Development.
- The assessment would be through the Project Demonstration and the Project Report, which should portray Programming Style, Structured Design, Minimum Coupling, High Cohesion, Good Documentation of the Code to ensure readability and ease of maintenance.

The suggested book was Fundamentals of Computers by Rajaram, (4^{th} Edition), published by the Prentice Hall of India.

4.2.7 Textbooks of Senior Secondary Level in Science Stream

The Director (Academics) of the NCERT is the head of the Academic Unit. The major functions of the unit include developing the curriculum for all the subjects in academic and vocational streams at the secondary and senior secondary levels, to organize teacher training workshops, to develop support material for the guidance of the teachers and students, to publish text books for secondary and senior secondary classes and monitoring the academic projects. The schools are required to strictly follow the syllabi and textbooks prescribed by the Board for the academic sessions and examinations concerned.

The textbooks should make the student life at school a happy experience, rather than a source of stress and boredom. The prescribed textbooks for senior secondary classes in Science stream are reviewed. The issues which come under the purview of the study are focused, analyzed and interpreted in the following paragraphs.

Table No 4.43

List of the Senior Secondary Science text books referred

Sl. No.	Text books referred
1	Mathematics part 1
2	Mathematics part 2
3	Chemistry part 1
4	Chemistry part 2
5	Physics part 1
6	Physics part 2
7	Biology
8	Computer Science

The above mentioned textbooks in their forward stated that according to the recommendations of the National Curriculum Framework 2005, the student life at school must be linked to their life outside the school. The syllabus and textbooks developed on the basis of NCF signify an attempt to implement this basic idea. They also attempt to discourage rote learning and lead in the direction of child-centered education outlined in the National Policy on Education (1986).

4.2.8 Teacher Handbooks

The handbooks are the basic guides to the teachers. But they also act as resources both to the teachers and the students. As one of the major focuses of the activities of the NCERT is to give support and address the needs of the teachers through the means of creating resources, organizing in-service training and interactions, it had undertaken the development of teachers' manuals and handbooks in English, Hindi and Urdu to support textbook based teaching.

The teachers' handbooks, which focused on the issues pertaining to project making in environmental education were analyzed and presented in the following sections.

Table No. 4.44

List of the handbooks referred

Sl. No.	Name of the handbook
1	Teachers' Handbook on Environmental Education for Classes XI-XII
2	Project Book in Environmental Education for Class X
3	Project Book in Environmental Education for Class IX
4	Project Book in Environmental Education for Class VIII
5	Project Book in Environmental Education for Class VII
6	Project Book in Environmental Education for Class VI

The Annual Report (2010-11) of NCERT stated that a project based syllabus was developed for Environmental Education at the higher secondary stage as per NCF – 2005. Based on this a Teacher's Handbook on Environmental Education was developed. The handbook contained only exemplar projects which made it imperative to develop a separate project book that would contain a wide range of projects. This project book would provide ample options to the students and teachers in the selection of the project to be undertaken. In addition to this, to ensure the continuation of proactive action towards the environment, NCERT proposed a project-based compulsory qualifying course comprising a core and projects for all students. The core focuses on interconnected nature of the physical-biological-social-economic system pertinent to environmental issues.

All the students would do at least one project under the guidance of a teacher. An individual student or a group of students might select a topic for the project. Students needed to develop a working hypothesis and prepare a detailed project proposal. The project proposal would include the calendar of activities to be undertaken. The teacher facilitator would closely monitor the working of the project and keep a record of it. On completion of the project the student would produce the report. In case of group project the teacher would keep a record of the different tasks performed by the group members. However, a joint project report would be presented for evaluation. The project-based learning would ensure learning in the affective domain which would bring forth good, sensitive and rational citizens.

The National curriculum framework (NCF) – 2005 recommends that environmental concerns be incorporated in all the subjects and appropriately discussed in all the levels of school education. It perceives school children as ecologists in their own right who need to be nurtured by a flexible school routine and teachers who engage with children in the construction of knowledge. In addition to the environment-related subject matter and activities incorporated in the syllabus and textbooks of the entire major subject, the NCERT had decided to bring out project books for students of classes VI to X. The books comprising this series attempted to build capacity for critical and multi-disciplinary thinking and a positive and problem-solving attitude. They aimed at exposing students to the real-life world around them, both in nature and society, in order to enable them to examine, assess and interpret the problems and concerns related to the environment.

The teachers would find ready-to-use demonstrations, experiments, illustrations, games, puzzles, analogies, lessons, activities, and strategies, as well as explanations of how to adapt these for diverse student populations. All topics are accompanied by extensive background material, providing teachers with the scientific, organizational, and pedagogical principles necessary for successful classroom implementation. The concepts are explained in greater detail, and directions are provided for presenting impressive classroom activities and demonstrations. These handbooks provide new and experienced teachers with a wealth of teaching strategies, resources, lessons, activities, and ideas to enhance the teaching and learning of science subjects.

Through the Project Book series for classes VI to X in Environmental Education it was suggested to the students that they work sincerely on the projects to get authentic results. In future they are to contribute to make a bigger change. The books contained twenty projects in each with the headings – title, background, methodology, conclusion and activities that can be taken up as follow up actions. An attempt had been made to make the projects workable in different corners of the country. For the first time, an opportunity is being provided to students to take up projects independently. Therefore the role of the teachers is instrumental as a facilitator and a guide for successful completion of the projects. The attempt of introducing project book is to bring about attitudinal change in the students towards environmental concerns and nurture them to become concerned and responsible citizens.

The success of this effort crucially depends on the interest and encouragement that school principals, teachers, parents and civil society in general show for encouraging children to carry out the projects and activities outlined in the book. It is extremely important that students' project work is assessed in a holistic manner, giving due regard to the motivation and enthusiasm of each student rather than through the conventional system of evaluation which ignores individuality and originality.

4.2.9 Manuals for Teachers

A manual is a tool used to gather information on how to use a particular device. Manuals are provided with every pack of devices such as computer, refrigerator and other machines which are bought from the market. But in the context of classroom instruction, it is a store of literature which would help the teachers to make their curriculum transaction practices more innovative and useful for the students. It reflects on suggestions which the teachers can use to make teaching leaning process more student centered. It would therefore focus on areas such as making best use of the time to create interest in the subject. The manuals contain resources for teachers to refresh their knowledge about technicalities of the subject. Enrichment material provided in the manuals helps to gain an insight into the subject. They encourage teachers to go beyond textbook to supplement the textual material. Thus they make the teaching learning more interesting and lively for the students. Teachers at sometimes find it challenging to develop effective assessment tools; they may also experience some difficulties in integrating them with classroom instruction. Under such circumstances, the manuals come to their rescue.

Manuals, according to the Pocket Oxford English Dictionary (2009) are the reference books and instruct on how to use a particular device or piece of software. They provide conceptual clarity and place some illustrative examples for the tasks in the hands of the teachers. The tasks exemplified in the manuals are of different types such as role plays, crossword puzzle, flow charts, popular science, book review, field trips, class work/home work assignments, group work, survey, project work, worksheets, games and multiple choice questions. The varied tasks that are provided may cater to the needs of different multiple intelligences. Certain practical guidelines that have been included in the manuals enable the schools and the teachers to implement the given tasks efficiently.

The CBSE is bringing out such manuals for various classes and in the entire major subjects. It is fervently hoped that teachers and students will derive maximum benefit from these publications. By studying the contents carefully and by using the tasks in classroom teaching, teachers would be able to build their capacity not only for enhanced learning to take place but also for preparing their own materials to add value to curriculum delivery.

The list of the manuals and the areas focusing on the implementation of the project work are presented, analyzed and interpreted in the forth coming sections.

Table No. 4.45

List of the manuals referred

Sl. No.	Title of the Manual
1	Teachers' Manual on School Based Assessment (SBA) Class IX and X, CBSE, India, 2009
2	Teachers' Manual on Formative Assessment in Science Class IX, CBSE, Delhi, India, 2010

After the introduction of the Continuous and Comprehensive Evaluation (CCE) in schools affiliated to the CBSE in class during 2009-10, the Board felt it necessary to provide a holistic picture of CCE to all the stake holders particularly the teachers. Hence the Board had brought out Teachers' Manuals on School Based Assessment (SBA) – Class IX and X. Besides giving detailed information about the scheme of CCE, fundamentals of assessment of co-scholastic and scholastic areas, dimensions of school-based assessment and tools and techniques of evaluation for formative and summative purposes had also been included in the manual.

The manual contained the following broad areas.

1. Formative assessment and summative assessment: concept and distinction
2. What are not good formative assessment practices

3. Overall framework of formative assessment with split up of units, time frame, periodicity, number of tasks for each formative assessment, calculation of weightage and recording, analysis and follow-up
4. Formative assessment tasks for different units/ lessons in languages, Mathematics, Science and Social Science for classes IX and X

It might be noted that each formative assessment was again divided into smaller assessments (class assignments, quiz, projects, and written tests) which carry different marks. It was suggested that these assessments should involve collaboration, discussion, reflection and improvement. Therefore the projects and assignment should be very carefully used as tools of formative assessment. However, in the hands of imaginative and resourceful teachers, they might become effective formative assessment tools. Before assigning the projects, it was imperative to be cautious about the following.

a) To give realistic projects and assignments.
b) It was not enough if we make the project or assignments were made simple and realistic. In order to ensure that further learning had taken place and that the students are able to link new knowledge with what they had learnt in the class, the teacher could interview each student on the project. The interview, if conducted imaginatively, could be very brief but at the same time give proof of the student's own research and presentation.
c) To make projects a group activity so that it could be done in the classroom itself. Groups will decide, with the teacher's help, what projects they would work on, division of the project into smaller units, allotment of smaller units among members etc. It means that project work should be discussed in the class to make it work.
d) To fix a time frame and interact with groups to see where they are at different stages, what they are doing and whether they need any help. This would instill seriousness of purpose, besides motivating the students to take up their work with keen interest.

Group projects were recommended in Mathematics and Science for formative assessment. Since the main concern was about the genuineness and credibility of the work submitted for assessment by the students, if adequate care was taken by the teacher in monitoring the project work, students might be allowed to do some part of it outside the schools. By making the projects realistic and simple, teachers could ensure authenticity of the work of students.

The group project work was detailed in the manual as a sample assessment technique. The title was to study the effect of temperature and surface area on rate of evaporation of three different liquids. The objectives of the project were to enable the students

- to learn that on heating, a liquid can be changed into vapors and the phenomenon is called evaporation,
- to understand that the rate of evaporation of any liquid depends on surface area, temperature, humidity and speed of the wind and
- to enhance the observation skills.

Numerous formative assessment techniques were suggested in addition to the projects like role plays; crossword puzzles; games and worksheets based on data, numericals, diagrams, graphs, pictures, mapping, flow charts, matching, multiple choice questions and conceptual clarification.

Manuals on Formative Assessment in the subjects of Hindi, English, Science and Social Science for class IX were detailed and exhaustive documents focusing on formative aspects of learning provided valuable guidance to the teachers in respective subjects. The nature of the projects, advantages of the projects, concerns regarding the projects and checklist for projects in different subjects were given. Suggestions for implementation of projects were as follows.

- Project topics should be decided or chosen, planned and conducted by the students largely with the teacher acting as a guide.
- Encouragement should be given to group projects. These would enable students to work together, share experiences and learn from each other.
- Keep on giving projects to the students to provide an opportunity to explore, investigate and work in groups.

- Children should be encouraged for judicious use of materials and keep them back after use.

The desirable behavior related to the learner's knowledge, understanding, application, evaluation, analysis and creativity in subjects and ability to apply it in an unfamiliar situation were some of the objectives in scholastic domain. In order to improve the teaching learning process, assessment should be both formative and summative. The tests, assignments and projects as a technique of formative assessment are most commonly used. In order to use projects and assignments as effective tools of formative assessment, the teacher should take certain precautions as per the manuals.

- Make the learners do the task as far as possible in the school itself under the direct supervision of the teacher
- Discuss the project with the learners and monitor their progress at every stage
- Involve them in the assessment process through self and peer assessment
- Give descriptive feedback as an instructional strategy to move students forward in their learning
- Help students link their classroom learning with the task and their experience
- Follow it up with activities like revisiting some of the concepts, explanations etc.

4.2.10 NCERT School Kits

The National Institute of Education (NIE) Workshop Department of NCERT, New Delhi is an independent department of NCERT. It was conceived in 1964 with a vision to build hands-on experience for meaningful education. Accordingly the focus of the NIE Workshop Department is to create activities that promise to motivate the students for significant educational experience in the field of science education in schools.

The main objectives outlined by NIE are:

- To study teaching equipment in Science

- To design, to develop and to make experimental trials in schools for testing the designs and production.

As per the objectives stated above, the main role of NIE Workshop Department is in designing, developing and producing science equipment in the form of 'Kits'. These kits are intended to provide academic assistance by supporting the print media and give scope for developing hands-on experience. In addition to this the NIE also provides hands-on training on the use of various kits produced by it. It also conducts hands-on extension activities for children to participate in annual Jawaharlal Nehru National Science Exhibition for Children. The workshop is in reality a model department for Kit development and production center and a path-setter in the shifting paradigm of educational practices. It is a vital source of educational kits for all levels of school education.

These NCERT School kits are essential alternatives to the lack of any equipment in any of the schools and are supplement to the text books. The attraction of putting together a set of teaching–learning aids/ apparatus in portable container along with the manuals has given boost to this development of kit programme. The kits have the following advantages:

- availability of necessary pieces of apparatus/ items at one place
- multipurpose use of each piece of apparatus
- economy of time in setting up of experiments
- portability from one place to another
- provision for teacher's innovation
- low cost and use of indigenous resources

The use of the Kits had been highly recommended in NCF-2005 for effective learning through hands-on minds-on learning approaches. To make a student (learner) a scientifically literate citizen as envisaged in the National Policy on Education (NPE) 1986 and NCF- 2005, there is an imperative need to switch to approaches like:

- problem solving-based;
- activity oriented;
- performance-based; and

- learner-centered approaches.

The school kits which are under the purview of the current study are listed, analyzed and interpreted in the forthcoming paragraphs.

Table 4.46

List of the school kits scrutinized

Sl. No.	Level	Forms of Kits
1	Primary and Upper Primary	• Primary Science Kit (PSK) • Mini Tool Kit (MTK) • Integrated Science Kit (ISK) • Upper Primary Mathematics Kit (UPMK) • Manual of Upper Primary Science Kit (UPSK)
2	Secondary	• Micro Biology Lab Kit (MSBK) • Secondary Microscale Chemistry Lab Kit (SMCLK) • Micro Physics Lab Kit (MSPK) • Secondary Mathematics Kit (SMK) • Secondary Science Kit (SSK)
3	Senior Secondary	• Senior Secondary Micro scale Chemistry Laboratory Kit (SSMCLK) • Solid State Model Kit (SSMK) • Molecular Model Kit (MMK) • Senior Secondary Physics Laboratory Kit for XI

From the above table it is evident that the Workshop Department, NCERT has designed and developed curriculum based five kits at primary and upper primary level, five at secondary level and four at senior secondary level. These kits are available at the lowest cost. The focus of these kits is given in the following paragraphs.

The kits of primary, upper primary and secondary level contain the items for performing small experiments in all the three major areas of basic sciences like Physics, Chemistry, Mathematics and Life Sciences. They provide scope for hands on experiences. In addition to this the primary and upper primary kits are supported with the audio-video guides.

As mentioned above four kits were designed for the Senior Secondary level. The details of these kits are discussed in the following paragraphs.

i) Senior Secondary Microscale Chemistry Laboratory Kit (SSMCLK)

This Micro Scale Chemistry Laboratory Kit has been designed to replace traditional Chemistry laboratory. It reduces the chemical waste without hazards and pollution. The entire Chemistry practical at XI and XII level can be performed using this kit. This technique provides scope to do number of experiments to clarify a concept. One kit is suitable for four students. It has 43 items. It is accompanied with a manual describing the use of items and details of each experiment. This kit is beneficial in the following manner

- The chemical waste by schools might be reduced markedly
- Students learn waste minimization techniques that they would ultimately practice throughout their lives
- Schools would continue to offer hand-on laboratory experience to their students, a practice that has been threatened by the increasing costs and difficulty of waste disposal. It would introduce laboratory work into institutions too poorly equipped
- Health risks to students and teachers in the school laboratories are minimized
- The cost of materials and equipment needed to provide students with an excellent science education is reduced to a significant extent
- Saves time for preparation
- Smaller storage area is needed
- Reduced reliance on intensive ventilation systems with a significant reduction in electricity and water consumption
- Pleasant working atmosphere

ii) Solid State Model Kit (SSMK)

This kit consists of a plastic molded platform, dowels and Poly Vinyl Chloride (PVC) hollow balls of two different diameters. On the topside (A) of the platform, holes are made at the vertices and centers of squares. On the bottom side (B), holes are made at the vertices and centre of regular hexagons. The holes show the positions of atoms in a unit cell. These holes can receive friction fitting dowels, which are pointed for easier insertion into the balls. Various simple, giant molecules and a number of crystal structures can be clearly visualized and understood through this kit. It is also accompanied by a manual to help the user learn basic concepts of solid state structures.

iii) Molecular Model Kit (MMK)

The Molecular Model Kit enables the students to explore the structure of simple organic, inorganic molecules and solids. This self-learning kit contains plastic molded various atoms having a number of prongs and shapes in various colors. The colors have a typical meaning according to International Color Code. Prongs are used to make bonds to other atoms through tubings. The kit can be used to make models for most of the molecules as discussed in the textbook. For example, structure of simple inorganic molecules, structure of organic molecules and isomerism in organic molecules can easily be built as per the diagrammatic structures of the textbook. The kit has detailed manual to enable the students to build the structure of molecules with kit items. The Senior Secondary Physics Laboratory Kit for Class XI is under development.

4.3 Findings Based on the Documents Analyzed

The findings based on the document analysis in relation to the implementation of the project work are given in the following paragraphs.

It was found that only one circular was released in the academic year **2003-04** which provided detailed guidelines on the project work for the students of class XII in Accountancy subject. The students were supposed to study at least three types of problems. The main objective behind all these problems was to enable the students to prepare the financial statement involving real life business situations and analyze and derive at meaningful information for taking decisions relating to investment, expansion, financing, etc.

In **2004-05,** the circulars paid attention on the following areas:

a) Organization of the Regional Level and National Level CBSE-INTEL Science Exhibition Competition, wherein a research based investigatory study projects under models/exhibits were included in order to improve their co scholastic areas,

b) Provision of the opportunities to carry out project work to the students to use the time available at home in the form of alternatives to home work and

c) Provision of guidelines for effective implementation of the Project Work in Social Sciences.

Through the circulars released in the academic year **2005-06** it was found that they emphasized on the implementation of the scheme of evaluation in Social Science in project work and learning. The salient features on project work were reiterated. The report of the project work should be hand written and restrict to 09 to 15 pages of A4 size. The projects need to be original, creative and innovative. Distribution of marks on project should be based on initiative, cooperativeness and participation; content accuracy and research work; creativity, originality; analysis of different situations and different perspectives; and viva or written test for content assimilation. The project reports need to be retained by the respective schools. They were to be submitted at the time of inspection/supervision by the Board. Simultaneously, the learning should also be made distressful, relevant, enjoyable and useful. Ultimately the project work should lead to the student involvement and participation in learning in order to avoid the learning gaps. Seriousness in evaluating the project work should be brought in because the students go through the documents, collect the relevant materials and analyze them to arrive at their own findings and conclusions. Boosting of internal marks should be avoided so as to evade the downscaling of internal marks.

It was found that three circulars were issued in the year **2006-07** which pointed out more specifications on implementation of project work. They focused on learning that should be centered on ‘Learning to be’, so that the learner ultimately rises as an independent thinker. The circulars restated the seriousness in following the revised guidelines in internal evaluation of term and unit tests; assignments; project work; and maintenance of records. The revised topics and themes of the projects and a list of the suggested projects for class IX and class X were also specified.

Discussing the need of project work, it asserted that identification of projects might be through mutual discussions and in relevance to social, cultural, economic and environmental issues of the locality. Two projects in standard IX and one project in standard X should be selected in the beginning of the session. The preparation time for project would be four months. The report should be handwritten, original, illustrative, creative and in the order of the prescribed format. At the end of the term the neatly bound simple folder of project report should be submitted. An oral or written test on project conclusions should be conducted for 10 minutes.

It was established that all the Social Science teachers should be involved in evaluation of the project work. The distribution of the marks should be as per the modifications specified by the board. In order to avoid the reuse of the projects they should be punched at the center. The best five reports of different levels should be retained for recording whereas the rest might be returned. Once the marks are allotted no amendment or scrutiny should be made.

It was found that the aspect of organization of the Regional Level and the National Level Science Exhibition for the year 2007 added an investigation-based study report and a working model. There was an increase in the registration fee which rose from rupees 100 to 400.

In **2007-08,** it was found that the circulars reemphasized the significance of organizing Regional Level and National Level Science Exhibitions and stressed that the foundations of scientific mind and thought are laid during the formative years of school education. Children are known to be naturally curious to know and learn and they construct new knowledge on the basis of variety of active learning experiences provided to them. With the objective of providing such experiences and in order to promote creativity and innovativeness in learners, the Board has been organizing these science exhibitions since 2005. The response had been both encouraging and enthusiastic.

Through these circulars it was found that greater emphasis was focused on the investigation-based innovative projects of students to kindle curiosity, originality and interest in the subject. Percentage wise distribution of marks for different criteria was displayed.

It was found through the circulars in the academic year **2008-09** that they expressed their concern over the guidelines for project work in Sociology in classes XI and XII. 20 marks were allotted to the practical project work whereas 80 marks were allotted to the theory work. Both of them were to be externally evaluated.

Details on distribution of 20 marks for practical project work were also given. In addition to this the distribution of marks for internal evaluation of Disaster Management was revised. The students were supposed to take up at least one assignment from Disaster Management to understand different methods of managing disasters. The assignment records were to be preserved up to six months for further inspection, if any.

The focus was to use eco friendly materials for project making with less expense. A hand written project report of 15 pages may be submitted by the students. A tentative list of topics/ themes for projects with a note to the teachers was supplemented.

It was found that a new initiative of establishing Mathematics Laboratory was taken up in the year 2003 to make Mathematics learning joyful and fun-filling in primary sections. Through circulars, guidelines and orientation programs, 10 activities based on different concepts of Mathematics syllabus were in use which included project work also.

It was found through the circulars released during the year **2009-10** that they focused on the issues of participation in Regional Level CBSE Science Exhibition-2009, examination reforms and continuous and comprehensive evaluation (CCE) in the CBSE affiliated schools. Details on the participation in the exhibition like number of members in a team, planning the travel schedule, time, date and venue details, parameters for evaluation of the exhibits, details of write-up are discussed. **Projects** were considered as a means of formative evaluation in CCE. Under group activities preferably in groups of 4-5 students, **investigatory or experimental projects** may be planned. The areas of assessment might include inquisitiveness of the students to quest, to observe, to think, to analyze, to apply, to comprehend, to compute and to conclude.

It was found that the circulars released in the academic year **2010-11,** discussed details on the organization of the Regional Level/National Level Science Exhibition 2010. Through the second document, it was requested to give publicity to the IGNITE competition amongst students, teachers and parents so as to activate the creative instinct in children to find solutions to the day-to-day problems. Every class teacher was persuaded to motivate students to pursue innovative ideas and projects during summer vacation. Further schools were also requested to start the Honey Bee Creativity Clubs (Clubs in school that promote creativity and innovation among children, projects done/ideas and innovations conceived by student members of the club may be linked to NIF during the IGNITE campaign or otherwise) as part of their enrichment activities if they have not already initiated action in this regard.

It was found that the circulars issued in the year **2011-12** focused on the issues of organization of CBSE Science Exhibition – 2011 and 2012, clarification in evaluation scheme for class XI and XII practical examination in Physics and provision of Project work in Business Studies for class XI and XII. The particulars of the Science Exhibition included details on themes, subthemes, title of the project/exhibits, scientific principle involved, method adopted, unique features of the exhibit, application of the project in real life situation and further scope of the exhibit. Details on practical examination evaluation for senior secondary classes like experiments, activities and project work are discussed. The details of records in practical examinations in XI and XII in Physics and the modification in the scheme of evaluation of this practical examination were discussed at length.

Through further analysis of the documents, it was found that the KVS promotes experimentation and innovation in education in collaboration with the CBSE and the NCERT by participating in the State Level Science Exhibition and Jawaharlal Nehru National Science Exhibition for Children. In this regard, the Kendriya Vidyalaya Samithi also sends a copy of its **'dispatches'** to all the schools under its banner.

It was found that the **KVS dispatches** released in connection with the present study focused on the issues of organization of the State Level Science Exhibition for children 2007-08, 2008-09, 2009-10 and 2010-11, Amendment in Article 106(A) & (C) of KVS Education Code. The details on the themes and subthemes of the exhibition along with the participation parameters are discussed at length in these dispatches. It is noticeable that the contribution of the project work marks in session ending examinations was reduced from 10 to 05 as per the amendment Article 106(A) and (C) of KVS Education Code.

In continuation with the document analysis, it was established that in order to ensure the widest possible participation and involvement of students and teachers in the Science Exhibition programme, NCERT organizes **JNNSEC** in two phases.

It was found that in the first phase of the exhibition, the State Level Science and Environment Exhibitions for Children (SLSEEC) are held in all the States, Union Territories and other organizations like Kendriya Vidyalaya Sangathan (KVS), Navodaya Vidyalaya Samiti (NVS) etc. at District, Zonal, Regional and finally at the State level. These exhibitions are organized and monitored by the CBSE. The guidelines to these science exhibitions are issued by the CBSE well in advance to all its affiliated schools. In fact the first phase of exhibition is a preparation for the second phase of exhibition.

It was found that in the second phase of the exhibition, the Jawaharlal Nehru National Science Exhibition for School Children (JNNSEC) or the National Level Science Exhibition is organized preferably in the months of November or December every year. The best exhibits selected from the entries at the State Level Science Exhibition are put on display at this exhibition. This exhibition is organized and managed by the NCERT. It is in fact, the Department of Education in Science and Mathematics (DESM) which carries out research, development, training, evaluation and extension activities in Science, Mathematics and Environmental Education from the upper primary to the higher secondary stage.

It was found that the CBSE publishes the **Compendium** which is a compilation of all the circulars issued to schools every five years. They help as records to be referred when needed. Hence, in 2005, ‘CBSE Update-Compendium of CBSE Circulars’ was published with 67 circulars under six themes, viz., New Subjects, Changes in Curriculum, Evaluation, Support Materials and Publications, General and Enrichment Activities. The second publication of Compendium is available in two volumes. Some of the circulars enclosed in the Compendium in relation to the implementation of the project work were as follows.

- Project and Practical work in Accountancy for class XII
- Guidelines to Project work in Social Science
- Restructuring of Science practical work

- Regional level CBSE Intel Science Exhibition
- Strengthening formative Assessment in affiliated schools under Continuous and Comprehensive Evaluation
- Introduction of Environmental Education as a compulsory subject in schools from Class I to Class XII
- Guidelines in Sociology (Code No. 039) subject for Project work and Marks distribution for class XI for the academic session 2008-09
- Revised design of the Sample Question papers in the subject of Mathematics for classes X and XII March 2008 Examination
- Project work Evaluation in Social Sciences

It was noticed from the analysis of the **Annual Reports** that the JNNSEC were held at different States like Himachal Pradesh, West Bengal, Puducherry, Maharashtra and Chattisgarh. The number of the exhibits ranged from 150 to 160 and the total number of participants ranged from 310 to 330. The JNNSEC was organized in the months of November or December every year for six or seven days. An educational tour is also organized during the exhibition.

Further analysis of the CBSE curriculum for senior secondary sections in Science stream it was found that the CBSE reserves the right to amend the syllabi and courses as and when it deems necessary. Wherein curriculum updating is a continuous process; as such the Board brings out the revised curricula every year. It was obligatory for the school and the students of a particular year to follow the syllabi, courses and the books prescribed by it for that year. No deviation from the ones prescribed was permissible. The **Senior School Curriculum** comprised of two parts. The Part I of the curriculum spoke about the eligibility requirements, scheme of studies and scheme of examinations, whereas the Part II discussed the courses of studies in detail. The second part discoursed about the languages and the prominent subjects like Mathematics, Physics, Chemistry, Biology, Biotechnology, Engineering Drawing, Home Science, Agriculture, Computer Science, Informatics Practices, Multimedia and Web Technology. In this context, the curriculum focused on the details of the aims, note to develop process skills and investigatory skills among the learners of the Science stream. Besides this, details on practical aspects and evaluation criteria are mentioned.

Through further analysis of the **textbooks,** it was found that the prescribed **textbooks** are the sole basis of learning for the examinations. Textbooks are one of the key reasons why other resources and sites of learning are ignored. The students are to be treated as participants in learning, not as receivers of a fixed body of knowledge. These aims imply considerable change in school routines and mode of functioning. The text books included objectives in the form of key statements, diagrams, exemplary problems, historical details at required sites, scientific investigations and anecdotes, pictures of scientists at appropriate places, lesson end exercises and answers to some selected problems. In this regard there were no guidelines exclusively on the implementation of the project work.

Further analysis of the handbooks for the teachers made it clear that they contained only exemplar projects in relation to the environmental education. Later on the NCERT made it imperative to develop a separate project books that would contain a wide range of projects providing ample options to the students and teachers in the selection of the projects to be undertaken. In addition to this, to ensure the continuation of proactive action towards the environment, NCERT proposed a project-based compulsory qualifying course comprising a core and projects for all the students from class VI to class XII. These **project books** were to promote socio-cultural ethos which facilitated India's attempt to pursue the path of ethically sound and sustainable development.

It was found from further analysis of the documents that after the introduction of the Continuous and Comprehensive Evaluation (CCE) in schools affiliated to the CBSE in class during 2009-10, the Board had brought out **Teachers' Manuals** on School Based Assessment (SBA) – Class IX and X. Besides giving detailed information about the scheme of CCE, fundamentals of assessment of co-scholastic and scholastic areas, dimensions of school-based assessment and tools and techniques of evaluation for formative and summative purposes had also been included in the manual. Moreover it was found that the **manuals** on Formative Assessment in the subjects of Hindi, English, Science and Social Science for class IX provided valuable guidance to the teachers on the nature of the projects, advantages of the projects, concerns regarding the projects and checklist for projects in different subjects were given. Suggestions for implementation of projects were also given.

Through further analysis of the documents it was found that the National Institute of Education (NIE) Workshop Department of NCERT, New Delhi created activities that promise to motivate the students for significant educational experience in the field of science education in schools in the form of **'School Kits'.**

It was found that the activities which might be performed using the kits give scope for enhancing the skills of observation, tabulation and note taking. In addition to this some similar and open ended activities leading to some projects might be also planned with the help of these kit items.

4.4 Analysis of the Data Obtained from the Teachers' Questionnaire

As stated earlier, the questionnaires were one of major sources of information to gain a comprehensive understanding about the present study. In order to substantiate the second, the third and the fourth objectives of the study, the data were collected separately from the teachers with the help of the questionnaires. These questionnaires gathered information on the demographic details of the teachers in addition to the implementation of the project work with respect to the following aspects:

- Objectives of the project work,
- Identification of the project work,
- Selection of the project work,
- Assignment of the project work,
- Orientation and guidance to the teachers,
- Development of the project work,
- Number of projects assigned to the students,
- Variety in projects assigned to the students,
- Time limitation in completion and submission of the projects by the students,
- Availability of the resources,
- Utility of the project work,
- Problems encountered in development of the project work,
- Evaluation procedures of the project work,
- Preservation and maintenance of the project work and

- Project work as a method of teaching.

The details on the above aspects are elaborately presented under separate side headings in the following paragraphs.

4.4.1 Demographic Facts of the Teachers

The Secondary Education Commission (1964-66) has remarked the role of the teacher as most significant. In the contemplated educational reconstructions the teacher's personal qualities, educational qualification, and the professional training occupy a pivotal role. The place that a teacher occupies in the school as well as in the community is accountable for national reconstruction.

Therefore this section embraces the analysis of the educational qualifications and teaching experience of the teachers. All the teachers of Mathematics, Physics, Chemistry, and Biology are Post Graduates in their respective subjects of teaching methodology with a professional degree of teaching, i.e., B.Ed. The Computer Science teachers are graduates with a Bachelors degree in Engineering or Masters Degree in Computer Applications. The Post Graduate Teachers (PGTs) in Biology had either Zoology or Botany as their subject. The Post Graduate Teachers (PGTs) in Chemistry had Organic Chemistry or Inorganic Chemistry as their specialization.

The number of teachers in different Science subjects is analyzed and placed in the following table.

Table No. 4.47

List of the subjects and the number of the teachers

Sl. No.	Subjects	Number of the teachers
1	Physics	07
2	Chemistry	08
3	Biology	06
4	Mathematics	06
5	Computer Sciences	04
Total		**31**

From the above table it is evident that there are seven Physics; eight Chemistry; six each in Biology and Mathematics; and four Computer Science post graduate teachers. The sum of teachers is **31.** All the teachers teach their respective subjects at secondary and higher secondary level, ranging from class IX to class XII. But the Computer Science teachers teach classes from VI to XII.

Most of the teachers are directly recruited for the posts of the Post Graduate Teacher (PGT). But very few teachers started their teaching career as a Primary Teacher (PRT) and later on they were promoted to the level of a Trained Graduate Teacher (TGT) and then on to the post of a PGT. The teaching experience of the teachers varied from 03 months to 15 years. Based on the length of the teaching experience, the number of classes taught and the strength of the class the number of projects observed by them ranged from 10 to 400.

4.4.2 Objective of the Project Work

In the context of the project work the objectives in general help to realize the value of the project work that is undertaken. They help to gain an awareness of the elements common to good project works. Ultimately they help in creating some exemplary projects. In this regard the teachers were asked (Item No. **19** of Appendix **D**) to specify the objective of assigning the project work to the students. The responses of the teachers to this item are analyzed and stated in the following statements.

- To show the relation between the theory and practice and to learn by doing
- To develop creative abilities and to increase innovative thoughts and critical thinking
- To improve the knowledge, understanding, interpretation of data of a particular topic or the content
- To enhance observation and application skills
- To develop the interest and the curiosity of the students
- To enhance the spirit of enquiry
- To inculcate scientific attitude
- To develop scientific aptitude
- To proceed with heuristic approach
- To participate in team work and group activity
- To develop leadership qualities
- To work with cooperation
- To improve the confidence levels

- To generate a sense of achievement

The above responses with similar sense of perception are further categorized under three dimensions in order to have a comprehensive understanding. These dimensions are as given under:

- Scholastic dimension
- Scientific dimension
- Leadership dimension

The objectives stated by the teacher for assigning the project work and the attributed dimensions are depicted in the following table.

Table No. 4.48

Dimension wise objectives for assigning the project work

Sl. No.	Dimension	Objective
1	**Scholastic dimension**	• To show the relation between the theory and practice and to learn by doing • To improve the knowledge, understanding, interpretation of data of a particular topic or the content • To enhance observation and application skills • To improve the confidence levels • To generate a sense of achievement
2	**Scientific dimension**	• To develop the interest and the curiosity of the students • To enhance the spirit of enquiry • To inculcate scientific attitude • To develop scientific aptitude • To proceed with heuristic approach • To develop creative abilities and to increase innovative thoughts and critical thinking
3	**Leadership dimension**	• To develop leadership qualities • To work with cooperation • To participate in team work and group activity

The above table shows dimension wise objectives stated by the teachers in assigning the project works to the students.

Apart from the above query the teachers were also enquired (Item No. **2 (a, b)** of Appendix **D)** about adequacy of achievement of the continuous and comprehensive evaluation through the project work. The responses to this item are analyzed and represented in the following table.

Table No. 4.49

Responses on the adequacy of achievement of the CCE objective

Sl. No.	Adequacy of the achievement of the CCE objective	Frequency	Percentage
1	Inadequately	03	09.67
2	Moderately	10	32.25
3	Adequately	15	48.38
4	Others	03	09.67
Total		**31**	**99.97**

It is clear from the above table that 15 (48.38%) teachers have responded on the adequacy of the objective of the continuous and comprehensive evaluation. 10 (32.25%) teachers have responded on the moderate achievement and three (09.67%) teachers have responded on inadequate achievement. Three teachers (09.67%) have responded stating that project information and knowledge helps the students to succeed in the academics.

The analyzed responses for **inadequate** achievement of the objective of the continuous and comprehensive evaluation are revealed as follows.

As per the teachers' responses the resources at many places of Kachchh region are inadequate. Moreover the senior secondary students attend their coaching and tuition classes. They do not pay attention to their projects; in case if projects are made compulsory, they students take help from the professionals for completion of projects. Students and parents give priority to academics and theory only so that this may help in cracking the competitive examinations. The attention of the students is towards marks and grades only. Moreover the weightage of marks in projects is less. On the contrary practical aspects of the projects need lot of devotion, will, skill, understanding, economic support and time for perfection. Students lack in one or the other of these. The students do not show much interest in project making. At many places the resources are limited. Some teachers also mentioned that there is no access to library or internet to the students. Mostly the projects are taken as a formality and neither the teachers nor the students take projects seriously.

The analyzed responses for **moderate** achievement of the objective of the continuous and comprehensive evaluation are the vast syllabus, examination system and lack of time which do not permit the students to take interest in the project work. The students are more oriented towards scoring of marks and grades. The projects are not given due weightage in school curriculum so this work becomes formal rather being an important tool for CCE. Lack of materials resources and access to library and internet stand as a barrier in attainment of the CCE objective. There is a possibility of recycling of projects also. Sometimes the students know the requirements of the project accordingly make ideal projects. Project work is such a task that has to be done with will, dedication and perfection. But it is not possible due to differences in levels of understanding and grasping of the students.

The analyzed responses for **adequate** achievement of the objective of the continuous and comprehensive evaluation are that the students do perform well in the examinations applying the knowledge gained through relevant projects that are in conjunction with the theory. They also students take assistance from the seniors and other professionals to complete the projects. Sometimes the projects are recycled. Projects also fulfill the tasks of achieving the objectives of teaching. In addition to the above after learning theory if the students carry out some projects they will get a thorough knowledge of the subject matter and succeed.

4.4.3 Identification of the Project work

Identification of the projects that are to be done by the students is an important step in project completion. The teachers were invited (Item No. **9 a, b** of Appendix **D**) to respond if they had a special syllabi or curriculum meant exclusively for the project work. The details of their responses to this item are analyzed and tabulated below.

Table No. 4.50

Responses for allocation of special syllabi/curriculum for identification of the projects

Sl. No.	Responses for allocation of special syllabi/curriculum for identification of the projects	Frequency	Percentage
1	Yes	13	41.93
2	No	18	58.06
Total		**31**	**99.99**

The above table makes it clear that 13 (41.93%) teachers have responded positively for having syllabi allocation for identification of the projects whereas 18 (58.06%) teachers have responded negatively. Considering the above issue positively, the teachers claimed that in class XII, two demonstration experiments and one investigatory project are to be carried on as directed by the CBSE and the NCERT syllabus. In class XI one project is to be carried on per term per subject. Therefore the text books are the main sources which are searched for the possibility of projects by the teachers. Accountancy, Commerce and Geography subjects provide a list of projects that may be taken up by the students, whereas Science subjects do not. The notification of Jawaharlal Nehru Science Exhibition provides themes and sub themes for project identification and selection. The details of the same are discussed under documents section **4.2.3**.

4.4.4 Selection of the Project Work

The selection of the projects is a crucial step in development of the project works. Multiple factors like availability of the material resources and time play a prominent role in deciding the selection of the project works. The teachers were requested (Item No. **20 a, b** of appendix **D**) to give information about the selection of projects and the attributes thereof. Their responses to this query are analyzed and presented below. Their priority for selection of the projects is also indicated in the tabular form.

Table No. 4.51

Attributes for selection of the projects

Sl. No.	Attributes for project selection	Frequency	Priority of attributes
1	From the text book	11	**11th**
2	From the (textbook) activities and exercises	14	**9th**
3	From the workbook	04	**15th**
4	From the library reference	16	**6th**
5	From the media	16	**6th**
6	From the relevant environmental or social situations	17	**5th**
7	Students choose on their own	09	**13th**
8	From any prescribed projects by the board	10	**12th**
9	From your own mental plans	15	**8th**
10	Availability of the time	18	**4th**
11	Consideration of the content/syllabus	23	**2nd**
12	Performance of the student	19	**3rd**
13	Availability of the resources	24	**1st**
14	Relevance of the project with the environmental issues like global warming	14	**9th**
15	Novelty of the project	07	**14th**
16	If other than these, please specify	---	**---**

From the above table it is evident that different attributes are considered for selection of the projects. The order of priority for selecting the projects varied from the availability of the resources to the exercises in a work book. The teachers usually considered the following attributes in a descending order to select a project.

1. Availability of the resources
2. Consideration of the content/syllabus
3. Performance of the student
4. Availability of the time
5. From the relevant environmental or social situations
6. From the library reference
7. From the media
8. From your own mental plans
9. From the (textbook) activities and exercises

10. Relevance of the project with the environmental issues like global warming
11. From the text book
12. From any prescribed projects by the board
13. Students choose on their own
14. Novelty of the project
15. From the workbook

From the above it is obvious that availability of the resources and the consideration of the content/syllabus were respectively the first and the second prioritized attributes in project selection. Some teachers also considered other attributes for project selection such as representation by students; low cost projects; informative projects; projects helpful in good learning; with some practical application to the society; and projects which may be used by everyone.

4.4.5 Project Work Assigned by the Teachers

In a student centered activity like project work, the role of the teacher is limited to provision of certain guidelines. Generally projects are assigned to the students keeping in mind a variety of learning experiences based on the varied interests, abilities and aptitudes of the learners. In this context the teachers were invited (Item No. **1** of Appendix **D**) to respond to give reasons for giving project work as an assignment. Their responses to this question are analyzed and presented in the following table.

Table No. 4.52

Different reasons for assigning the projects

Sl. No.	Different reasons for the project assignment	Frequency	Priority of reasons
1	In order to complete the content/syllabus	06	**10th**
2	In order to concentrate on the learner based education	18	**2nd**
3	In order to consider the individual differences	07	**9th**
4	In order to consider the level of applicability	13	**5th**
5	In order to integrate different skills	17	**3rd**
6	In order to inculcate social values like co-operation	12	**6th**
7	In order to evaluate the students throughout the academic year	09	**8th**
8	In order to utilize the time effectively	04	**12th**
9	In order to use the resources efficiently	10	**7th**
10	In order to develop critical thinking	24	**1st**
11	In order to give hands on experience	14	**4th**
12	Because it is given in the curriculum	06	**10th**
13	If other than these, please specify ________________	---	**---**

The priority of specific reasons for assigning the projects to the students is presented in a descending order begins with critical thinking; concentration on learner based instruction; to integrate different skills; to give hands on experience; level of applicability of projects in real life and new situation; to inculcate social values; to use resources effectively; to evaluate the student throughout the year; to consider individual differences; for syllabus completion as given in the curriculum and use of time. In addition to the above reasons, the project assignment is also given for the following other reasons.

- In order to inculcate and generate self confidence
- So as to develop a sense of achievement among the students
- To promote their individual efforts
- To develop optimum scientific temper.

It is comprehendible from the above analysis that all the above stated reasons for assignment of the projects may be further analyzed and categorized into the following three major heads according to the teacher's point of view. They are

thinking; learning and instruction; and **utility.** Critical thinking is aroused due to uptake of the project work. The students start thinking in a divergent manner applying their varied knowledge and skills. They start integrating different skills for hands on experience. The individual differences are also considered for this purpose. In addition to the above stated reasons, the students start using their time judiciously and apply time management skills in real life situations. They also learn optimum use of the available resources.

The teachers were put a question (Item No. **1 b, c** of Appendix **D**) if they were aware of the set criteria in project assignment. Their responses and comments to this query are analyzed and presented below.

Table No. 4.53

Awareness of the set criteria for assigning the project work

Sl. No.	Responses for awareness of the set criteria for project assignment	Frequency	Percentage
1	Yes	26	83.87
2	No	05	16.12
Total		**31**	**99.99**

It is clear from the above table that 26 (83.87%) of the teachers gave a positive response for awareness of the set criteria in assigning the projects, whereas five (16.12%) teachers gave a negative response. The set criteria explained by the teachers are presented under the following four categories.

1. Norms of KVS/CBSE
2. Focusing on the learner
3. Availability of the resources
4. Utility

The teachers explained that as per the **NCERT and CBSE norms; and KVS guidelines,** the criteria for assigning the project work is for improving thought processes and developing application skills among the students. The projects should be content based, skill based, and innovative. They check and explore the scientific knowledge, originality, and creativity of the individual student. The projects may be in the form of an extended learning in the subject and in relation to the real life contexts.

The teachers also stated that the projects must be assigned by **focusing on the learner.** In fact no specific criteria are mentioned in CBSE curriculum exclusively for Science projects, but certain traits are considered in assigning the projects like individual differences, workmanship, learning done, creativity and suitability or applicability to mankind. From within the syllabus projects are given to increase thinking, reasoning and logic in relation to day to day real life application. The project work should be done by the students themselves and they must be involved in project work in order to inculcate social values like-cooperation and to give hands on experience. The cost should be bearable by the student.

It is also mentioned by the teachers that the **availability of resources** in the form of access to internet for the latest information is mandatory for project development and completion. Moreover if the projects are from within the syllabus the students apply the theoretical knowledge. Content details of the topic, objectives, ways for collection of resources/materials; details on support from the school laboratory; procedure/ methods of investigation; observation/ analysis processes; utility of the results and conclusions are essential before the project assignment.

The teachers also proclaimed that the projects are assigned to the students for their **utilitarian** value. They foster creativity among students with a positive attitude towards education and life. The students gain experience and continue with development of skills on different levels like application of knowledge and practical skills. In addition to this the projects are helpful to inculcate social values in group learning with absolute team spirit. They improve presentation skills and aid in personality development.

4.4.6 Orientation and Guidance to the Teachers

Science content increases and changes and a teacher's understanding in Science must keep pace. Therefore the ways and means for the professional growth of the teachers is through frequent organization of the orientation and guidance programs. The focus of such orientation programs is for both content enrichment and pedagogy.

In this context, the teachers were enquired (Item No. **5 a (i), (ii)** of appendix **D**) for the details on the orientation programs or any special training for implementation of the project work that they had attended. The teacher responses to this item are analyzed and presented in the following table.

Table No. 4.54

Responses for the orientation programs attended by the teachers

Sl. No.	**Responses for the orientation programs undergone**	**Frequency**	**Percentage**
1	Yes	05	16.12
2	No	26	83.87
Total		**31**	**99.99**

From the above table it is ascertained that only five (16.12%) teachers have undergone the orientation programs whereas 26 (83.87%) of the teachers have not. Further the details of such orientation programs attended by the teachers are shown in the following table.

Table No. 4.55

Details of the orientation programs attended by the teachers

Sl. No.	**Name of the orientation program/workshop/ training**	**Organizing authority**	**Duration and time period of the program**	**Your comment or remark on the effectiveness of the program**
1	In-service training course for PGTs - Training program for teachers on project method of teaching entitled "GSWP". The acronym stands for "Getting Started With Project".	KVS, Head Quarters, New Delhi	21 days (9th to 30th May, 2009)	very effective, knowledgeable and helpful in evaluation of the project
2	In-service program		12 days	average

From the above table it is apparent that two types of orientation programs were organized for the teachers. One was an in-service training course for teachers on project method of teaching entitled "Getting Started With Project" (GSWP) was organized by the KVS, Head Quarters, New Delhi in the month of May, 2009 for 21 days and another for 12 days. The 21 day training programme is conducted on the principle of continuing in-service education for teachers. This is also a service condition and promotion is based on teachers attending a 21 day training programme conducted by an authorized organization or university.

The teachers who did not attend any orientation programs stated that they needed more project investigation guidelines on project work. The orientation programs would help them to implement projects more effectively. They stated that there should be some institutions or NGO's which would take absolute interest in demonstration of projects to the local/regional schools. The teachers suggested that some manuals or magazines should be published on project work for self orientation or else demonstrations might be organized by the senior members in the form of workshops and special training programs. Teaching in schools should be made project based and special weightage should be given to it. They emphasized that information and guidance he details on availability of the resources is required by both the teachers and the students. Hence, proper training and orientation is necessary for proper selection, planning and evaluation of the projects. The teachers stated that the orientation programmes ensure effective implementation of project work.

The teachers were enquired (Item No. **5 b** of Appendix **D**) whether they would reorient their students in project development. Their responses the same are analyzed and presented in the following table.

Table No. 4.56

Responses for reorientation given to the students

Sl. No.	**Responses for reorientation of the students**	**Frequency**	**Percentage**
1	Yes	18	58.06
2	No	13	41.93
Total		**31**	**99.99**

From the above table it is comprehendible that 18 (58.06%) teachers oriented their students whereas 13 (41.93%) teachers did not.

In addition to orientation given to the students, the teachers were also enquired (Item No. **5 c** of Appendix **D**) for obtaining guidelines when the syllabi changed. The responses to this query are analyzed and presented below.

Table No. 4.57

Distribution of the responses for obtaining the guidelines when the syllabi changes

Sl. No.	Response for obtaining the guidelines when the syllabi changes	Frequency	Percentage
1	Yes	15	48.38
2	No	16	51.61
Total		**31**	**99.99**

It is explicable from the above table that 15 (48.38%) of the teachers gave a positive response for obtaining guidelines if the syllabus changed while 16 (51.61%) teachers gave a negative response.

4.4.7 Development of the Project Work under the Guidance of the Teacher

Once the topic of the project is selected and finalized, the students are advised to proceed with development of the project work. It needs procuring the relevant information and gathering the material resources. In this context the teachers were enquired (Item No. **18 a, b** of appendix **D**) whether the students referred and gathered relevant information for project development. Their responses for the same are analyzed and presented in the following table.

Table No. 4.58

Responses for gathering relevant information for project development

Sl. No.	Responses for gathering the relevant information for project development	Frequency	Percentage
1	Yes	27	87.09
2	No	04	12.90
Total		**31**	**99.99**

It is evident from the above table that 27 (87.09%) teachers stated that the students referred and gathered relevant information for project development whereas four (12.90%) teachers did not. The comments of the teachers on how the students accumulate this information on projects from various resources are presented in the following paragraphs.

The teachers stated that the students use library, computer lab and other science labs for gathering relevant information. The experimental works are usually supported with guidelines by the subject teachers. Appropriate information and time are given to the students. The students mostly collect information easily from websites as per their caliber. In addition the students rely over the concerned teacher for more than guidance and presentation. In small groups of three to four students collect and use the information according to their need.

During Science Exhibition at school level, the students are allowed to observe the projects and gather relevant information. They refer various books of the library to develop the projects. Simultaneously they make notes or write comments. The students discuss among themselves about their projects and come out with their own ideas and suggestions. They explore books, guides and internet to improve the presentation of the projects.

On the contrary, it was stated by the teachers that ignorance in application of the knowledge; non cooperation from the parents, financial problems, lack of materials, lack of creativity, disinterest of the students in hard work, unavailability of diverse material in the local markets hamper the process of collecting relevant information for project development.

Further, the teachers were enquired (Item No. **21** of appendix **D**) about the procedure for implementation of project work. Their responses for this item are analyzed and presented below.

The teachers mentioned that as per the KVS rules, the projects are assigned to the students. Guidance is given to them while making the project. Three projects are given term wise in a year at regular intervals. First selection of proper topics is done with a broad description. Information and guidelines on introduction and data collection are given. Broad information and knowledge on the principle or theory involved in the project; virtual image or diagram of the model; information on collecting and assembling the raw material to construct the model; presentation of the criteria for evaluation; regular monitoring and feedback regarding proceedings are given to the students. Simultaneously the information is to be collected; observations are recorded and interpreted. The project work ends with the report writing.

It was also explained by the teachers that the students are assigned the tasks based on their achievement levels. In case of working models, they are first checked in the school lab for its correctness, relevance and utility. Some of the teachers prepared a list of the projects well in advance based on the class and availability of the resources. Later on the students are allowed to select the projects. In groups the project work is distributed among the students and then regular monitoring is done on each group. Within the available time the project work is completed with the help of students.

The teachers were inquired (Item No. **23 a, b** of appendix **D**) about the satisfactory involvement of the students in project development. The teacher responses for the same are analyzed and presented in the following table.

Table No. 4.59

Responses for satisfactory involvement of the students in project development

Sl. No.	Responses for satisfactory involvement of the students in project development	Frequency	Percentage
1	Yes	23	74.19
2	No	08	25.80
Total		**31**	**99.99**

It is marked from the above table that 23 (74.19%) of the teachers gave a positive response stating that the student involvement in project work was satisfactory whereas eight (25.80%) teachers gave a negative response. The teachers were also inquired (Item No. **23 c** of appendix **D**) about the impact of this involvement on the personality of the students. The responses of the teachers to this question are analyzed and presented below.

The teachers commented that the projects satisfy the curiosity of the students. They learn to take logical decisions and start thinking critically. By working in groups and the students realize the values of cooperation, team spirit and tolerance. The students develop leadership qualities. They gain self confidence and start liking the subject. The students achieve knowledge and clear the concepts about topic of the project. The teaching and learning process become more effective and simpler to explain. The project method of learning empowers the students with extra knowledge and motivates them further. The projects help in developing application, communication and presentation skills of the students. The sense of achievement in students fills their hearts with joy and motivates them to think on practical aspects of the subject generating knowledge based learning. They start raising their queries during every step of project development. They develop self learning capacity. The computational and logical ability of the students increases. After completing the project the students are in a position to understand the idea or fact behind project and will remember it throughout their lives.

4.4.8 Number of projects assigned to the students

The teachers were enquired (Item No. **6** of Appendix **D**) about the number of projects assigned to the students. The responses of the teachers to this question are analyzed and presented in the following table.

Table No. 4.60

Responses for the number of projects assigned to the students

Sl. No.	Responses for the number of projects assigned to the students	Frequency	Priority of options
1	Three projects per subject per year	16	**1st**
2	Two projects per subject per year	05	**2nd**
3	One project per subject per year	05	**2nd**
4	None	---	**---**
5	If other than these, please specify________	05	**2nd**
Total		**31**	**---**

From the above table it is understandable all the schools assigned projects to their students. A maximum number (16) of teachers stated that three projects were assigned per subject per year to each student. Five teachers each stated that one or two projects were assigned per subject per year to the students. In addition to the above stated responses, the teachers also mentioned that for class XII only one investigatory project per year is given. For Jawaharlal Nehru Science Exhibition which is conducted by the NCERT the students were advised to make projects.

4.4.9 Variety in projects assigned to the students

For a wider participation of the students in a classroom, a variety of projects are given to the students. The teachers were enquired (Item No. **7** of Appendix **D**) for the type of projects that they give to the students. Their responses to this query are analyzed and placed in the following table.

Table No. 4.61

Responses for variety in the projects assigned

Sl. No.	Responses for variety in the projects assigned	Frequency	Priority of variety
1	A written assignment	14	**2nd**
2	A chart	14	**2nd**
3	A model/a working model	21	**1st**
4	Projects involving reference work and discoveries	09	**6th**
5	Projects involving innovations, inventions	11	**4th**
6	Projects which are challenging and encouraging	10	**5th**
7	Projects which are relating to the relevant situations or contexts	09	**6th**
8	Collecting and preserving specimen/s	07	**8th**
9	If other than these, please specify ____________	---	**---**

From the above table it is explicable that model or a working model was the first option of the teachers to assign the project. The other variety of projects given by the teachers in descending order were written assignments; charts; projects involving innovations and inventions; challenging and encouraging projects; projects involving reference work and discoveries; collecting and preserving the specimens. In addition to the above responses the teachers also stated that computer related projects; power point presentation in compact discs; projects based on the practical application to society; development of software project/ presentations/ programs are also the types of projects assigned to the students. The teachers also mentioned that variety can be introduced even by doing old activities in new ways.

The teachers were asked (Item No. **8** of Appendix **D**) to write down five illustrative titles of projects in their respective subjects. The titles of the projects mentioned by the teachers in different subjects are given below.

In **Physics** the project titles that are given to the students are presented in the form of a grid as follows.

Table No 4.62

Grid showing the illustrative project titles in Physics

Logic gates	Burglar alarm (working model)	Electric motor	Newton's rings
To make a model of solar device	audio amplifier (working model)	Faraday's laws of EMJ	Static models of d.c. motor
Compound pendulum	Purification of water (conventional methods)	Seismograph (non-working model)	Red shift and violet shift in stars
Models showing conversion of one form of energy to other	Harnessing energy (solar inverter) (nonworking model)	Railway signal switching and lever switching (working model)	Rate of cooling depends on area, type of liquid and type of the vessel
Use of Science and Technology on atmosphere, in sports and games; in engineering; in water propagation and in aerospace			

In **Chemistry** the project titles that are given to the students are given in the following grid.

Table No 4.63

Grid showing the illustrative project titles in Chemistry

Electronic train	Factors affecting rusting of iron	Study of different types of medicines	3-D model of solid state
Preparation of rayon threads	PPT on CDs on any lesson	Water conservation plant	Analysis of antacids
Earthquake proof houses	Study of relative roles of evaporation	Solar energy device for pumping water	Model of food chain
Thermal fabrics for cold and hot climates	Model to explain the motion of planets and satellites	Collection of data for pollution and population	Qualitative analysis of different water samples
Voltaic Cell	Artificial snowfall	Food adulteration	Model of an atom
Effect of potassium bisulphate as food preservative	Use of satellite in modern age Electrolysis	Quantity of casein in different samples of milk	Qualitative analysis of homeopathic drugs

In Biology illustrative project titles that are given to the students are given in the following grid.

Table No 4.64

Grid showing the illustrative project titles in Biology

Controlled pollination	Pollen germination	Tissue culture	Uterus fibroid
Organic farming pattern	Water harvesting instruments	Global warming and pollution	Biodiversity on wild life
Checking soil erosion	Study of apical dominance	Tuberculosis a survey	Water harvesting (working model)
Vermin composting (working model)	Study of soil pH of different area	How to solve global warming	Green house effect
Different habit and habitats of plants	Germination and observation different seeds	B T cotton (genetically modified crop)	Urine harvesting (semi-working model)
Pollution and its effects on Taj Mahal (working model)	Indian peacock-habitat/ reproduction/feeding habits	Study of chlorophyll content	Self sustained zero pollution zone (building area)
Alternative sources of energy (self sustained farmland) (semi-working)			

In Mathematics the illustrative project titles that are given to the students are given in the following grid.

Table No 4.65

Grid showing the illustrative project titles in Mathematics

Morkav chains	Square root spirals	Relevance of Statistics	Venn diagram
Electronic counter of cars	Verification of the value of Pie	History of famous Mathematicians	Concepts of Trigonometry
Constructions through power point presentations	Importance of Geometry	Verification of Pythagoras Theorem	Application probability
Mensuration	Some problems in combinations	Fuzzy sets (in colleges)	Geometry in real life
Eucledian Geometry Vs Coordinate Geometry		Relation between Bimodal Theorem and Bimodal Distribution	

In Computer Science the illustrative project titles that are given to the students are given in the form of grid in the following manner.

Table No 4.66

Grid showing the illustrative project titles in Computer Science

Banking	Railway reservation	Income tax calculation	Payroll system
Result analysis	Password lock for folders	Hotel management	Theatre banking online
Student information system	Office management system	Library management system	Airlines reservation system
Online quizzing software			

It is noticeable from the above table that from simple chart making and power point presentation to complicated variety of working model project designs were made by the students.

4.4.10 Time Limit in Completion and Submission of the Projects by the Students

Project completion within the restricted time is a part of the academic schedule. Therefore the students are expected to develop and close the task of project within the specified time limit. In this context the teachers were enquired (Item No. **22 a, b** of Appendix **D**) about the necessity of a regular project period in the class time table. The teacher responses to this query are analyzed and presented in the following table.

Table No. 4.67

Teacher responses for the necessity of a regular project period in the class time table

Sl. No.	Responses for the necessity of a project period in the class time table	Frequency	Percentage
1	Yes	20	64.51
2	No	11	35.48
Total		**31**	**99.99**

It is clear from the above table that 20 (64.51%) teachers have affirmed the necessity of a regular class time table whereas 11 (35.48%) teachers have not affirmed the same. While clarifying the above apprehension, they stated that projects are considered as a static routine work. But allocation of specific period in the time table facilitates adequate time for project activities. It would reduce the additional burden from the academics and the regular theory classes would not be disturbed. The interaction with the peer and the teacher would improve the firsthand experiences and would generate skills among the students to undertake innovative activities. This would ensure appropriate time for the teachers to discuss all the aspects of projects. It not only reduces the academic pressure but also ensures that they participate in project work with their pleasure. Hence the development of the project would be more systematized and ultimately this could generate creativity and applicability amongst the student community.

In contrary to the above the teachers asserted that as there was no allotment of regular project period in daily time table, the practical period was employed for this job. As the students are supposed to complete and submit one project in every unit test one or two periods in the weekly time table are sufficient for clarification of project related queries, if need arises.

The teachers also mentioned that the project work for the students had now become a regular practice in schools. Completing the projects within the limited hours of school is not possible for which these projects are carried home. Such circumstance give a chance that the projects might be completed by the parents.

4.4.11 Availability of the Resources

A resource for learning is any source, human or material, from which a learner gets information or other help in solving a learning problem. Therefore the teachers were enquired (Item No. **3 a** of Appendix **D**) about the availability of the resources in project development. Their responses to this item are analyzed and presented in the following table.

Table No. 4.68

Teacher responses for availability of different types of the resources

Sl. No.	Responses for availability of different types of resources	Frequency	Priority of resources
1	Teacher's Handbook	06	**6th**
2	Guidelines for the implementation of the effective projects	12	**5th**
3	Manuals	16	**3rd**
4	Workbooks	06	**6th**
5	Relevant Journals/Magazines/Periodicals published by the NCERT	13	**4th**
6	Circulars	17	**1st**
7	Evaluation Procedures	17	**1st**
8	If other than these, please specify ____________	---	**---**

It is observable from the above table that the teachers had prioritized the circulars and the evaluation procedures as first resource. The other options in the descending order are the manuals; relevant journals and periodicals published by the NCERT; guidelines for effective implementation of the projects; teacher's handbook and workbooks. In addition to the above options, the teachers responded that the internet and the study material for the students are the other types of resources available in project development.

The teachers were also enquired (Item No. **3 b** of Appendix **D**) about the nature of the material obtained and used in project development. Their responses to this query are analyzed and presented in the following paragraphs.

The teachers stated that soft copies of the projects in pen drives and compact discs; and hard copies are commonly obtained. The magazines, journals, internet materials are sometimes obtained by the teachers regularly by personal funding for developing their creative ideas. Thermocole is the most easily available material for project development. The manuals, work books, guide books also support the teachers as main resources. Project guidelines and related materials are accumulated from the internet at the beginning of the project initiation in order to develop better understanding about the projects. The reference books are also used as main resources.

The teachers also mentioned that due to remoteness of this Kachchh region, it was difficult to get materials for the project development. Therefore the material on projects in the form of software modules and the CDs of projects are obtained from places like Ahmadabad.

The teachers were also enquired (Item No. **4 a, b** of Appendix **D**) about the utility of the documented resource material. The responses of the teachers to this query are analyzed and presented in the following table.

Table No. 4.69

Teacher responses for utility of the documented resource material

Sl. No.	Responses for utility of the documented resource material	Frequency	Percentage
1	Yes	22	70.96
2	No	09	29.03
Total		**31**	**99.99**

It is noticeable from the above table that 22 (70.96%) teachers gave a positive response towards the utility of the documented resource material whereas nine (29.03%) teachers gave a negative response.

The teachers explained that the documented material is useful in giving as samples to the next year students. They may be used as teaching aid, may be exhibited in science exhibitions, may give basic ideas of projects and may guide the students. This may generate some new ideas among the students. These materials are like tools by which it is possible to develop better understanding about the whole project related activities.

The teachers were also enquired (Item No. **24** of Appendix **D**) about the facilities available in the schools. Their responses are analyzed and presented in the following table.

Table No. 4.70

Teacher responses for availability of the resources in the schools

Sl. No.	Responses for availability of the resources	Frequency	Priority of resources
1	Relevant library (reference) books in sufficient numbers	26	**1st**
2	Essential Library Journals and magazines	14	**4th**
3	Sufficient number of computers with necessary networking	20	**2nd**
4	Well equipped laboratories	15	**3rd**
5	Arrangement of field trips	12	**5th**
6	Provision of small and easy finances to the students	07	**6th**
7	Man power assistance (trainees)	04	**7th**
8	If other than these, please specify ___________________	---	**---**

It is marked from the above table that the library reference books are the prime resource materials. It is followed with the following options in a descending order – sufficient number of computers with necessary networking; well equipped laboratories; essential library journals and magazines; arrangement of the field trips; provision of small an easy finances to the students; man power assistance. In addition to the above options the teacher's proper guidance and dedicated teachers are essential.

The teachers were enquired (Item No. **25 a, b** of Appendix **D**) if the students were taken for tours and trips for project purposes. Their responses to the above query are analyzed and presented in the following table.

Table No. 4.71

Teacher responses for organization of the tours and trips for project development

Sl. No.	Responses for the organization of the tours and trips for project development	Frequency	Percentage
1	Yes	25	80.64
2	No	06	19.35
Total		**31**	**99.99**

It is learnt from the above table that 25 (80.64%) teachers gave a positive reply whereas six (19.35%) teachers gave a negative reply. They were also asked to explain their responses. The same are analyzed and presented below.

The teachers stated that there is provision of educational tours/excursion and maximum KV schools organize the educational tours every year. But it is difficult to have a field trip in Kachchh as it is a very remote area and lack good transportation facilities. Sometimes excursion trips being organized by the school; to visit any historical places or big laboratories or companies. The dyeing fabric (bandhni print); Science city (Ahmedabad); sky observation, visit to different museums are some of the places which the students had visited. In addition to this the students had also visited the pathology lab to see how different types of medical tests are performed; visited the Mathematics garden; Science centers; and observed the astronomical shows. The knowledge gained after the trip would be of immense help in project work development.

4.4.12 Utility of the Project Work

The project work helps to improve the teaching learning process. In this context the teachers were enquired (Item No. **16 a** of Appendix **D**) about the usefulness of projects in the Science fairs and Science exhibitions. Their responses to this query are analyzed and presented in the following table.

Table No. 4.72

Teacher responses for utility of projects in Science fairs and exhibitions

Sl. No.	Responses for utility of projects in science fairs and exhibitions	Frequency	Percentage
1	Yes	27	87.09
2	No	04	12.90
Total		**31**	**99.99**

It is obvious from the above table that majority (27) (87.09%) of the teachers have responded positively for the utility of the projects in teaching learning process and their utility as exhibits in Science fairs and Science exhibitions. On the contrary a minority (04) (12.90%) of the teachers have responded negatively.

The teachers were also asked (Item No. **16 b, c** of Appendix **D**) to respond on the helpfulness of the projects in the form of teaching aids and give comments on this issue. The responses to this question are analyzed and tabulated in the following manner.

Table No. 4.73

List of responses for utility of projects as teaching aids

Sl. No.	Response for utility of projects as teaching aids	Frequency	Percentage
1	Yes	28	90.32
2	No	03	09.67
Total		**31**	**99.99**

It is clear from the above table that again a majority (28) (90.32%) of teachers have responded positively towards the utility of the projects as teaching aids whereas a minority (03) (09.67%) of the teachers have responded negatively.

The teachers mentioned that the projects are helpful both as exhibits and as teaching aids. The teachers stated that the selected projects are displayed at KVS cluster, regional and national level exhibitions and some of them are used as teaching aids. In fact the projects make the teaching learning process easier and interesting. They increase the effectiveness of teaching when used as a teaching aid. Mostly the power point presentations, charts and other working/non working models are always used in the learning process as teaching aids. They are also used as references for other batch students.

In order to promote the scientific temper, science fairs and science exhibitions must be organized in every school. The following projects were used as exhibits in Regional and National Level Science Exhibitions.

- A project built in C++ program language, i.e. a game TIC TAC TOE
- A project on rain harvesting, global warming and acid rain
- A project on transpiration and ascent of sap
- A project on "Satellite Communication"
- A project on the Periodic table
- A project on solid state and structure of different sub atoms

The above projects were appreciated by the observers and the judges.

4.4.13 Problems encountered in development of the project work

The teachers play a prominent role in the life of a student. During the instructional process they might face certain hindrances which do not permit them to move ahead smoothly. In this context the teachers were enquired (Item No. **14 a, b** of Appendix **D**) about the problems that they encounter in implementation of the project work and to give their comments on this issue. The responses of the teachers to this query are analyzed and presented in the following table.

Table No. 4.74

Teacher responses for the problems encountered during project development

Sl. No.	The responses for the encountering problems	Frequency	Percentage
1	Time aspect	23	**33.82**
2	Economic aspects	13	**19.11**
3	Individual differences	10	**14.70**
4	Academic aspects	10	**14.70**
5	Social aspects	08	**11.76**
6	Cultural aspects	02	**02.94**
7	Evaluation aspects	02	**02.94**
8	If other than these, please specify _______________	---	**---**
Total		**68**	**99.97**

It is evident from the above table that the problems faced by the teachers varied in different aspects. Time (33.82%) was the main constraint, followed with economical aspects (19.11%), individual differences (14.70%), academic aspects (14.70%), social aspects (11.76%), cultural aspects (02.97%) and evaluation aspects (02.97%). In addition to this there was lack of adequate resources in the form of library, internet and laboratory facilities.

The teachers mentioned that many of the students found it difficult to give time to collect the materials to prepare a project. They needed sufficient amount of time to prepare and complete an effective project. This problem was further elevated by insufficient amount of money with the students. Some teachers stated that only simple projects costing around rupees 50 per project were to be made by the students.

The teachers stated that the parents and the students are with the mindset to devote much time and resources for only theoretical study which aims at cracking various competitive examinations. Each and every individual have differences in intelligence, interest and grasping capacity. Moreover, the teachers are bound to cover a vast curriculum. Under such circumstance it is not possible for the teachers to assign the projects considering all the aspects. Evaluation procedures are also different for different subjects.

The teachers emphasized that in order to carry out the project work effectively resources like enriched and advanced library, well equipped laboratories, access to internet browsing are needed. But Kachchh being a remote place often the students and the teachers are unable to obtain the necessary resources. The teachers stated that the relevant material is hard to find in remote places of Kachchh like Naliya, Mundra and Gandhidham. The project materials have to be ordered and procured from places like Ahmadabad and Rajkot.

The teachers proclaimed that sometimes the individual differences create differences of opinion to carry out the project work in groups. The teachers asserted that the students are busy with their regular classes and home tasks. At times they are overburdened with homework and coaching class schedules. The theoretical portion of the higher secondary section is very vast and in timely completion of projects is difficult for the students. Handling the troubles that may shoot during project development is managed by the students on their own.

The teachers expressed their concern for the projects by stating that the teaching community and the society should not underestimate the project. The teachers, parents and the society should completely cooperate with the students. They should understand and realize the pains taken by the students in order to develop the projects.

The teachers were enquired (Item No. **15 a, b** of Appendix **D**) for major problems faced by the students for development and submission of the projects and to give their comments on this issue. The responses to this query are analyzed in the following manner.

Table No. 4.75

Teacher responses for student problems in project development

Sl. No.	Problems faced by the students in project development	Frequency	Percentage
1	Workload of the theory aspect	24	**32.87**
2	Collection of the relevant resource material	20	**27.39**
3	Financial support from the parents	13	**17.80**
4	Co operation from the peer group	08	**10.95**
5	Guidance from the teacher	08	**10.95**
6	If other than these, please specify ________________	---	**---**
Total		**73**	**99.96**

It is clear from the above table that the students faced problems in project development and submission. It is noticeable that workload of the theory subjects (32.87%) was the major problem for the students. This was followed with other problems which are mentioned in a descending order as collection of the relevant resources material (27.39%), financial support from the parents (17.80), cooperation from the peer group (10.95%), and guidance from the teacher (10.95%). In addition to the above, lack of creativity was one of the problems of the students. At times the student's caliber was also low.

According to the teachers point of view the students are busy in studies all the time. But as the project work is a part of the curriculum it must be completed. As the students are from the higher secondary section are about to write their board examination in the following year they focus more on theory syllabus of each subject. Moreover the students give more importance to theory because of its weightage. Therefore they are not able to complete the project work effectively.

Undoubtedly internet browsing enormous amount of information but isolating relevant material is quite pain taking and time consuming for the students. The teachers further mentioned that the parents also mostly stressed good percentage on Board examination results and the forthcoming competitive examinations.

It was mentioned by the teachers that the financial support is a must from the parents. However, all the parents may not afford the expenses for the projects. But there are certain parents who are unwilling to spend extra money for activities like project work. At the same time there are some parents who give importance to the project work.

In a group some students work hard and some are lazy then the cooperation related problems arise. Some of the students show less interest and lack creative and presentation skills. Very few students seem to be selfish and no cooperation exists in the group under such instances.

4.4.14 Evaluation Procedures of the project work

Project work evaluation is a significant part as it is accountable in the final assessment. The projects are evaluated keeping certain criteria as parameters. The teachers were asked (Item No. **10 a** of Appendix **D**) to respond to the parameters which they considered during project evaluation. Their responses are analyzed and tabulated.

Table No. 4.76

Teacher responses on the parameters of project evaluation

Sl. No.	Parameters of Project Evaluation	Frequency	Percentage
1	Application	26	**22.22**
2	Content	20	**17.09**
3	Qualitative aspect	19	**16.23**
4	Objective based aspect	16	**13.67**
5	Expression	13	**11.11**
6	Novelty	09	**07.69**
7	Quantitative aspect	07	**05.98**
8	Subjective based aspect	07	**05.98**
9	If other than these, please specify _______________	---	**---**
Total		**117**	**99.97**

From the above given table it is obvious that application (22.22%) of the project was considered as the first priority parameter in evaluation of the projects. This was followed with the content (17.09%), quality (16.23%), objective (13.67%), expression (11.11%) and novelty (07.69%). In addition to this quantity and subjectivity were considered as meager aspects. Besides this sincerity, the labor afforded and the numbers of references involved are also considered as parameters for evaluation of the projects.

In addition to the above the teachers were enquired (Item No. **10 b, c** of Appendix **D**) about the availability of a framework for evaluation of the projects and to comment on this issue. Their responses to this item are analyzed and tabulated below.

Table No. 4.77

Teacher responses for availability of a frame work for project evaluation

Sl. No.	Responses for availability of a frame work for project evaluation	Frequency	Percentage
1	Yes	16	51.61
2	No	15	48.38
Total		**31**	**99.99**

From the above table it is comprehensible that about half (31) (51.61%) of the teachers were aware of the framework to be adopted in evaluation of the projects. The rest (15) (48.38%) were unaware of the framework. From the teachers' point of view, the characteristics mentioned by them are represented in the form of a grid as given below.

Table No. 4.78

Teacher responses for characteristics of the framework for project evaluation in the form of a grid

Grid with the characteristics of the framework for project evaluation		
Newness or novelty	Variety in construction	Reasoning ability of the student
Quality	Variety in presentation	Conduction of Viva
Indisputable and in depth knowledge	Application or factual use	Procedure/ process involved
References made	Comparative with earlier such studies	Investigation/ experimentation carried on and invention involved
Utility or help for understanding the topic		
Relation with the objective/theme/subject taught		
Observation and tabulation of the results and Conclusions drawn		

From the above table it is noticeable that about 15 characteristics were considered by the teachers for evaluation of the projects. These range from relating the project with the objective and theme to variety in construction and presentation of the project. Over and above the newness involved; reasoning ability; procedure adopted, applicability; observation, tabulation of the results and the conclusions drawn were also considered in project evaluation.

Other than the framework for project evaluation, the teachers evaluate (Item No. **11** of Appendix **D**) the projects by adopting different methods. The same details were enquired from them and are analyzed and tabulated in the following table.

Table No. 4.79

Teacher responses for project evaluation methods

Sl. No.	Project evaluation methods	Frequency	Percentage
1	By conducting viva	24	**30.37**
2	By continuous and comprehensive evaluation	19	**24.05**
3	Through practical examination	13	**16.45**
4	By oral testing	10	**12.65**
5	Based on the scholastic achievement of the student	06	**07.59**
6	Through written examination	03	**03.79**
7	Based on the general classroom performance of the student	03	**03.76**
8	Do not evaluate at all	01	**01.26**
9	If other than these, please specify ____________________	---	**---**
Total		**79**	**99.92**

From the above table it is clear that viva (30.37%) was the most common method for project evaluation, followed with continuous and comprehensive evaluation (24.05%), through practical examination (16.45%) and by informal oral testing (12.65%). Based on the scholastic achievement (07.59%) of the student and through written examinations (03.79%) also the projects were evaluated. Quality was another aspect which was considered for this purpose. But, very rarely (01.26%) the projects were not evaluated.

The teachers have responded (Item No. **12 a** of Appendix **D**) to the consideration of due weightage to be given to the different aspects in project evaluation. Their responses are analyzed and tabulated below.

Table No. 4.80

Teacher responses for considering due weightage for different aspects in project evaluation

Sl. No.	Responses for considering due weightage for different aspects in project evaluation	Frequency	Percentage
1	Yes	25	80.64
2	No	06	19.35
Total		**31**	**99.99**

From the above table it is evident that most (25) (80.64%) of the teachers gave due weightage to different aspects in project evaluation. Some (19.35%) of the teachers did not.

In response to the extent of weightage (Item No. **12 b** of Appendix **D**) that should be given to the projects the teachers mentioned a range from 5% to 20%. They have commented on this proposal that as per KVS norms the weightage should be given.

The teachers were enquired (Item No. **12 c** of Appendix **D**) about how the teachers proceeded with project evaluation. They mentioned that the ground work done before development of a project was given importance like collection of relevant literature or theory, working principle involved and a rough sketch or overall design of the project. On the basis of innovation, practicability/ application or easiness to use, working, sincere efforts of students the projects were evaluated. In addition to this scholastic achievement of the students, information collected, logic implemented, results and conclusions drawn and by oral testing like viva were considered in project evaluation.

In response to how to improve (Item No. **12 d** of Appendix **D**) upon the current system of evaluation of the projects the teacher responses were analyzed and presented as follows. The teachers stated that the theoretical knowledge of the student should be verified with regard to the project designed. The teachers and the students should get opportunities to undergo special training to widen their knowledge horizons to develop projects. From time to time different themes are to be given by the teachers to think and come out with novel ideas. The projects should be free from the curriculum bond. Where possible the theoretical portion needs to be reduced. The teachers should make necessary corrections and appreciated new innovations and discoveries of the students. Own interest of student should be given importance. The students should be promoted to take support of technology. Project designing should not be carried on as a formality.

Utility to the society and applicability in daily life situation should be given more emphasis. Individual modules should be given to the students. Besides this the limitations or the drawbacks if any should be listed. Preparation for the presentation of the project also needs to be powerful during oral testing or open viva.

The teachers were enquired (Item No. **13** of Appendix **D**) about how would they distinguish the performance of each individual student in group projects. The responses to this question are analyzed and presented in the following paragraph.

The projects are usually given to the students either individually or in groups. Under such circumstances the teachers distinguish the performance of each student by regular observation. But in a group activity it was essential to allocate each individual student a responsibility to ease evaluation. By checking the team work through the results and findings and by orally conducting viva the students are individually evaluated. Apart from this the participation of each student was identified by his/her involvement and his contribution towards the project. Clarity in the basic concepts, knowledge and understanding of the project were also considered. Cooperation, promptness and creativity revealed during construction of the project were also observed. Besides this the zeal and enthusiasm shown by the students was also accounted.

4.4.15 Preservation and Maintenance of the project work

Multiple factors are involved in developing good projects. Exemplary projects should be preserved and maintained for future reference and records. The teachers were invited (Item No. **17** of Appendix **D**) to give response if they returned the projects to the students after evaluation. Their responses to this query are analyzed and tabulated in the following table.

Table No. 4.81

Teacher responses to the retention of the projects after evaluation

Sl. No.	Responses to the retention of the Projects after evaluation	Frequency	Percentage
1	Yes	22	70.96
2	No	09	29.03
Total		**31**	**99.99**

It is learnt from the above table that most (22) (70.96%) of the teachers returned the projects once after evaluation was completed. Some (09) (29.03%) of the teachers did not return the projects.

In continuation to the above response, the (09) teachers were enquired (Item No. **17 a** of Appendix **D**) if the projects were not returned to the students after evaluation, then was there any provision for preservation of such projects. The teacher responses to this query are analyzed and tabulated as follows.

Table No. 4.82

Teacher responses to the preservation of the projects after evaluation

Sl. No.	Responses to the preservation of the projects	Frequency	Percentage
1	Yes	06	66.66
2	No	03	33.33
Total		**09**	**99.99**

It is evident from the above table that most (06) (66.66%) of the teachers preserved the projects after evaluation whereas some (03) (33.33%) of the teachers did not.

The teachers were enquired (Item No. **17 b** of Appendix **D**) about the diverse methods of project maintenance. The teacher responses to this query are analyzed and tabulated.

Table No. 4.83

Teacher responses on methods of project maintenance

Sl. No.	Responses on methods of project maintenance	Frequency	Percentage
1	Safely in the Science laboratory or Science club	12	33.33
2	Under the subject teacher's custody	08	22.22
3	By proper care and handling	07	19.44
4	By subject-wise and year-wise recording	04	11.11
5	By regular dusting	03	07.69
6	By using chemicals like naphthalene balls, etc	02	05.55
7	If other than these, please specify ________________	---	**---**
	Total	**36**	**99.34**

It is obvious from the above table that many (33.33%) of the projects were safely maintained in the Science laboratory or in the Science club. The projects were also maintained under the subject teacher's custody (22.22%) or were properly cared and handled (19.44%) by the institution. They were also recorded (11.11%) subject-wise and year-wise. In addition to this the projects were also regularly dusted (07.69%) and were maintained by using naphthalene balls (05.55%). In addition to this the best, rare and costly projects were kept as records in the laboratory for future use.

4.4.16 Project Work as a method of teaching

The teachers were invited (Item No. **26 a** of Appendix **D**) to respond to the project work as a method of teaching. Their responses to this query are analyzed and presented in the following paragraphs.

In real sense, if the project work was carried on with all the seriousness and sincerity, it would prove to be more effective than teaching that is carried on with the help of the books. In other words knowledge improves beyond the books. Rather project work generates new and varied ideas among the students to clarify the concepts about different phenomena. Project work helps the students to understand and apply the scientific principles underlying certain phenomena and mechanisms. In the process the students learn new concepts by themselves. As an illustration the structure and functioning of the solar cells may be considered here. In fact the students start showing interest and understand the topics taught in class. The project work develops rational thinking among the students. Through the project work the students fairly get answers on 'how' and 'why' of many scientific functions.

As the students are involved in doing the project work, they remain active throughout till they complete the project. They learn all the project related matter with enthusiasm. Projects when used as a teaching device, creates awareness among the students. It could be of immense help in teaching learning process if it is done with genuineness and devotion. By live shows and hands on experience learning becomes more curios and the subject matter penetrates deep into the mind and hearts of the students. The merit of a project is its quality and practical applicability to the mankind. The project work inculcates a sense of real achievement and satisfaction to the inquisitive minds of the students. In due course of time the projects build the mind power of the students.

The teachers were asked (Item No. **26 b** of Appendix **D**) to give their suggestions for improving the project work. Their responses are analyzed and presented as follows:

- The students should be properly motivated and guided for creative projects.
- The teachers are supposed to plan and take on the project work supported with the field visits.
- Regular orientation and training courses help teacher to keep informed with the latest devices.
- Curriculum must be based on practical skills supported by availability of technology to update the teacher and the student.
- The project work is ought to be taken up by identifying the skills and aptitude among the students. In addition to this cooperation, integrity and brother hood among the students should be also considered.
- More educational tours must be organized for first hand learning experiences for some selected areas in Sciences.
- Subject experts from various fields may be invited to speak, guide and train the teachers. On line experts' opinions may also be sought in the execution of a project.
- The weightage of marks allocated to the projects may be increased so that the students work hard with genuine interest in their subject. Rather due

weightage should be provided to project work, preferably as a separate and compulsory task/assignment/paper based on the projects. The Ministry of Education should think about including the weightage of projects in various competitive exams and entrances for higher studies.

- Project work is ought to be assigned in relation to the syllabus and to bring awareness about the environment like global warming, pollution by non biodegradable wastes and importance of space programmes. They should be interesting and relevant to the present situation without consuming much time.
- There should be regular assignment of the project work. The students are supposed to complete their projects in close collaboration of the teacher. The students should be encouraged to participate at Regional/National Level Science Exhibitions or Science Fairs. Through the project work the students become experts in the project that they had developed.
- Project work is ought to be investigatory in nature. Therefore appropriate provision of guidance, facility, time and finance are essential.
- Some exemplary projects may be given due recognition by awards and rewards.
- The teachers and the parents should appreciate the applicability and importance of projects in the learning process.
- Projects must be learner centered and learning oriented.
- The project should not be a psychological and financial burden to the parent**s.**
- Teachers should have sufficient time to take genuine interest in the project work of the students; they should not be engaged for other work/s other than teaching.
- There should be special provision for availability of resources for developing the projects. Therefore there might be timely allocation of the required resources and financial support from schools to develop a project.
- According to the time period available all the requirements and resources are collected first for developing simple and efficient projects.
- Often the projects of the students should be monitored by higher authorities. Adequate details on the projects would be a welcome from the CBSE.

- As projects are compulsory in academics a separate time period should be allotted to the students to do their project work. This might encourage more and more students to involve wholeheartedly in completing the project work.

4.5 Findings based on analysis of the Teacher Responses

Analysis of the responses on the teachers' questionnaire with respect to the implementation of the project work lead to the following findings on:

- Demographic Facts of the Teachers
- Objectives of the Project Work
- Identification of the Project Work
- Selection of the Project Work
- Assignment of the Project Work
- Orientation and Guidance to the Teachers
- Development of the Project Work
- Number of Projects Assigned to the Students
- Variety in Projects Assigned to the Students
- Time Limit in Completion and Submission of the
- Projects by the Students
- Availability of the Resources
- Utility of the Project Work
- Problems Encountered in Development of the Project Work
- Evaluation Procedures of the Project Work
- Preservation and Maintenance of the Project Work
- Project Work as a Method of Teaching

Demographic details on the teachers

Based on the demographic details on the teachers it was found that except the Computer Science teachers all other teachers were Post Graduates in their respective subjects of teaching methodology along with a professional degree of teaching, i.e., B.Ed. The Computer Science teachers were either graduates with a Bachelors degree in Engineering or Masters Degree in Computer Applications.

It was found that there were seven Physics; eight Chemistry; six each in Biology and Mathematics; and four Computer Science post graduate teachers. The sum of teachers was **31.** All the teachers taught their respective subjects at secondary and higher secondary level, ranging from class IX to class XII. But the Computer Science teachers taught classes from VI to XII. It was found that most of the teachers were directly recruited for the posts of the Post Graduate Teacher (PGT). But very few teachers started their teaching career as a Primary Teacher (PRT) and later on they were promoted to the level of a Trained Graduate Teacher (TGT) and then on to the post of a PGT. The teaching experience of the teachers varied from 03 months to 15 years.

Objective of the Project work

It was found from the objectives stated by the teachers for assigning the project work was to focus on the significant relationship of theory with the practice. In addition to this the students were trained in the scientific method by imbibing the qualities like scientific attitude and scientific aptitude. Besides this the leadership qualities and the team spirit were built.

It was found that lack of interest and resources stood as a barrier in adequate achievement of the objective of the project work through continuous and comprehensive evaluation. Competitive examinations and focus on high scores at senior secondary level beat the necessity of accomplishing other academic tasks. Differences in understanding and grasping levels of students, less weightage given to the projects, possibility of recycling the projects from seniors to the juniors, enormous amount of syllabi and lack of accessibility to resources aid in moderate achievement of the objective of project work implementation through continuous and comprehensive evaluation. Correlating the theory with the practice and the knowledge gained through the projects helped to achieve the objective of project work adequately.

Identification of the Project work

It was found that 13 (41.93%) teachers had responded positively for having syllabi allocation for identification of the projects whereas 18 (58.06%) teachers had responded negatively. It was found that the text books were the main sources for identification of the projects. There were no special syllabi or curriculum that was exclusively meant for project identification.

Selection of the Project work

It was found that the teachers selected the projects mostly based on the availability of the resources. The syllabus, performance of the student and the time affordable were the primary factors considered before selecting project by the teacher. The library references, the media also contributed in project selection. In addition to this they also selected the projects which were generated from their own mental plans. The textbooks and their activities also supported in selection of the projects. The workbooks were the least preferred books to select a project. Novelty in the project was also not given importance in project selection. In addition to the above, the teachers had selected some general project on banking and railway reservation in Computer Science.

Assignment of the Project work

It was found that the specific reasons for assigning the projects to the students were highly varied. The reasons cited by the teachers were critical thinking; concentration on learner based instruction; to integrate different skills; to give hands on experience; level of applicability of projects in real life and new situation; to inculcate social values; to use resources effectively; to evaluate the student throughout the year; to consider individual differences; for syllabus completion as given in the curriculum and to inculcate and generate self confidence. In addition to the above the projects were assigned so as to develop a sense of achievement among the students, to promote their individual efforts and to develop optimum scientific temper.

It was found that 26 (83.87%) of the teachers gave a positive response for awareness of the set criteria in assigning the projects, whereas five (16.12%) teachers gave a negative response. The set criteria explained by the teachers were presented under the following four categories viz. Norms of KVS/CBSE; focusing on the learner; availability of the resources and utility.

Orientation and Guidance given to the Teachers

It was found that only five (16.12%) teachers had undergone the orientation programs whereas 26 (83.87%) of the teachers had not. Two types of orientation programs were organized for the teachers. One was an in-service training course for teachers on project method of teaching entitled "Getting Started With Project" (GSWP) was organized by the KVS, Head Quarters, New Delhi in the month of May, 2009 for 21 days and another for 12 days. After the orientation program of the teachers it was found that 18 (58.06%) teachers oriented their students whereas 13 (41.93%) teachers did not.

It was found that 15 (48.38%) of the teachers gave a positive response for obtaining guidelines if the syllabus changed while 16 (51.61%) teachers gave a negative response.

Development of the Project Work

It was found that 27 (87.09%) teachers stated that the students referred and gathered relevant information for project development whereas four (12.90%) teachers did not.

Through the teachers' comments it was found that as per the KVS rules, the projects were assigned to the students. Guidance was given to the students while making the project. Three projects were given term wise in a year at regular intervals. First selection of proper topics was done with a broad description. Information and guidelines on introduction and data collection were given. Knowledge of principle or theory in broad; virtual image or diagram of the model; information on collecting and assembling the raw material to construct the model; presentation of the criteria for evaluation; regular monitoring and feedback regarding proceedings were given to the students.

It was found that 23 (74.19%) of the teachers gave a positive response stating that the student involvement in project work was satisfactory whereas eight (25.80%) teachers gave a negative response.

Through the teachers' comments it was found that the projects satisfied the curiosity of the students. They learnt to take logical decisions and start thinking critically. By working in groups and the students realized the values of cooperation, team spirit and tolerance. The students developed leadership qualities. They gained self confidence and started liking the subject. The students achieved knowledge and cleared the concepts about topic of the project. The teaching and learning process became more effective and simpler to explain. Therefore the project method of learning empowered the students with extra knowledge and motivated them further. The projects helped in developing application, communication and presentation skills of the students. The sense of achievement in students filled their hearts with joy and motivated them to think on practical aspects of the subject generating knowledge based learning. They started raising their queries during every step of project development. They developed self learning capacity. The computational and logical ability of the students increased. After completing the project the students were in a position to understand the idea or fact behind project and would remember it throughout their lives.

Number of Projects Assigned to the Students

It was found all the schools assigned the projects to their students. A maximum number (16) of teachers stated that three projects were assigned per subject per year to each student. Five teachers each stated that one or two projects were assigned per subject per year to the students. In addition to the above stated responses, the teachers also mentioned that for class XII only one investigatory project is given in an year. For Jawaharlal Nehru Science Exhibition which is conducted by the NCERT the students were advised to make projects.

Variety in Projects Assigned to the Students

It was found that model or a working model was the first option of the teachers to assign the project. The other variety of projects given by the teachers in descending order were written assignments; charts; projects involving innovations and inventions; challenging and encouraging projects; projects involving reference work and discoveries; collecting and preserving the specimens. In addition to the above responses the teachers also stated that computer related projects; power point presentation in compact discs; projects based on the practical application to society; development of software project/ presentations/ programs were also the other types of projects assigned to the students. Variety was introduced even by doing old activities in new ways.

Time Limit in Completion and Submission of the Projects by the Students

It was found that 20 (64.51%) teachers have affirmed the necessity of a regular class time table whereas 11 (35.48%) teachers have not affirmed the same. While clarifying the above apprehension, the teachers stated that projects were considered as a static routine work. But allocation of specific period in the time table would facilitate to give adequate time for project activities. It would reduce the additional burden from the academics and the regular theory classes would not be disturbed. The interaction with the peer and the teacher would improve the firsthand experiences and would generate skills among the students to undertake innovative activities.

Availability of the Resources

It was found that the teachers had prioritized the circulars and the evaluation procedures as first resource. The other options in the descending order were the manuals; relevant journals and periodicals published by the NCERT; guidelines for effective implementation of the projects; teacher's handbook and workbooks. The students mentioned that the reference books should be also available with the teachers.

It was found that 22 (70.96%) teachers gave a positive response towards the utility of the documented resource material whereas nine (29.03%) teachers gave a negative response. It is marked from teachers' responses that the library reference books were the prime resource materials. It was followed with the following options in a descending order – sufficient number of computers with necessary networking; well equipped laboratories; essential library journals and magazines; arrangement of the field trips; provision of small an easy finances to the students; man power assistance.

It was found that 25 (80.64%) teachers gave a positive reply for organization of tours and trips to the students whereas six (19.35%) teachers gave a negative reply. It was found from their comments that apart from the available resources many more types of resources for learning were required to the classroom teachers.

Utility of the Project Work

It was found that majority (27) (87.09%) of the teachers had responded positively for the utility of the projects in teaching learning process and their utility as exhibits in Science fairs and Science exhibitions. On the contrary a minority (04) (12.90%) of the teachers had responded negatively.

It was found that a majority (28) (90.32%) of teachers had responded positively towards the utility of the projects as teaching aids whereas a minority (03) (09.67%) of the teachers had responded negatively.

The teachers mentioned that the projects were helpful both as exhibits and as teaching aids. The teachers stated that the selected projects were displayed at KVS Cluster, Regional and National Level Exhibitions and some of them were used as teaching aids. The following projects were used as exhibits in Regional and National Level Science Exhibitions.

- A project built in C++ program language, i.e. a game TIC TAC TOE
- A project on rain harvesting, global warming and acid rain
- A project on transpiration and ascent of sap
- A project on "Satellite Communication"
- A project on the Periodic table
- A project on solid state and structure of different sub atoms

The above projects were appreciated by the observers and the judges.

Problems Encountered in Development of the Project Work

It was found that the problems faced by the teachers varied in different aspects. Time (33.82%) was the main constraint, followed with economical aspects (19.11%), individual differences (14.70%), academic aspects (14.70%), social aspects (11.76%), cultural aspects (02.97%) and evaluation aspects (02.97%). In addition to this there was lack of adequate resources in the form of library, internet and laboratory facilities.

It was found that the students faced problems in project development and submission. It was noticeable that workload of the theory subjects (32.87%) was the major problem for the students. This was followed with other problems which were mentioned in a descending order as collection of the relevant resources material (27.39%), financial support from the parents (17.80), cooperation from the peer group (10.95%), and guidance from the teacher (10.95%). In addition to the above lack of creativity was one of the major problems of the students. At times the student's caliber was low.

Evaluation Procedures of the Project Work

It was found that application (22.22%) of the project was considered as the first priority parameter in evaluation of the projects. This was followed with the content (17.09%), quality (16.23%), objective (13.67%), expression (11.11%) and novelty (07.69%). In addition to this quantity and subjectivity were considered as meager aspects. Besides this sincerity of the students, the labor afforded by them and the number of references involved were also considered as parameters for evaluation of the projects.

It was found that about half (16) (51.61%) of the teachers were aware of the framework to be adopted in evaluation of the projects. The rest (15) (48.38%) were unaware of the framework. From the teachers' point of view, the characteristics mentioned by them ranged from relating the project with the objective and theme to variety in construction and presentation of the project. Over and above the newness involved; reasoning ability; procedure adopted, applicability; observation, tabulation of the results and the conclusions drawn were also considered in project evaluation.

It was found that viva (30.37%) was the most common method for project evaluation, followed with continuous and comprehensive evaluation (24.05%), through practical examination (16.45%) and by informal oral testing (12.65%). Based on the scholastic achievement (07.59%) of the student and through written examinations (03.79%) also the projects were evaluated. Quality is another aspect which was considered for this purpose. But, very rarely (01.26%) the projects were not evaluated. It was found that most (25) (80.64%) of the teachers give due weightage to different aspects in project evaluation. Some (19.35%) of the teachers did not do so. It was found that the teachers mentioned a range from 5% to 20% that should be assigned to the project work in final assessment.

It was found that the ground work was done before development of the project. Importance was given to collection of relevant literature or theory, working principle involved and a rough sketch or overall design of the project. On the basis of innovation, practicability/ application or easiness to use, working, sincere efforts of students the projects were evaluated. In addition to this scholastic achievement of the students, information collected, logic implemented, results and conclusions drawn and by oral testing like viva were considered in project evaluation.

It was found from the teachers' comments on improvement of the current system of project evaluation that the theoretical knowledge of the student should be verified with regard to the project designed. In this connection the teachers and the students should get opportunities to undergo special training in order to widen their knowledge horizons to develop projects. From time to time different themes were to be given by the teachers to think and come out with novel ideas.

It was found that the projects were usually given to the students either individually or in groups. Under such circumstances the teachers distinguished the performance of each student by regular observation. But in a group activity it was essential to allocate individual student a responsibility to ease evaluation. By checking the team work through the results and findings and by orally conducting viva the students were individually evaluated.

It was found that involvement of the student in project development was important to improve the current system of project work implementation. In addition to this imagination and innovations made by the student in designing the project should be assessed. It was to be examined whether the project was traditional or innovative. Various skills involved in constructing the project, the degree of neatness and craftsmanship were taken into account. General layout of the project, relevance, clarity of the associated charts accompanying the project and overall attractiveness to the layman and was to be assessed.

Preservation and Maintenance of the Project Work

It was found that most (22) (70.96%) of the teachers returned the projects after the evaluation was completed. Some (09) (29.03%) of the teachers did not returned the projects after evaluation.

It was found that most (06) (66.66%) of the teachers preserved the projects after evaluation whereas some (03) (33.33%) of the teachers did not.

It was found that many (33.33%) of the projects were safely maintained in the Science laboratory or in the Science club. The projects were also maintained under the subject teacher's custody (22.22%) or were properly cared and handled (19.44%) by the institution. They were also recorded (11.11%) subject-wise and year-wise. In addition to this the projects were also regularly dusted (07.69%) and were maintained by using naphthalene balls (05.55%). In addition to this the best, rare and costly projects were kept as records in the laboratory for future use.

Project Work as a Method of Teaching

Through the teacher's comments it was found that if the project work was carried on with all the seriousness and sincerity, it would prove to be more effective than teaching with the help of the books. In other words knowledge would be improved beyond the books. Rather project work generated new and varied ideas among the students to clarify the concepts about different phenomena. Project work helped the students to understand and apply the scientific principles underlying certain mechanisms. In the process the students learnt new concepts by themselves. In fact the students started showing interest and understood the topics taught in class. The project work developed rational thinking among the students. Through the project work the students fairly got answers on 'how' and 'why' of many scientific functions.

As the students were involved in doing the project work, they remained active throughout till they completed the project. They learnt all the project related matter with enthusiasm. Projects when used as a teaching device, created awareness among the students. It could be of immense help in teaching learning process if it was done with genuineness and devotion. Ultimately, it inculcated a sense of real achievement and satisfaction to the inquisitive minds of the students. In due course of time the projects build the mind power of the students.

It was found that the teachers' suggestions for improving the project work were in relevance to the following.

- The students should be properly motivated and guided for creative projects.
- The teachers are supposed to plan and take on practical, project and field visits and educational tours must be organized.
- Curriculum must be based on practical skills supported by availability of technology to update the teacher and the student.
- The project work is ought to be taken up by identifying the skills, cooperation, integrity, aptitude and brother hood among the students.
- Subject experts from various fields may be invited to speak, guide and train the teachers. On line experts' opinions may also be sought in the execution of a project.

- The weightage of marks allocated to the projects be supposed to be more so that the students work hard for real knowledge in their subject.
- There should be regular assignment of the project work. The students are supposed to complete their projects in close collaboration of the teacher.
- Through the project work the students become experts in the area of their project.
- Project work is ought to be assigned in relation to the syllabus and to bring awareness about the environment like global warming, pollution by non biodegradable wastes and importance of space programmes.
- As projects are compulsory in academics a separate time period should be allotted to the students to do their project work.
- Project work is ought to be investigatory in nature. Therefore appropriate provision of guidance, facility, time and finance are essential.
- Some exemplary projects might be selected and given due recognition for encouragement.
- The teachers and the parents should appreciate the applicability and importance of projects in the learning process.
- Projects must be child centered and learning oriented.

4.6 Analysis of the data obtained from the Student's Questionnaire

The students are the major stakeholders for implementation of the project work. Therefore along with the document study the responses were separately obtained from the students with the help of the students' questionnaire. These questionnaires gathered information on the following aspects:

- Assignment of the project work to the students
- Orientation and guidance to the students
- Development of the project work by the students
- Number of projects done by the students
- Variety of projects done by the students
- Time limit observed in completion of the project work
- Socio-economic concerns to develop project work
- Availability of the resources to develop project work
- Utility of the project work
- Interest and appreciation of the project work
- Problems encountered in development of the project work
- Evaluation procedures of the project work
- Preservation and maintenance of the project work
- Step up of the project work

The details of student responses on the above aspects are elaborately presented under separate sections in the forth coming paragraphs.

4.6.1 Assignment of the Project Work to the Students

Apart from gaining the maximum required knowledge from the presentation of the teachers, students are expected to acquire further knowledge on their own. Also, they should develop certain necessary cognitive attributes, skills, attitudes, etc. required for understanding their subject areas. Therefore the students were asked (Item No **13 a** of Appendix **E**) whether they plan their projects before developing them. The student responses to this query are analyzed school wise presented in the following table.

Table No. 4.84

School wise student responses for planning of the projects

Sl. No.	School	School wise responses for planning of the projects				Total	%
		Yes	%	No	%		
1	**School 1**	41	97.61	01	02.38	**42**	**99.99**
2	**School 2**	32	96.96	01	03.03	**33**	**99.99**
3	**School 3**	24	100	--	--	**24**	**100**
4	**School 4**	20	90.90	02	09.09	**22**	**99.99**
5	**School 5**	04	100	--	--	**04**	**100**
6	**School 6**	07	100	--	--	**07**	**100**
7	**School 7**	14	93.33	01	06.66	**15**	**99.99**
Total		**142**	**96.59**	**05**	**3.40**	**147**	**99.99**

It is evident from the above table that 142 (96.59%) of the students properly planned and proceeded with the development of the projects, while five (3.40%) of the students did not. In addition to this the students were also enquired (Item No **13 b** of Appendix **E**) about whether they would get a facility to visit institutes or research organizations for hands on experience. School wise responses of the students to this query are analyzed and presented in the following table.

Table No. 4.85

School wise responses for visiting institutes for hands on experience

Sl. No.	School	School wise responses for visiting institutes for hands on experience				Total	%
		Yes	%	No	%		
1	**School 1**	10	23.80	32	76.19	**42**	**99.99**
2	**School 2**	09	27.27	24	72.72	**33**	**99.99**
3	**School 3**	01	04.16	23	95.83	**24**	**100**
4	**School 4**	01	04.54	21	95.45	**22**	**99.99**
5	**School 5**	04	100	--	--	**04**	**100**
6	**School 6**	07	100	--	--	**07**	**100**
7	**School 7**	07	46.66	08	53.33	**15**	**99.99**
Total		**39**	**26.53**	**108**	**73.46**	**147**	**99.99**

It is evident from the above table that 39 (26.53%) of the students gave a positive response and stated that they visited the institutes and other research centers for hands on experience while 108 (73.46%) of the students gave a negative response.

4.6.2 Orientation and Guidance to the Students

In today's competitive world there are students who have failed to prove their talents, because of multiple constraints. Therefore, the teachers, who are in charge of the students, should develop an urge within them who are in need of their help. The students are mostly at a loss as to how a project should be handled and rely on their own concepts. In this context the students were enquired (Item No. **15 a** of Appendix **E**) about whether they received any guidance from the teachers. Their responses for this item are analyzed and presented in the following table.

Table No. 4.86

Distribution of the school wise responses for guidance given to the students

Sl. No.	Responses for guidance given to the students	Frequency		Total (%)
		Yes (%)	No (%)	
1	School 1	28 (66.66)	14 (33.33)	**42 (99.99)**
2	School 2	16 (48.48)	17 (51.51)	**33 (99.99)**
3	School 3	13 (54.16)	11 (45.83)	**24 (100)**
4	School 4	10 (45.45)	12 (54.54)	**22 (99.99)**
5	School 5	04 (100)	---	**04 (100)**
6	School 6	02 (28.57)	05 (71.42)	**07 (99.99)**
7	School 7	15 (100)	---	**15 (100)**
Total		**88 (**59.86**)**	**59 (**40.13**)**	**147 (99.99)**

From the above table it is evident that more than half (88) (59.86%) of the students were given guidance by the teachers whereas many (59) (40.13%) students did not obtain any guidance.

The quality of the teacher's guidance was represented by the amount of "wholeheartedness" and "interest" shown by the students in presenting their project work. The role of the teacher was to guide the students in making the projects where and when necessary and to suggest possible alternatives if they encounter any problems. It was necessary that the teachers help the students over periods of discouragement and lack of interest, and to lead them in the final process of judging the merits and defects of their project work.

4.6.3 Development of the project work by the students

Development of the project is one of the important stages in project work. The entire process needs attention and support from multiple facets. The students were enquired (Item No. **14 a** of Appendix **E**) about how they do develop and complete the projects. The responses to this query are analyzed and depicted in the following table.

Table No. 4.87

School wise responses of the students for development and completion of the projects

Sl. No	School	Options				
		Help from				
		Self	Peer group	Parents	Teacher	Any other
		i	ii	iii	iv	v
1	School 1	22	22	13	20	---
2	School 2	18	17	09	15	---
3	School 3	07	16	01	07	---
4	School 4	16	08	01	04	---
5	School 5	02	---	01	03	---
6	School 6	04	02	01	01	---
7	School 7	01	07	01	06	---
Total		**70**	**72**	**27**	**56**	**---**
Priority of help		**2nd**	**1st**	**4th**	**3rd**	**---**

From the above table it is noticeable that the first option of the students for development and completion of the project was with the help of the peer group. Next it was followed with self help and help from the teachers. The help obtained from the parents was the last option.

In addition to the above the students were also enquired (Item No. **14 b, c** of Appendix **E**) about adoption of a systematic method in development of the projects. The responses to this query are analyzed and depicted in the following table.

Table No. 4.88

School wise responses of the students for adopting a systematic method in project development

Sl. No.	Responses for spending time and money on projects	Frequency		Total (%)
		Yes (%)	No (%)	
1	School 1	30 (71.42)	12 (28.57)	**42 (99.99)**
2	School 2	21 (63.63)	12 (36.36)	**33 (99.99)**
3	School 3	18 (75)	06 (25)	**24 (100)**
4	School 4	15 (68.18)	07 (31.81)	**22 (99.99)**
5	School 5	04 (100)	---	**04 (100)**
6	School 6	03 (42.85)	04 (57.14)	**07 (99.99)**
7	School 7	10 (66.66)	05 (33.33)	**15 (99.99)**
Total		**114 (77.55)**	**33 (22.44)**	**147 (99.99)**

From the above table it is clear that majority (114) (77.55%) of the students did adopt a systematic method in project development process. On the other hand some (33) (22.44%) of the students did not adopt any systematic method in project development.

The students explained that they adopted a systematic procedure in development of the project work. Initially they tried to understand the concept of the project to gather all the information. They discussed with the teacher and received his/her comments. They also referred the books and browsed the internet. Library books were referred for additional information on the project. Some students referred Encarta and encyclopedia also.

The students wrote important things in a note book, and then finally made it fair. They sorted and manipulated the material resources according to their requirement. Requisite diagrams were drawn and designs were made in relation to the project work. The students prepared the graphs where necessary. Calculations and computations were carried on where necessary.

The students enquired periodically from teacher as how to do and when to do the project. They stated that sometimes the teacher gave hints to develop the project. The students tried to understand the principles behind working of the projects. They used their own logic to create programs in computer. As per the requirement the students bought the charts and other necessary things. The students stated that lot of thinking and imagination is required for project development. From good books, internet, library, parents help, from news papers the students tried to make projects. Some students directly did the project work on the computers.

The students stated that they logically planned and proceeded by giving a meaningful thought on the topic of the project. They read about the topic and took help from the books, and internet. They then accumulated the ideas and organized them. The students collected the data and arranged sequentially. They also noted down the significant points and filed them separately. The teachers sometimes helped in concept clarification. Discussion among the peer group helped to improve the project work.

Appropriate time was also given for project development. The students also thought to present the project in an innovative way. Some projects are lively and interesting. In groups the students distributed the work among them and also discussed with the teacher. They tried to understand concept, go through theory clear all doubts, and take precautions. They also strived to recycle the waste material in developing the projects. They tried to prepare the project at one place by dividing the work of the project among themselves. The students followed the steps of think, plan and do. The students tried to use the resources from internet and took ideas from references. They proceeded when everything was ready for project development. The same method was followed in all the subjects. Some students commented that file work projects are just for copying purpose and they gain no new experience.

4.6.4 Number of projects done by the students

The students were expected to develop numerous projects in different subjects in each academic year. They were enquired about the number of projects that they developed in different subjects. Their responses to this query are analyzed and presented in the following table.

Table No. 4.89

School wise and subject wise student responses for the number of projects done

Sl. No.	School	Number of projects														
		Mathematics			Physics			Chemistry			Biology			Computer Science		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
		Number of the Students														
1	School 1	02	32	03	23	10	01	17	05	01	07	01	01	01	17	06
2	School 2	13	08	04	04	07	05	04	22	02	05	04	---	07	07	---
3	School 3	06	---	---	09	09	02	18	04	---	05	06	---	14	05	02
4	School 4	04	06	08	02	15	05	08	12	01	---	05	---	11	06	02
5	School 5	---	---	---	---	---	---	04	---	---	---	---	---	04	---	---
6	School 6	---	---	---	04	---	01	02	---	01	02	---	---	---	01	---
7	School 7	14	---	---	14	---	---	15	---	---	14	---	---	---	---	---
Total		**39**	**46**	**15**	**56**	**41**	**14**	**68**	**43**	**05**	**33**	**16**	**01**	**37**	**36**	**10**

It is evident from the above table that the number of projects assigned to the students ranged from one to three in different subjects. Only one project was done by majority of the students in each subject, followed with two and three projects (Mathematics, Physics, Chemistry, Biology and Computer Science).

The cumulative number of projects in different subjects is presented in the following table.

Table No. 4.90

Distribution of the responses for the number of projects done by the students

Sl. No.	Subjects	Options			Total	%
		1	2	3		
1	Mathematics	39	46	15	**100**	**21.73**
2	Physics	56	41	14	**111**	**24.13**
3	Chemistry	68	43	05	**116**	**25.21**
4	Biology	33	16	01	**050**	**10.86**
5	Computer Science	37	36	10	**083**	**18.04**
Total		**233**	**182**	**45**	**460**	**---**
Percentage		**50.65**	**39.56**	**09.78**	**---**	**99.99**

It is evident from the above table that more than half (50.65%) of the responses opted by the students were for a single project completion. It was followed with the option of two projects completion (36.56%) and three project completion (09.78%). In addition to this it is also clear from the above table that maximum number (25.21%) of projects were done in Chemistry, followed with Physics (24.13%), Mathematics (21.73%), Computer Science (18.04%) and Biology (10.86%).

4.6.5 Variety of projects done by the students

In the context of making variety of projects, the students were enquired (Item No. **1 a, b** of Appendix **E**) about the type of the projects that were done by them. The responses to this query are analyzed and presented in the following table.

Table No. 4.91

Responses for the variety in projects that are done by the students

Sl. No.	Variety in projects that are done by the students	Frequency							Total	Priority of variety
		S1	S2	S3	S4	S5	S6	S7		
1	A written assignment	38	31	24	18	04	07	13	**135**	**1st**
2	Chart Work	26	24	21	09	03	04	13	**100**	**3rd**
3	A model	37	18	14	14	---	03	13	**99**	**4th**
4	Projects involving reference work	04	01	04	04	03	05	02	**23**	**5th**
5	Projects involving investigations, innovations and inventions	03	06	02	07	02	---	---	**20**	**6th**
6	Projects which are challenging and encouraging	03	01	04	01	---	---	01	**10**	**8th**
7	Projects which are relating to the relevant situations or contexts	02	01	05	01	---	02	---	**11**	**7th**
8	Projects with Power Point Presentation	32	31	09	20	04	04	06	**107**	**2nd**
9	If any other, please specify______________	---	---	---	---	---	---	---	**---**	**---**

It is evident from the above table that varied types of projects were done by the students the year long. Their first priority to choose a project was a written assignment, followed with the power point presentation and the chart work. The other options included model preparation, projects involving reference and innovative investigations. Challenging and encouraging projects in relevance to the social and technological contexts are also taken up by the students.

The varied types of the projects that are done by the students in **Mathematics** are classified into file work or written assignments, power point presentations, chart work and models. The projects under each section are given in the following paragraph.

The **File work or written assignment** projects were on logarithm; relations and function; graphs of parabola equation, ellipse; Trigonometric formulae; Set theory and equations; trigonometric ratios; application of Mathematics; Trigonometric identities and their derivation; locating an object in space with the help of coordinates; graphical representation of equations; trigonometric function and straight lines; deriving the value of pie; complex numbers; and permutations. The **power point presentation** projects were on Sets; Trigonometry formulae; Statistics; history of Mathematics; and the main concepts of Trigonometry. The projects on **chart work** included biography of C V Raman; biography of Pythagoras; representation of equations; concepts and formulae of permutations/combinations; Sets and graphs of parabolas; Trigonometric functions, linear inequalities, set theory, ellipse; Venn diagrams; and conic sections and their properties. The projects in the form of **model** preparation were on Sets, making a cone by plastic paper; making ellipse by using card board, plotting graph of quadratic and cubic equations; 3 D geometry models; Trigonometric 3 dimensional model; and conic sections of an ellipse.

The details of the varied types of the projects that are done by the students in **Physics** are classified into power point presentations, file work or written assignments, model work and charts. The projects under each section are given in the following paragraph.

The projects in the form of **power point presentations** were on projectile motion; laws of motion; gravitation; measuring scale; animation on electricity; Thermodynamics; equations of motion; Mechanics of solids; working of large Hardon Collider; Satellite project; kinetic energy; and infra red rays. The **file work** included topics on how to save people from flood; magnetic torch; Daniel Bernoulli and his devotion to Physics; construction of electrical crane, electrical and magnetic fields, gravity effect, effect of surface tension; projectile motion; motion in a plane, Bernoulli's theorem; Wind energy; Solar cooker; Heat transfer; Newton's first law of motion, concept of lever; and Projectile and vectors.

The project in the form of **model** work included an AC generator; conservation of energy; sources of energy; making a scale with least count to 0.2 mm and 0.5 mm of card board; a working model on harnessing energy; Tsunami alert alarm; disaster management; information technology; Fire alarm; potable water; burgler alarm; water management; elasticity of solids; and paper scale projects. The projects in the forms of **charts** were on Pascal's law and units and measurements.

The types of the projects made by the students in **Chemistry** are classified into chart work, file work, power point presentations models. The projects under each section are given in the following paragraph.

The **chart work** included projects on Periodic Table-Modern and long form; hybridization types and examples; Chemical bonding; types of hydrocarbons; pH value chart; Structure of DNA; Graphite structure and fractional distillation of water. The **file work** included OHP sheets on States of matter. The **power point presentation** projects were on the concepts of organic chemistry; states of matter; redox reactions; S-Block/P-Block elements; soft ware designing of modern periodic table; working of Daniel cell; thermodynamics; equilibrium; bomb calorimeter; structure of atom; and Hydrogen. The projects in the form of **models** were on artificial snowfall; sources of energy; chemical environment; energy conservation; disaster management; electromagnetic radiation; step farming; and Daniel cell.

The types of the projects made by the students in **Biology** are classified into chart work, power point presentations models. The projects under each section are given in the following paragraph.

The **chart work** projects were on water purification technique; transverse section of monocot root and stem; diagram of the heart; classification of kingdoms; study of non-chordates; and classification of Fungi. The **power point presentations** were on scientific nomenclature, specifying and collection of certain plant species, their nomenclature; money plant; vegetative propagation; parts of flower; diarrhea; disorders of respiratory system; seed germination; locomotion of fishes; and digestive system. The **models** were on sewage treatment plant; food and agriculture; greenhouse; hydroponics; making a nursery in the school garden individually; and artificial habitation aquarium.

The types of the projects made by the students in **Computer Science** are classified into chart work, power point presentations in CDs and the programming work. The projects under each section are given in the following paragraph.

The **chart work** projects were on memory frames of lessons; types of computers; data representation; facts on computers and programs; generation of language computer; and programming methodology. The **power point presentations** in CDs included data handling; programming; arrays; user defined functions; types of computers and their applications; hardware and software; and types of computers and generation of computers. The projects based on **programming** were on working with operating system and C++programming; programming based on 9 numeric numbers even or odd and other; C++ programs and their outputs; getting started with C++ and its programs; flow of control; working with operating system; sine coding of program; Various header files and their functions; evolution of computers; problems due to hackers; C++ programs and concepts of OOP; Programming languages; Functions of various menus and their procedure; C++ programming, processor management; Program writing for different purposes like games; Windows operating system. List of arrays and structures and other important concepts were submitted in files.

4.6.6 Time Limit Observed in Completion of the Project Work

Time limitation is the uniformity in cut-off-date for submission of the projects. The students were enquired (Item No. of **2 a, b** of Appendix **E**) about the necessity of time limitation to complete the project work. As a reaction to this question their responses are analyzed and presented in the following table.

Table No. 4.92

School wise distribution of student responses for the time limit to complete the projects

Sl. No.	Responses for spending time and money on projects	Frequency		Total (%)
		Yes (%)	No (%)	
1	School 1	38 (90.47)	04 (09.52)	**42 (99.99)**
2	School 2	27 (81.81)	06 (18.18)	**33 (99.99)**
3	School 3	14 (58.33)	10 (41.66)	**24 (100)**
4	School 4	22 (100)	---	**22 (100)**
5	School 5	03 (75)	01 (25)	**04 (100)**
6	School 6	06 (85.71)	01 (14.28)	**07 (99.99)**
7	School 7	13 (86.66)	02 (13.33)	**15 (99.99)**
Total		**123 (83.67)**	**24 (16.32)**	**147 (99.99)**

It is obvious from the above table that a majority of the students (123) (83.67%) had responded positively for the obligation of time limit for project completion and submission, whereas some (24) (16.32%) of the students had not. It was evident from the above table that the students had preferred a time limit for project submission.

The students have explained that if the students are punctual, then none of their work remains pending and they set aside some time. This time may be utilized for learning other subjects. Due to time limitation, they pay attention and increase their power of work. They become more conscious and courageous to accomplish the task of project work.

Moreover, they stated that there was no meaning of project if there was no time limit. The students might linger on with the project for a long time. If there was no deadline, the rate of performance and capability of the student remained undetected. Time limitation ensured the teacher to understand the ability of the students to finish a task within the specified time. With the time limitation they concentrated and tried to understand the principles behind the construction and development of the projects. The students took the project work seriously to think, to plan and to execute it. Accordingly, they searched, referred, discussed and became conscious about submission of the project. Simultaneously they realized the value of time. In addition to this they managed with their home assignments also. Therefore fixing a deadline was essential for every project assigned to them. If not, it might so happen that some of the students might delay and not submit the project at all.

On the other hand the students who had responded negatively claimed that the teacher should give total details of the project well in advance so that they would complete it without wasting the time. The students also asserted that as they did not had any exposure to the typing skills. Their typing speed was very slow. Therefore it took more time for typing and adding some animation. They needed to think to learn about the project. Later on they searched and applied their skills in project. Therefore they should not be pressurized to submit the projects with the time limit. In fact time limitation hinders 100% efforts on part of the students. Self study, tuitions, home work and preparation for competitive examinations did not permit them to complete the projects in time. It lead to stress in the minds of the students.

Over and above the requirement of time limit for project completion and submission the students were also enquired (Item No. of **15 b** of Appendix **E**) for allocation of special period in the time table. In response to this query their responses are analyzed school wise and are displayed in the following table.

Table No. 4.93

School wise student responses for the necessity of a special period in the time table

Sl. No.	School	Frequency		Total
		Yes	No	
1	School 1	23	19	**42**
2	School 2	24	09	**33**
3	School 3	18	06	**24**
4	School 4	15	07	**22**
5	School 5	---	04	**04**
6	School 6	04	03	**07**
7	School 7	10	05	**15**
Total		**94**	**53**	**147**
Percentage		**63.94**	**36.05**	**99.99**

It is apparent from the above table that many (94) (63.94%) of the students had responded positively stating that a special period was necessary exclusively allotted for project work. Some (53) (36.05%) of the students had however asserted that there was no such need. Projects should, as far as possible, be done in the school itself. But certain projects that called for extensive research and use of different materials might be difficult to be carried out within school hours. Since the main concern was about the genuineness and credibility of the work submitted for assessment by the students, if adequate care was taken by the teacher in monitoring the project work, students might be allowed to do some part of it outside the schools. Detailed guidelines on the precautions and steps to be taken in this regard had to be provided to the students. By making the projects realistic and simple, teachers could ensure authenticity of the work of students.

The students were also enquired (Item No. of **15 c** of Appendix **E**) about the time period required for a project completion. Their responses to this query are analyzed and presented below.

Time was main constraint in accomplishing any task. In response to the above item the students stated that it depended on the nature and size of the project, i. e. be it a file work or chart work or a power point presentation or a model or a school project or an exhibition project or an investigatory project. Chart would needed minimum time. On the other hand file work would approximately required two to three days. While power point presentation necessarily consumed four to five days for typing and animation, if any. Above and all model preparation and investigatory projects needed maximum time of about one month as it involves discussion, creation, planning, accumulating material resources, assembling, scrutiny, validation and report writing. The students also claimed if proper guidelines were obtained from the subject teacher, the process of project development would be accelerated. In fact, project development was coupled with the time constraint. If time was less the students would be under stress. Project completion depended upon the availability of the resources like computer laboratory and science laboratory. In addition to this, it also depended upon when the project work was given. During or before the tests and examinations, the work progressed slowly. Last but not the least it also depended on the number of students involved in project completion. In group work it was likely that the projects were completed in less time. Therefore projects, when developed as a group activity could be done in the classroom itself. Groups would decide, with the teacher's help, what projects they would work on, how the work would be divided into smaller units and allotment to the group members etc. It the real sense project work should be discussed in the class to make it work.

In one of the other items (Item No. of **3 a** of Appendix **E**), the students were enquired about the convenient time for allotment of the project work to them. As a reaction to this question the preferences of the students are analyzed and presented subject wise (Mathematics, Physics, Chemistry, Biology and Computer Science) in the following table.

Table No 4.94

Student preferences for allotment of the projects in Mathematics, Physics, Chemistry, Biology and Computer Science

Sl. No.	Subject	i In the beginning of the year	ii Prior to the vacation	iii After relevant theory	iv If any other
1	Mathematics	21	60	44	01
2	Physics	16	65	63	01
3	Chemistry	07	74	47	04
4	Biology	--	21	10	--
5	Computer Science	19	43	40	01
Total		**53**	**263**	**204**	**07**
Priority of options		**3rd**	**1st**	**2nd**	**4th**

It is obvious from the above table that the student's first preference for project allotment in Mathematics, Physics, Chemistry, Biology and Computer Science was prior to the vacation. Over all again the second and the third options were after completion of the relevant theory and beginning of the year respectively.

4.6.7 Socio-economic Concerns to Develop Project work

Socio-economical aspects focus on the social impact of some sort of economic change. It is an area studying the reciprocal relationship between social philosophy, ethics, and human dignity on one hand with the economic science on the other hand towards any progressive work. In this regard the socio-economical aspects might influence the development of the projects. Therefore the students were enquired (Item No. **17 a, b** of Appendix **E**) about the necessity of spending time and money on the development of the projects. Their responses are analyzed school wise and presented in the following sections.

Table No. 4.95

School wise student responses for spending time and money on project development

Sl. No.	Responses for spending time and money on projects	Frequency		Total (%)
		Yes (%)	No (%)	
1	School 1	35 (83.33)	07 (16.66)	**42 (99.99)**
2	School 2	22 (66.66)	11 (33.33)	**33 (99.99)**
3	School 3	18 (75)	06 (25)	**24 (100)**
4	School 4	15 (68.18)	07 (31.81)	**22 (99.99)**
5	School 5	04 (100)	---	**04 (100)**
6	School 6	06 (85.71)	01 (14.28)	**07 (99.99)**
7	School 7	14 (93.33)	01 (06.66)	**15 (99.99)**
Total		**114 (77.55)**	**33 (22.44)**	**147 (99.99)**

It is obvious from the above table that majority (114) (77.55%) of the students responded positively to the necessity of spending time and money on development of the projects. Whilst some (33) (22.44%) had responded negatively. They asserted that knowledge was more important than money. In future they needed to enhance their mental ability and communication skills in different fields like medicine and engineering. Projects though a costly affair, they gained the wonderful work experience which was very important for future success in life. New information, new knowledge and creativity helped them in their future lives. The students learnt organizational skills and understood the value of team work. Accumulating different components for building the projects was in fact needed money and time. In the process of developing the project practical thinking boosted the confidence levels of the students.

It goes without saying that no pains no gain. Therefore the students had to take pains to assimilate the benefits of projects and ultimately score high in the final examinations. For school exhibitions and national exhibitions it was important to spend time and money. The students expressed theoretical ideas in a practical manner and gained a whole concept of different phenomena involved. Time permitted them to present neat projects. They claimed that nothing could be achieved without time and money. To judge the ability, creativity and performance of the students, projects were one of the means. It was necessary to spend time for collection the resource materials. It was also equally necessary to spend time to write a good report. Project making was not a leisurely task. It was meant for the students therefore they could compromise with time and money. The logical reasoning behind project development facilitated them in many ways in future. But it was quite important to create projects as fine products for which both time and money were essential.

On contrary to the above statements, the students those who had negatively responded for necessity of spending time and money on projects affirmed that as their time was crucial, they needed to spend it more on studies. This was the time where the students needed to compete for the competitive examinations. The weightage allotted for the projects was meager. Therefore spending time and money was unreasonable. Instead spending time on theoretical aspects would fetch them to succeed in final examinations and competitions. By recycling or reusing of different (waste) materials also projects might be done. It was not always necessary to spend money. Ultimately how far the projects would be relevant in future life was a big question.

Development of projects essentially needed some amount of money. Basically the students are the learners. Therefore they naturally depend on other sources for their monetary requirements. They were asked (Item No. **18** of Appendix **E**) if they obtained any financial support for development of the projects. The responses of the students to this query are analyzed and presented school wise in the following table.

Table No. 4.96

School wise student responses if financial support was obtained for project development

Sl. No.	**Responses for financial support obtained for projects**	**Frequency**		**Total (%)**
		Yes (%)	**No (%)**	
1	School 1	35 (83.33)	07 (16.66)	**42 (99.99)**
2	School 2	30 (90.90)	03 (09.09)	**33 (99.99)**
3	School 3	18 (75)	06 (25)	**24 (100)**
4	School 4	14 (63.63)	08 (36.36)	**22 (99.99)**
5	School 5	04 (100)	---	**04 (100)**
6	School 6	04 (57.14)	03 (42.85)	**07 (99.99)**
7	School 7	12 (80)	03 (20)	**15 (100)**
Total		**117 (79.59)**	**30 (20.40)**	**147 (99.99)**

It is obvious from the above table that 117 (79.59%) students obtained financial support for project development whereas 30 (20.40%) students did not. In addition to this the financial support obtained by the different school varied from 57.14% to 90.90%.

In addition to the above the students were also enquired (Item No. **18 a** of Appendix **E**) from whom they get the financial support. The responses to this question are analyzed and tabulated as under.

Table No. 4.97

School wise student responses for financial supporters in development of the projects

Sl. No	**School**	**Options**			
		i	**ii**	**iii**	**iv/ v /vi**
		From the school	From the parents	From the classmates by collection	From government scholarship/ sponsoring agency or individual/ any other
1	School 1	03	24	12	---
2	School 2	05	30	09	
3	School 3	01	19	06	
4	School 4	02	11	01	
5	School 5	03	04	02	
6	School 6	---	05	01	
7	School 7	---	13	13	
Total		**14**	**106**	**44**	
Priority of options		**3rd**	**1st**	**2nd**	

The above table clearly depicts the priority of options of the students. It is learnt from this table that parents were the major financial supporters for the students followed with contribution from the classmates and from the school. They did not obtain any financial support either in the form of government scholarship or sponsorship from any agency or individual or in any other form.

The students were also questioned (Item No. **18 b** of Appendix **E**) to reflect on the approximate amount of monetary gain that they get to develop the projects. Their responses for the same are analyzed and presented in the following table.

Table No. 4.98

Student responses for the financial support obtained for project development

Sl. No.	Responses for financial support obtained	Approximately money spent in rupees	
		Minimum	Maximum
1	School 1	20	1000
2	School 2	20	2000
3	School 3	30	500
4	School 4	50	500
5	School 5	30	100
6	School 6	50	100
7	School 7	50	100

It is apparent from the above table that minimum amount of financial support obtained by the students ranged from rupees 20 to 50 whereas the maximum amount ranged from rupees 100 to 2000. Depending on the nature of the project the students needed to spend the amount.

The students were enquired (Item No. **18 c** of Appendix **E**) if they would drop the project if they fail to get financial support. The responses to this query were analyzed and tabulated below.

Table No. 4.99

School wise student responses for dropping the project due to insufficient financial support

Sl. No.	Responses for dropping the project	Frequency		Total (%)
		Yes (%)	No (%)	
1	School 1	07 (16.66)	35 (83.33)	**42 (99.99)**
2	School 2	06 (18.18)	27 (81.81)	**33 (99.99)**
3	School 3	04 (16.66)	20 (83.33)	**24 (99.99)**
4	School 4	02 (09.09)	20 (90.90)	**22 (99.99)**
5	School 5	02 (50)	02 (50)	**04 (100)**
6	School 6	---	07 (100)	**07 (100)**
7	School 7	02 (13.33)	13 (86.66)	**15 (99.99)**
Total		**23 (15.64)**	**124 (84.35)**	**147 (99.99)**

From the above table it is obvious that majority (124) (84.35%) of the students did not drop the project if they did not get any financial assistance to develop the projects. On the contrary some (23) (15.64%) of the students would do so.

Moreover the students were also enquired (Item No. **18 d, e, 19** of Appendix **E**) about the maximum and the minimum amount that they have spent on a single project. They stated that the maximum amount spent on a single project was rupees 2000 whilst the minimum amount was rupees 20. On an average the expenses in different subjects accounted to rupees 50 to 100. The time spent on each project ranged from a day to a month. Project development definitely needed time and money. It might be a little amount to buy the stationery items like pencils, erasers, measuring scale, glue, pens, papers, pins, sketches, tapes, folders, etc. Thermocole sheets, drawing sheets, card board sheets were the most commonly bought materials for project development. Money was needed to be spent on cyber café also for internet browsing. All the accumulated materials needed proper arrangement for which time was needed.

4.6.8 Availability of the Resources to Develop Project Work

Availability of the resources is the key factor in completion of any type of project. Therefore the students were enquired (Item No. **16** of Appendix **E**) about the availability of the sufficient reference and resource material. The student response to this query are analyzed and presented in the following table.

Table No. 4.100

School wise student responses for obtaining the resource material in different Science subjects

Sl. No.	School	Mathematics		Physics		Chemistry		Biology		Computer Science		Total	
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
1	School 1	19	23	28	14	22	20	04	14	22	05	95	76
2	School 2	07	18	25	04	15	13	01	04	07	---	55	39
3	School 3	04	16	10	11	07	16	01	07	08	12	30	62
4	School 4	02	18	06	14	03	14	02	08	04	13	17	67
5	School 5	01	---	---	---	04	---	---	---	04	---	09	---
6	School 6	---	03	02	03	02	03	02	---	---	03	06	12
7	School 7	05	07	04	06	05	09	03	04	01	---	18	26
Total		**38**	**85**	**75**	**52**	**58**	**75**	**13**	**37**	**46**	**33**	**230**	**282**
Percentage		**30.89**	**69.10**	**59.05**	**40.94**	**43.60**	**56.39**	**26**	**74**	**58.22**	**41.77**	**44.92**	**55.07**

As per the students responses it is evident from the above table that the resources were not available (55.07%) in adequate quantities. In Mathematics (69.10%), in Physics (40.94%), in Chemistry (56.39%), in Biology (74%), in Computer Science (41.77%) the references and the resource materials were not available in sufficient quantities. On the other hand some references and resources were available in Physics and the Computer Science subjects.

The resources in **Mathematics** were in the form of the library references and the computer laboratory access to the internet browsing. The Encarta software was also available in the school. The document files and practicals made by the other students were also helpful. The laboratory manual provided some guidelines. The guidance from the teachers and the senior students was of great help.

The resources in the **Physics** subject were in the form of laboratory apparatus. But the available instruments were less in number and were in bad condition, like Ammeter, Voltmeter, wires, lenses, Telescope, weighing machines, solar cells. The major resource was the oral guidance obtained from the teachers. This guidance was mainly in the form of generating some new ideas. The computer laboratory gave an access to the internet and the Encarta material. The library reference books like encyclopedia and some good old books were mostly helpful. It was difficult to find time for collecting the information and project materials. The practical manual also helped in giving some guidance.

The resources for the **Chemistry** subject were less and inadequate. New instruments were required. Most of the chemicals were present in the laboratory like acids and bases. The guidance was obtained from the teachers orally. Laboratory chemicals and apparatus were used for experimentation. The library books were used for reference and the computer laboratory was used for preparing the presentation. Usually free period was used for project work. Previous year records and CDs were also used for project making. Sometimes senior students guided in developing the projects. Practical manuals were also helpful.

The resources in **Biology** were in the form of library reference books like encyclopedia; laboratory specimens as samples; guidance from the teachers; senior friends and the internet access. No instruments such as forceps, brushes, blades, slides, watch glasses were available in sufficient number. Charts and CDs were present.

The resources available in **Computer Science** were in the form of new and latest computers connected with the internet. The Software of C++ and MS office programs were present. Many books on programming were available. Earlier years' file works and projectors provided additional help.

4.6.9 Utility of the Project Work

Practical knowledge is undoubtedly built through the projects. Therefore the students were asked (Item No. **10 a** of Appendix **E**) about the usefulness of the projects in their studies. Their responses to this query are analyzed and presented in the following table.

Table No. 4.101

School wise student responses for utility of the projects in improving the studies

Sl. No.	**Responses for utility of the projects**	**Frequency**		**Total (%)**
		Yes (%)	**No (%)**	
1	School 1	32 (76.19)	10 (23.80)	**42 (99.99)**
2	School 2	28 (84.84)	05 (15.15)	**33 (99.99)**
3	School 3	24 (100)	---	**24 (100)**
4	School 4	16 (72.72)	06 (27.27)	**22 (99.99)**
5	School 5	04 (100)	---	**04 (100)**
6	School 6	06 (85.71)	01 (14.28)	**07 (99.99)**
7	School 7	15 (100)	---	**15 (100)**
Total		**125 (85.03)**	**22 (14.96)**	**147 (99.99)**

From the above table, it is comprehended that majority (125) (85.03%) of the students had affirmed the usefulness of the projects in improving their studies. On the other hand some (22) (14.96%) students had not. Their explanation to the above query is presented as follows.

The projects made in the form of teaching aids helped the students. They projects aided in idea generation which took a concrete shape. Specific theoretical concepts were made clear by understanding the working principles behind projects. Projects from within the text helped in improving the studies. Projects like tsunami alert alarm increased the knowledge and gave ideas to help people from such disasters. Information gathering process during the project development helped in future search. Projects acted as memory frames in front of the student's eyes every time and helped them to remember longer. The students got encouragement by observing the models done by the other students. The basic theoretical knowledge improved during project development was more interesting. Project application towards peace and welfare were good and were necessary.

Through the projects it was easy to understand abstract concepts like bond length, bond angle, and chemical bonding in Chemistry. The students learnt to draw proportional diagrams on the charts and in the examinations. The 3 D models of orbital of atom gave clear idea. The power point presentations helped the students to see the main points directly for themselves. The projects gave courage to move forward in their studies. The projects helped to study and go beyond the books for their betterment. The projects helped in revision during the examinations and in correcting their mistakes.

They improved the curiosity to know and to explore more. They were helpful to explain the phenomena and theories. Visualization through projects helped to remember quickly and more accurately. Though practical experience was gained through the projects the students did not get proper instructions on projects. Proper time and particular time were necessary for project work. If this was delayed the students did not find time to do well and to score high in the project work. The same type of projects when repeatedly given became useless as they did not had any new appeal.

In contrast to the above explanation, some students had stated that it was not necessary that every project should help in improving their studies. File work and written assignments did not help much. Irrelevant projects without any association with the school subjects were not much useful. They were not always helpful if not taken in real sense. It would be wastage of time and money if there was no seriousness towards the projects. The students stated that the projects were given as a formality to give marks. Basically they were non innovative and non educative. Projects were not always useful sometimes they created lot of disturbances and left less time to focus on other subjects. Projects created tension in the minds of the students.

The students were enquired (Item No. **11** of Appendix **E**) to respond for additional learning that was carried on along with the development of the projects. Their responses are analyzed and presented in the following table.

Table No. 4.102

Student responses for utility in additional learning through project development

Sl. No	Responses for additional learning along with the development of projects	Schools							Total	Priority in learning
		1	2	3	4	5	6	7		
1	How to arrange	16	08	14	07	---	04	07	**56**	**5th**
2	How to organize	14	13	16	11	02	03	07	**66**	**4th**
3	Logic	23	18	18	08	02	03	07	**79**	**3rd**
4	How to manipulate	05	04	03	04	---	02	03	**21**	**9th**
5	Cooperation	17	06	12	06	01	---	08	**50**	**6th**
6	Conversation	13	04	09	04	01	02	04	**37**	**7th**
7	Computations and Mathematics	14	07	06	04	03	---	---	**34**	**8th**
8	Thinking and Creation	33	27	21	17	02	05	09	**114**	**1st**
9	How to use resources, like library, internet, etc.	25	23	16	11	03	06	13	**97**	**2nd**
10	If other than these, please specify _______________	---	---	---	---	---	---	---	**---**	**---**

It is evident from the above table that the student learning in descending order ran from thinking and creation, exploitation of resources, logic, development of organizational skills, arranging and assembling, cooperation and conversation, computations and Mathematics to enhancement of manipulation skills. Above and all the projects helped in raising the art and craft talent of the students. Besides this the communication skills and the leadership qualities of the students were also enhanced. As example if the student knew the mathematics formulae but did not knew how to apply them, then that knowledge is useless. Similarly the students use and enjoy the crackers, but if they did not knew the chemicals and the principles behind the working of the crackers, then that knowledge useless again.

4.6.10 Interest and Appreciation of the project work

In learning centered approaches of teaching the interests of the students could be capitalized. The interests of the students could be used largely as a means of getting and holding the attention during the teaching learning process. In this regard the students were enquired (Item No. **12 a** of Appendix **E**) about the interest and appreciation shown by them in the project work. Their responses to this query are analyzed and presented in the following tabular form.

Table No. 4.103

Student responses for interest shown in the projects

Sl. No.	Responses for interest Shown in the projects	Frequency				Total
		Yes	%	No	%	
1	School 1	39	92.85	03	07.14	**42**
2	School 2	31	93.93	02	06.06	**33**
3	School 3	24	100	---	---	**24**
4	School 4	17	77.27	05	22.72	**22**
5	School 5	04	100	---	---	**04**
6	School 6	07	100	---	---	**07**
7	School 7	15	100	---	---	**15**
Total		**137**	**93.19**	**10**	**06.80**	**147**

It is perceptible from the above table that majority of the students (137) (93.19%) showed interest in the project work. On the other hand a few (10) (06.86%) of the students did not. In addition to this the students were also enquired (Item No. **12 b** of Appendix **E**) about rating of the projects for appreciation. The responses of the students to this item are analyzed and presented in the following table.

Table No. 4.104

Student responses for rating of the projects for appreciation

Sl. No	School	Options					Total
		i	ii	iii	iv	v	
		Excellent	Good	Average	Poor	Very Poor	
1	School 1	11	17	14	---	---	**42**
2	School 2	07	21	04	01	---	**33**
3	School 3	07	13	04	---	---	**24**
4	School 4	04	11	05	01	01	**22**
5	School 5	01	03	---	---	---	**04**
6	School 6	---	04	03	---	---	**07**
7	School 7	09	05	01	---	---	**15**
Total		**39**	**74**	**31**	**02**	**01**	**147**
Percentage		**26.53**	**50.34**	**21.08**	**01.36**	**00.68**	**99.99**
Priority of options		**2nd**	**1st**	**3rd**	**4th**	**5th**	**---**

It is evident from the above table that half (74) (50.34%) of the students had appreciated and rated their projects as 'good.' The other responses in a descending order were many (39) (26.53%) students categorizing as excellent, some more (31) (21.08%) as average, very few (03) (02.04%) as poor to very poor category.

4.6.11 Problems Encountered in Development of the Project work

There are a number of problems related to the student activity programs like development of project work. In this context the students were enquired (Item No. **20 a** of Appendix **E**) about the problems if they had faced any during the project development. The responses of the students are analyzed and presented in the following table.

Table No. 4.105

School wise student responses for problems in implementation of the projects

Sl. No.	Response for problems if any in implementation of the projects	Frequency				Total
		Yes	(%)	No	(%)	
1	School 1	38	(90.47)	04	(09.52)	**42**
2	School 2	30	(90.90)	03	(09.09)	**33**
3	School 3	22	(91.66)	02	(08.33)	**24**
4	School 4	18	(81.81)	04	(18.18)	**22**
5	School 5	02	(50.00)	02	(50.00)	**04**
6	School 6	05	(71.42)	02	(28.57)	**07**
7	School 7	12	(80.00)	03	(20.00)	**15**
Total		**127**	**(86.39)**	**20**	**(13.60)**	**147**

It is evident from the above table that majority (127) (86.39%) the students faced problems during implementation of the projects, whereas some (20) (13.60%) of the students did not.

In addition the students were asked (Item No. **20 b, c** of Appendix **E**) to choose some problems during project work implementation and comment on this issue. The responses to this query are analyzed and presented in the form of a table as given here under.

Table No. 4.106

List of the Details of the problems faced by the students in implementation of the projects

Sl. No.	Option	School							Total	%
		1	2	3	4	5	6	7	273	99.98
1	Individual differences	19	14	16	07	01	01	09	**67**	**24.54**
2	Time	25	25	20	11	02	03	11	**97**	**35.53**
3	Evaluation	06	04	04	03	01	01	02	**21**	**07.69**
4	Academics	09	15	11	04	---	02	05	**46**	**16.84**
5	Cultural	01	01	---	01	---	---	---	**03**	**01.09**
6	Social	03	01	01	03	---	01	01	**10**	**03.66**
7	Economic	11	03	09	03	01	02	---	**29**	**10.62**
8	Any other	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**

It is learnt from the above table that for many (35.57%) availability of the time was the main constraint in project development. It was followed with other problems like individual differences (24.54%), load of academics (16.84), financial matters (10.62%), evaluation procedures (07.69%) and other social constraints (03.66%). In addition to the above constraints, the students stated (under if any other option) that the teacher's partiality; carrying project from home to school; presentation problems; gathering the information; details on where to collect the information and slowness in typing were the major constraints. If there was a big group project then all the members of the group used their own ideas due to which the project took long time for completion.

The students mentioned that as projects were just given for completing the formality the students also did it likewise. There was no specific time for projects. The students ran here and there for collection of the required material. There was lack of knowledge about making the models. Individually more time was taken for project completion. Therefore the group projects helped the students to do more work. But in groups also there were the problems of non cooperation. The students found less time to study. If the peer groups were formed by the students themselves, comparatively there are fewer problems.

The students explained that the problems of the students differed from person to person. Personal tuitions and different academic pursuits also affected their efforts for project development. The project expenses, time constraint and the unavailability of the resources make the project work a costly affair.

The students expressed that nothing was told to the students as how they could proceed with the project. The sources of information were rare and sometimes the help from the teachers was not at hand. Sometimes the students were forced to do uninteresting, repetitive and boring projects if they were for just writing and filing by just downloading information from internet or copying.

The students stated that though the computer facilities are provided by the school, the students do not get free period to use them. Too much time and money is spent on doing power point presentation and other work outside the school. When long and lengthy projects are taken up the students forget their regular academics and get absorbed in the project work. Many a time all the subject teachers give the project work at the same time and the students find less time to complete them all together. This consumes lot of time. In higher secondary sections the time is very important to the students.

The students stated that the individual differences and the time aspect are the two major problems to develop any project. At times the students felt that spending time on the project work is just wasting time as they need to complete the home work and continue with the daily studies along with the preparation for the competition level examinations. Projects that are given to the students are almost extinct and are of no use to them. The students mentioned that they need lot of time and patience to complete the project. They said that it becomes quite difficult to understand when they see other students getting better ideas and have better economic aspects.

The students emphasized that they should be provided with all those facilities that they need to complete the project. Most of projects are very large and take long hours to complete. Such type of projects cannot be done alone. The expenditure on such projects is also high. Maximum time is spent on project making and the studies in other school subjects would be reduced and they might score minimum marks in the examinations. Ultimately the teachers and the parents give comments that they do not study. If tests and examinations are there during the project work, then the main problem is with the time management. The students face some problems regarding computer science like typing, compiling, setting, organizing, etc.

The students mentioned that as the projects consume much time their time schedule is disturbed. Otherwise that time would be utilized for regular studies. Sometimes the parents also do not support due to some economic problems. Thus the concentration is also lost. Individuals have naturally different opinions about organizing the same project.

The students mentioned that in group projects, all the ideas of the students are different. During the discussions it becomes very difficult to come to a common understanding. In planning and in making models most of the day time is spent. All the group members spend money, but usually one or two persons do the project according to their own time and interest. Group project involving many students is problematic. The loads of work makes the students tiring thereby losing their interest in the subject. In group projects the students face difficulty in collecting the material together as different students have different tuition timings, further the cost of the project stops further procedure.

In groups it is difficult to collect information, as each one has different ideas. It becomes to compile all the ideas of the group. The schools give projects to do but the materials to make it are costly. Time is to be spent on it so there is less time for regular study. Moreover there is not time for other type of social activities. The time given by the teacher in project work is very short. The project work indirectly affects the academics of the students. In group projects, the ideas from each member have to be taken before beginning the project work. The opinions and thinking abilities of each member differ. Sometimes the ideas of some group members are appreciated.

4.6.12 Evaluation Procedures of the Project Work

Evaluation establishes the effectiveness of the projects. There are certain criteria based on which project evaluation is taken up. The result of the project work contributes to the final assessment. In this context it is essential that the students must be aware of this. Therefore the students were enquired (Item No. **4** of Appendix **E**) if they knew the weightage given to the projects in the final assessment. Their responses to the same question were analyzed and tabulated below.

Table No. 4.107

Student responses for knowledge about weightage for projects in final assessment

Sl. No.	Responses for knowledge about weightage for projects in final assessment	Frequency		Total
		Yes	No	
1	School 1	37	05	42
2	School 2	31	02	33
3	School 3	12	12	24
4	School 4	20	02	22
5	School 5	04	---	04
6	School 6	05	02	07
7	School 7	12	03	15
Total		**121**	**26**	**147**
Percentage		**82.31**	**17.68**	**99.99**

It is understandable from the above table that most (121) (82.31%) of the students are aware about the weightage of marks assigned to the projects in final assessment, whereas some (26) (17.68%) of the students were unaware of the same.

The students were also enquired (Item No. **5** of Appendix **E**) about regularity in assessment of the projects. The responses to this question are analyzed and tabulated below.

Table No. 4.108

School wise student responses for regularity in assessment of the projects

Sl. No.	Responses for regularity in assessment of the projects	Frequency		Total
		Yes	No	
1	School 1	41	01	42
2	School 2	30	03	33
3	School 3	22	02	24
4	School 4	20	02	22
5	School 5	04	---	04
6	School 6	07	---	07
7	School 7	15	---	15
Total		**139**	**08**	**147**
Percentage		**94.55**	**05.44**	**99.99**

According to the students point of view it is evident from the above table that most (139) (94.55%) of the projects were regularly assessed by the teachers. Very few (08) (05.44%) projects were not assessed regularly.

The students were also inquired (Item No. **5 a** of Appendix **E**) as when the projects were assessed. The responses to this query are analyzed and tabulated below.

Table No. 4.109

School wise student responses for time of assessment of the projects

Sl. No.	**School**	**Options**			
		i	**ii**	**iii**	**iv**
		Immediately after the submission	Within the term/ time period	At the end of the session	If any other
1	School 1	18	21	---	---
2	School 2	07	21	02	---
3	School 3	14	08	---	---
4	School 4	11	07	01	---
5	School 5	---	01	---	---
6	School 6	03	02	---	---
7	School 7	12	03	---	---
Total (131)		**65**	**63**	**03**	**---**
Percentage (99.99)		**49.61**	**48.09**	**02.29**	**---**

It may be learnt from the above table that most (65) (49.61%) of the projects were assessed immediately after the submission, whereas many (63) (48.09%) of the projects were assessed within the time or term period. Very few (03) (02.29%) projects were assessed at the end of the session.

The students were enquired (Item No. **6** of Appendix **E**) if they obtained any feedback from the teachers. The responses to this query are analysed and presented in the following table.

Table No. 4.110

School wise student responses for obtaining feedback on the projects

Sl. No.	Responses for obtaining feedback on the projects	Frequency		Total
		Yes	No	
1	School 1	23	19	42
2	School 2	21	12	33
3	School 3	17	07	24
4	School 4	14	08	22
5	School 5	04	---	04
6	School 6	06	01	07
7	School 7	11	04	15
Total		**96**	**51**	**147**
Percentage		**65.30**	**34.69**	**99.99**

It is obvious from the above table that many (96) (65.30%) a time feedback was given on the projects during assessment. Sometimes (51) (34.69%) no feedback was given.

The students were also enquired (Item No. **6 a** of Appendix **E**) for the nature of the feedback given during assessment of the projects. Their responses to this query are analyzed and tabulated in the following table.

Table No. 4.111

School wise student responses on the nature of feedback on the projects

Sl. No.	School	Options			
		i	ii	iii	iv
		Oral	Written Comments	Material Resource	If any other
1	School 1	08	08	05	---
2	School 2	16	04	03	---
3	School 3	16	07	01	---
4	School 4	11	03	---	---
5	School 5	03	01	---	---
6	School 6	05	---	---	---
7	School 7	04	08	01	---
Total (104)		**63**	**31**	**10**	**---**
Percentage (99.98)		**60.57**	**29.80**	**09.61**	**---**

It is clear from the above table that 63 (60.57%) students mentioned that feedback was given in the form of oral comments. Besides this 31 (29.80%) students stated that written comments were given. In addition to this 10 (09.61%) students commented that very rarely feedback on material resources was given.

Further the students were enquired (Item No. **7 a** of Appendix **E**) if any information on the criteria for assessing the projects was given to the students. The student responses to this question are analyzed and tabulated below.

Table No. 4.112

School wise student responses for information on assessment criteria of the projects

Sl. No.	**Responses for assessment criteria of the projects**	**Frequency**		**Total**
		Yes	No	
1	School 1	22	20	42
2	School 2	18	15	33
3	School 3	13	11	24
4	School 4	15	07	22
5	School 5	04	---	04
6	School 6	01	06	07
7	School 7	15	---	15
Total		**88**	**59**	**147**
Percentage		**59.86**	**40.13**	**99.99**

It is evident from the above table that 88 (59.86%) students gave positive response stating that the teachers gave information on the assessment criteria of the projects, whereas 59 (40.13%) of the students gave negative response.

The students were also questioned (Item No. **7 b, c** of Appendix **E**) if they were satisfied with the process of project assessment and to comment on this issue. Their responses to this query are analyzed and presented in the following table.

Table No. 4.113

School wise student responses for satisfaction about assessment of the projects

Sl. No.	Responses for satisfaction about assessment of the projects	Frequency		Total
		Yes	No	
1	School 1	18	24	42
2	School 2	16	17	33
3	School 3	20	04	24
4	School 4	13	09	22
5	School 5	03	01	04
6	School 6	04	03	07
7	School 7	13	02	15
Total		**87**	**60**	**147**
Percentage		**59.18**	**40.81**	**99.99**

It is apparent from the above table that 87 (59.18%) students are satisfied with assessment process, whereas 60 (40.81%) students are not satisfied with the assessment.

Commenting on this issue the students stated that the basis of project checking is specific. The teacher gives instructions about what they see in a project like hard work, efficiency, creativity and neatness behind the projects. They discuss about how many marks are allotted to each part of project. In addition to this they also give many hints and ideas to develop projects and to make them creative. The teacher explains the mistakes and supports them to improve their projects. They help to revise the projects and clear the difficulties of the students. They take care of the content, neatness and execution of the projects to judge them. The teacher reads the entire report and then gives the marks. The teacher justifies good projects with good remarks. The marks are given based on the students' efforts and presentation. The students present the project in a rough manner first and as per guidance of the teacher, prepare a fair and final project and submit. Sometimes the teachers discuss about the project checking by giving enough time and information.

The students mentioned that the project work should be the total contribution of the students and the teachers should not give any information. By this the potential and capability of the students are not known. Project work is not for destruction but for construction of better human lives.

On the contrary the students stated that the project making is a formality in work and in reality it is a copying and pasting job. The projects should develop the innovative nature of the students. The project work should be recognized and duly appreciated. Once the projects are submitted nobody cares about them. The teachers hurriedly check and do not explain what the students need to do. Some give marks on drawing and creativity. Some only give for theory and other give marks based on character of student. The teacher must show the best projects to all the students so that they get some better ideas in doing next project. By this they can also rectify their mistakes if any. There is no class discussion or group discussion over the project. The students have no idea of how the projects are checked. They stated that the teachers do not tell about the marks distribution. Some teachers tell how to improve their ideas. Some teachers see presentation and quality in the project. The marks are heavily deducted for the mistakes in the projects. The teachers should read the project thoroughly and give the marks. Sometimes the marks are allotted not on basis of practical but on the academic performance of the students in theory subjects, marks obtained in the unit tests, half yearly and annual examinations.

The students mentioned that there is no necessity of the projects in Mathematics. The projects in Computer Science programs should be evaluated in front of the students. Most of the time making projects is only copying of the whole book or some topics. There is no new experience in doing projects. Moreover the computers do not process fast in the school. The Computer Science projects should be done on Computers and not on files or charts. Sometimes the logic involved in execution of the Computer program is not known.

4.6.13 Preservation and Maintenance of the project work

Once after project completion and submission, the students were questioned (Item No. **8** of Appendix **E**) if their projects were retained by the school. Their responses to this question are analyzed and tabulated below.

Table No. 4.114

School wise student responses for retaining the projects

Sl. No.	Responses for retaining the projects by the school	Frequency		Total
		Yes (%)	No (%)	
1	School 1	32 (76.19)	10 (23.80)	**42**
2	School 2	25 (75.75)	08 (24.24)	**33**
3	School 3	18 (75.00)	06 (25.00)	**24**
4	School 4	18 (81.81)	04 (18.18)	**22**
5	School 5	02 (50.00)	02 (50.00)	**04**
6	School 6	03 (42.85)	04 (57.14)	**07**
7	School 7	12 (80.00)	03 (20.00)	**15**
Total		**110 (74.82)**	**37 (25.17)**	**147**

It is apparent from the above table that most (110) (74.82%) of the students have responded that the schools have retained the projects whereas some (37) (25.17%) students stated that the schools have returned the projects to them.

The students were asked (Item No. **8 a** of Appendix **E**) to choose the reasons for retaining the projects by the school. The student responses to this query are analyzed and tabulated here under.

Table No. 4.115

School wise student responses to choose reasons for project retention by the schools

Sl. No	School	Reasons to retain the projects				
		i	ii	iii	iv	v
		Good project	Teaching aid	An exhibit	Sample model	Any other
1	School 1	09	16	09	12	---
2	School 2	12	14	04	15	---
3	School 3	12	12	09	05	---
4	School 4	04	08	04	09	---
5	School 5	---	02	---	---	---
6	School 6	01	---	---	01	---
7	School 7	02	05	10	06	---
Total (181)		**40**	**57**	**36**	**48**	**---**
Percentage		**22.09**	**31.49**	**19.88**	**26.51**	**---**

It is clear from the above table that the projects are retained by the schools to be used as a teaching aid (31.49%), to be shown as a model to the other students (26.51%), because it is a good and rare project (22.09%), and that they may be used as an exhibit in the forthcoming Science Exhibition/Science Fair. Over and above they are also used as secondary raw materials (thermocole sheets, cardboards, files) to make new projects.

The students were invited (Item No. **9** of Appendix **E**) to choose different means of project preservation and maintenance. The student responses to this query are analyzed and tabulated below.

Table No. 4.116

School wise student responses for the preservation and maintenance of the projects

Sl. No.	Methods of project preservation and maintenance	Frequency							Total	%
		S1	S2	S3	S4	S5	S6	S7		
1	As wall posters	19	13	18	11	---	---	07	**68**	**15.66**
2	In science laboratory and science club	22	16	08	10	---	01	08	**65**	**14.97**
3	Under the subject teacher's control	22	18	13	06	01	02	02	**64**	**14.74**
4	As teaching aids	16	08	16	12	01	---	06	**59**	**13.59**
5	In the general classroom	02	09	21	05	01	---	02	**40**	**09.21**
6	As exhibits	16	03	09	08	01	---	01	**38**	**08.75**
7	With proper care and handling	08	02	02	08	02	02	08	**32**	**07.37**
8	As documents	09	10	02	01	01	---	05	**28**	**06.45**
9	By subject wise and term wise recording	05	09	---	05	02	02	01	**24**	**05.52**
10	By dusting regularly	02	01	01	02	01	---	01	**08**	**01.84**
11	By reorganizing and rearranging	04	02	---	01	---	---	---	**07**	**01.61**
12	By use of insecticides/ naphthalene balls	---	01	---	---	---	---	---	**01**	**00.23**
13	By renovating	---	---	---	---	---	---	---	**---**	**---**
14	If other than these, please specify _____________	---	---	---	---	---	---	---	**---**	**---**
Total									**434**	**99.94**

It is evident from the above table that the projects are preserved and maintained in the school. They are used as wall posters (15.66%), maintained in Science laboratory and Science club (14.97%), are kept under the subject teacher's control (14.74%), are used as teaching aids (13.59%), are kept in the general classroom (09.21%), are kept as exhibits (08.75%), are handled with proper care (07.37%), are saved as documents (06.45%), are recorded subject wise and term wise (05.52%), by frequent dusting (01.84%), by reorganizing and rearranging (01.61%) and by the use of chemicals like insecticides/naphthalene balls (00.23%). Besides this they are also stored as scrap to be disposed off later.

4.6.14 Step up of the Project Work

The students were enquired (Item No. **21** of Appendix **E**) if they wished to add some additional information and suggestions on the project work. The responses to this query are analyzed and categorized under the following heads and presented in the form of a grid.

Table No. 4.117

Student responses on the step up of the project work in the form of a grid

Information and guidance	Availability of the resources	Assignment of projects
Weightage of marks	Time	Finances
Evaluation	Utility	Number
Assorted points on the nature of the projects		

It is obvious from the above grid that the additional information and suggestions on the step up (improvement) of the project work are categorized and explained under the following heads.

Information and guidance

- Prior information and knowledge about what a project is and what students are expected to do, provision of the resources (instruments/objects) and access to the internet, sufficient time to concentrate and money to complete the project are essential requirements and any other guidance if needed should be provided.

- Before giving any project, the teacher must give all the details-explain the principle behind the working of the project and give the students the basic knowledge and must clear all their doubts.
- Teachers should give ideas and reference books regarding these project topics.
- Proper guidance is needed from the teachers.
- Teacher to give projects with maximum explanation, proper time and approximate money to be spent.
- Teachers and parents should support us, apparatus should be provided from school.
- More and good instruction and information.
- The teachers should at least discuss with the students from time to time.

Availability of the resources

- On a regular basis the school should take the students to different places of scientific interest like Science city, research center. If such visits are made available our excitement increases and our projects may be also selected for national level.
- Projects are for creative work; therefore the schools should take the students to research centre or any other place that develop creative ideas. Projects are not for gathering information and copying and working with files and notebooks.
- Material resources like apparatus, test tubes etc, should be given from the school on request.
- Non availability of materials in laboratories.
- Big projects difficult to manage during school times, material supply needed from school
- Extra period, material resources, internet, Encarta, library facilities with the latest references needed.
- The library should be enriched with the latest books, the subjects teachers should have a set of 6-7 reference books for each class, topics should be chosen by the student.
- Projects are good if all facilities are given, then we can spend less time do good projects systemically.

Assignment of projects

- Projects are to be based on some new logic, help us to gain some new informative so that this experience may be used in planning other projects.
- Students should be given only those projects that are within their limit and caliber, projects should not disturb their mental status.
- Projects should develop our personality.
- In groups all do not participate but write names, so one model in group and rest individual projects.
- Students should get their interesting topic or area for projects to avoid problems.
- All projects to be given in the beginning of the session.
- Projects should not be given during or before the exams or tests.
- After theory projects helps a lot.
- In groups projects are easy to make and are good.
- Projects are to be given according to the choice and wish of the students. Marks should be given based on the quality of the project.
- Teachers should give the project, but accordingly the quantity of home work need to be reduced.
- It would be better if teacher first enquire the choice of the students.

Weightage of marks

- Project carries marks so it should be done, schools to provide all the facilities.
- The percentage of marks to be increased to 10% weightage.

Time

- Compulsorily special and sufficient time should be given in the school so that the students get the teachers help immediately in the school itself.
- School must provide a particular period of time for the internet to search for information on the topics and to merge information.
- Projects should be small which require less time and from which we learn something.
- It should be done in school itself, like in free period.

Finances

- Innovative, creative and low cost projects are needed. The students can manage with less money, school help financially needed, they say give the receipt, but when we show them that the reply is that the procedure is too long for claiming money and at that student looses hope of getting money back.
- Projects should not to be a burden financially or mentally.
- Projects to be economical, so in groups we can save, teachers to guide and pay attention to students and tell how to improve projects.

Number

- Projects are not to be given in every term and during the examinations. They may be simple projects given only once or twice in a year.
- One individual project and one group project is enough per subject per year.

Evaluation

- The teachers should evaluate the projects judiciously and impartially. They should give constructive remarks to promote the excellent students and to encourage the students whose performance is poor.
- Teachers to check the project work and give the remarks/feedback as good or bad to know our weakness and if good, we will be encouraged to do more good and excellent projects.

Utility

- Group projects help for better job completion.
- Projects help us to interact with the nature and environment.
- Projects not only enhance the knowledge but also build up the confidence of the students
- Improves our time management skills.
- Helps to refer different types of books to gather knowledge, so that reference skills develop.
- Conversation skills are improved.
- We should use logic to make investigatory projects.

‘

Assorted points on the nature of the projects

- Projects should be given compulsorily.
- Projects should not minimize our other studies and activities.
- Projects are to be adjusted with academics and home work and preparation for competitive examinations; therefore little home work is good.
- Projects to be done on current topics to capture the attention of the students, nobody likes repeated projects.
- Projects must be given individually to know his ideas, his performance, his thinking.
- To make an excellent project proper planning and cooperation of all in the group is required.
- Most of time projects are in the form of power point presentation but other types are also needed.
- Projects on computers to be encouraged for all.
- The teachers and the government must take special steps to motivate the students to make the projects.
- Good projects should receive prizes and the student should be congratulated and encouraged so that others will be also promoted to make good projects next time.

4.7 Findings Based on the Students' Questionnaire

The findings obtained from the data of the students' questionnaire were categorized as per the objectives of the study and are presented in the following paragraphs under the headings as given below.

- Assignment of the Project Work to the Students
- Orientation and Guidance to the Students
- Development of the Project Work by the Students
- Number of Projects done by the Students
- Variety of Projects done by the Students
- Time Limitation Observed in Completion of the Project Work
- Socio-economic Concerns to Develop Project Work
- Availability of the Resources to Develop Project Work

- Utility of the Project Work
- Interest and Appreciation of the Project Work
- Problems Encountered in Development of the Project Work
- Evaluation Procedures of the Project Work
- Preservation and Maintenance of the Project Work
- Step up of the Project Work

Assignment of the Project Work to the Students

It was found that 142 (96.59%) of the students properly planned and proceeded with the development of the projects, while five (3.40%) of the students did not.

It was evident that 108 (73.46%) of the students gave a negative response stating that they did not visited any institutes or research centers for hands on experience while 39 (26.53%) of the students gave a positive response.

Orientation and Guidance to the Students

It was confirmed that more than half (88) (59.86%) of the students were given guidance by the teachers whereas many (59) (40.13%) of the students did not obtain any guidance for project development.

Development of the Project Work by the Students

It was noticed that the first option of the students for development and completion of the project was with the help of the peer group. Next it was followed with self help and help from the teachers. The help obtained from the parents was the last option.

It was found that majority (114) (77.55%) of the students adopted a systematic method in project development process. On the other hand some (33) (22.44%) of the students did not adopt any systematic method in project development. In addition it was found that the students tried to understand the concept of the project. They gathered all the information on the project. They discussed with the teacher and received his/her comments. They also referred the books and browsed the internet. Library books were referred for additional information on the project. Some students referred Encarta and encyclopedia also.

The students proceeded by writing important points in a note book, and then finally made it fair. The students sorted and manipulated the material resources according to their requirement. Requisite diagrams were drawn and designs were made in relation to the project work. The students prepared the graphs where necessary. Calculations and computations were carried on where necessary.

It was found that the students enquired periodically from teacher as how to do and when to do the project. They stated that sometimes the teacher gave hints to develop the project. The students tried to understand the principles behind working of the projects. They used their own logic to create programs in computer. As per the requirement the students bought the charts and other necessary things. The students stated that lot of thinking and imagination was required for project development. The students made the project with the help of the good books from the library, from the help of the parents and from the news papers. Some students directly did the project work on the computers.

It was confirmed that the students logically planned and proceeded by giving a meaningful thought on the topic of the project. They read about the topic and took help from the books, and internet. They then accumulated the ideas and organized them. The students collected the data and arranged sequentially.

It was found that appropriate time was also given for project development. The students also thought to present the project in an innovative way. In groups the students distributed the work among themselves. Discussion among the peer group helped to improve the project work. They also strived to recycle the waste material in developing the projects. The students also used some illustrations and examples in the project development. The material that was down loaded from the internet was written, compiled and submitted in files. The students followed the steps of think, plan and do. They proceeded when everything was ready for project development. The same method was followed in all the subjects.

Number of Projects done by the Students

It was found that more than half (50.65%) of the responses opted by the students were for a single project completion. It was followed with the option of two projects completion (36.56%) and three project completion (09.78%). In addition to this it was also clear that maximum number (25.21%) of the projects were done in

Chemistry, followed with Physics (24.13%), Mathematics (21.73%), Computer Science (18.04%) and Biology (10.86%).

Variety of Projects done by the Students

It was evident that varied types of projects were done by the students the year long. Their first priority for a project was a written assignment, followed with the power point presentation and the chart work. The other options included model preparation, projects involving reference and innovative investigations. Challenging and encouraging projects in relevance to the social and technological contexts were also chosen by the students.

Time Limit Observed in Completion of the Project Work

It was found that a majority of the students (123) (83.67%) have responded positively for the obligation of time limit for project completion and submission, whereas some (24) (16.32%) of the students have not. The students had explained that if the students were punctual, they set aside some time for both the projects and the studies. Due to time limitation, they paid attention to their work in general and thus increased their efficiency. They became more conscious and courageous to accomplish the task of project work.

It was found that many (94) (63.94%) of the students had responded positively stating that a special period was necessary which should be exclusively allotted for the project work. Some (53) (36.05%) of the students have however asserted that there was no such need. The projects should, as far as possible, be done in the school itself.

It was found that the student's first preference for project allotment in Mathematics, Physics, Chemistry, Biology and Computer Science was prior to the vacation. Over all again the second and the third options were after completion of the relevant theory and beginning of the academic year respectively.

Socio-economic Concerns to Develop Project Work

It was revealed majority (114) (77.55%) of the students responded positively to the necessity of spending time and money on development of the projects. Whilst some (33) (22.44%) have responded negatively. They asserted that knowledge was more important than money. In future they needed to enhance their mental ability and communication skills in different fields like medicine and engineering. Therefore though the projects were a costly affair, they gain wonderful work experience which was very important for future success in life.

It was found that 117 (79.59%) students gained financial support whereas 30 (20.40%) students did not. In addition to this the financial support obtained by the different schools varied from 57.14% to 90.90%.

It was confirmed that the parents were the major financial supporters for the students. This was followed with contribution from the classmates and from the school. The students established that they did not obtain any financial support either in the form of government scholarship or sponsorship from any agency.

Availability of the Resources to Develop Project Work

As per the student responses it was found that the resources were not available (55.07%) in adequate quantities to develop the projects. In Mathematics (69.10%), in Physics (40.94%), in Chemistry (56.39%), in Biology (74%), in Computer Science (41.77%) the references and the resource materials were not available in sufficient quantities. On the other hand the students stated that some references and resources were available in Physics and the Computer Science subjects.

Utility of the Project Work

It was found that majority (125) (85.03%) of the students have affirmed the usefulness of the projects in improving their studies whereas some (22) (14.96%) students have not. It was evident from the responses of the students that the utility of the projects in learning runs in the following descending order. It started from thinking and creation; exploitation of resources; logic; development of organizational skills; arranging and assembling; cooperation and conversation; computations in Mathematics and enhancement of the manipulation skills. Above and all the projects helped in raising the art and craft talents of the students. Besides this the communication skills and the leadership qualities of the students were also enhanced.

It was found that the working models were more useful because the students could easily understand the processes behind certain phenomena. Moreover such projects were good to study and to explain. Projects make difficult theoretical concepts easy and gave inspiration to learn more. The projects of the senior students gave idea about how to make projects. Reading the texts before making the projects helped the students in their studies. Projects motivated the students. Projects gave freedom to the students to know more and more about them. The students developed a practical mind set. The projects gave scope to increase the skills, creativity and intelligence of the students. The factual information collected about the projects was always useful. The students stated that the projects showed the way to represent themselves and their work. The projects not only improved the knowledge but also increased awareness on general information. The projects made the learning attractive.

Interest and Appreciation of the Project Work

It was found that majority of the students (137) (93.19%) showed interest in the project work. On the other hand a few (10) (06.86%) of the students did not.

It was evident that half (74) (50.34%) of the students had appreciated and rated their projects as ‘good.’ The other responses in a descending order were many (39) (26.53%) students categorized their projects as excellent, some more (31) (21.08%) as average, very few (03) (02.04%) as poor to very poor category.

Problems Encountered in Development of the Project Work

It was evident that majority (127) (86.39%) the students faced problems during implementation of the projects, whereas some (20) (13.60%) of the students did not.

It was found that for many (35.57%) of the students **time** was the main constraint in project development. It was followed with other problems like individual differences (24.54%), load of academics (16.84), financial matters (10.62%), evaluation procedures (07.69%) and other social constraints (03.66%). In addition to the above constraints, the students stated that carrying the project from home to school was a big problem. Slowness in typing, gathering the information, presentation the project, and were the other major problems. The students stated the problems of group projects as differences in caliber of the students.

The problems of the students differed from person to person. Personal tuitions and different academic pursuits also affected their efforts for project development. Usually more care could be given to the projects but the students were not able to do so due to their regular studies. The students found very less time to school home work and for preparing for the competitive examinations. The project expenses, time constraint and the unavailability of the resources made the project work a costly affair.

Evaluation Procedures of the Project Work

It was found that most (121) (82.31%) of the students were aware about the weightage of marks assigned to the projects in final assessment, whereas some (16) (17.68%) of the students were unaware of the same.

According to the students point of view it was found that most (139) (94.55%) of the projects were regularly assessed by the teachers while very few (08) (05.44%) projects were not assessed.

It was revealed that most (65) (49.61%) of the projects were assessed immediately after the submission, whereas many (63) (48.09%) of the projects were assessed within the time or term period. Very few (02.29%) projects were assessed at the end of the session.

It was ascertained from the student responses that many (96) (65.30%) a time feedback was given on the projects during assessment. Sometimes (51) (34.69%) no feedback was given.

It was found that majority (63) (60.57%) of the times oral comments or feedback was given whereas sometimes (31) (29.80%) written comments were given. Very rarely feedback on material resources was given.

It was evident that 88 (59.86%) students gave positive response stating that the teachers gave information on the assessment criteria of the projects, whereas 59 (40.13%) students gave negative response for the same.

It was established that many 87 (59.18%) students were satisfied with assessment, whereas 60 (40.81%) students were not satisfied with the assessment.

From the comments of the students on this issue it was revealed that the basis of project checking was specific. The teacher gave instructions about what they see in a project like hard work, efficiency, creativity and neatness of the project. The teachers discussed about the number of marks that were allotted to each part of the project. Over and above they also gave many hints and ideas to develop projects and to make them creative. The teacher explained the mistakes and supported them to improve the projects.

On the contrary to the above it was found from the comments of the students that the project making was a formality in work and in reality it was a copying and pasting job. They expressed their views that the innovative projects should be duly recognized and appreciated. The teachers must show the best projects to all. Further analysis of the students' comments revealed that the students had shown their concern to the **remarks** and **evaluation.**

The feedback in the form of **remarks** gave information about the quality of the project. The teachers identified the mistakes of the students and gave solutions as an alternative. The students expected that at least in the project work the reasons should be given for good or bad performance. The teachers verbally told about the projects only as a formality. But they should also take the projects seriously. Some teachers gave information and knowledge on projects and told the students about what was wrong in their project. Knowledge about different types of projects should be told to the students.

The students stated that during the **evaluation** the marks should not be given based on the performance in the theory subjects. At times the students got unexpected marks in the project work. The evaluation should be done impartially and remarks should be written unbiased. If possible the evaluation was to be carried on in front of the student.

Preservation and Maintenance of the project work

It was found that most (110) (74.82%) of the students mentioned that the schools had retained the projects whereas some (37) (25.17%) students stated that the schools had returned the projects to them.

It was revealed that the reasons for retaining the projects by the school projects were to be used as a teaching aid (31.49%); to be shown as a model to the other students (26.51%); because it was a good and a rare project (22.09%); and that the project might be used as an exhibit in the forthcoming Science Exhibition/Science

Fair. Over and above it was also confirmed they were also used as secondary raw materials (thermocole sheets, cardboards, files) to make new projects.

It was made certain by the students that the different means of project preservation and maintenance were to be used as wall posters (15.66%), to be maintained in the Science laboratory and Science club (14.97%); to be kept under the subject teacher's control (14.74%); to be used as teaching aids (13.59%); to be kept in the general classroom (09.21%); to be kept as exhibits (08.75%); to be handled with proper care (07.37%); to be recorded and saved as documents (06.45%); to be recorded subject wise and term wise (05.52%); by frequent dusting (01.84%); by reorganizing and rearranging (01.61%) and by the use of chemicals like insecticides/naphthalene balls (00.23%). Besides this they were also stored as scrap to be disposed off later.

Step up of the Project Work

The student responses confirmed that the project work could be improved if the following 10 areas were given due attention.

The first area for improvement was about **Information and guidance.** Prior information and knowledge about what a project is and what the students are expected to do should be made clear to the students. Besides this information on procuring the resources (instruments/objects) and access to the internet browsing are required. Sufficient time should be available to concentrate on the project. Information on approximate expenses that might be incurred on the project must be known. More instructions are required followed with periodic discussions with the teacher. Proper guidance is needed if the students encountered any problems.

The second area was **availability of the resources** for project improvement. It was found that the schools should take the students to different places of scientific interest for creative project works. They affirmed that the projects were not for simply gathering information and copying in files and notebooks. Material resources like instruments, equipments and apparatus were to be made available in the school. Extra period in the time table; access to internet browsing; software like Encarta and on line encyclopedia were mandatory. Besides this enriched library facilities with the latest references were needed. It was demanded by the students that the subject teachers should also have a set of 6-7 good reference books in their discipline. They reaffirmed that good projects could be made in less time if all the resources were available.

The third area was about **assignment of the projects** to the students. It was found that the students preferred the projects that would provide some good experience. They should be based on some new topic and logic. They urged that all projects were to be given in the beginning of the session to avoid stress during the tests and examinations. Models were to be given in groups whereas the other types might be given as individual projects. The projects were to be given according to the choice and caliber of the students. The students requested that the quantity of home work need to be reduced when the projects were being done by them. They students mentioned that through the projects they should be able to develop their personality.

The fourth area was on the **weightage of marks** that were to be given to the projects. The students demanded increase in weightage (percentage) of marks to 10%.

The fifth area was about the **time** on which the students focused to improve the project work. They demanded that compulsorily special and sufficient time should be given in the school so that the students get immediate teacher help in the school itself. They reiterated that provision of such extra time would help them to work, to gather information and to compile the project presentation.

The sixth area was on **finances**. The students stressed for innovative, creative and low cost projects. The students can manage with less money, school help financially needed, they say give the receipt, but when we show them that the reply is that the procedure is too long for claiming money and at that student looses hope of getting money back. Projects should not to be a burden financially or mentally. Projects to be economical, so in groups we can save, teachers to guide and pay attention to students and tell how to improve projects.

The seventh area was about the **number** of projects that were given to the students. In this regard it was found that the students demanded for one individual project and one group project per subject per year. They mentioned that the projects were not to be given in every term and during the examinations.

The eighth area for improvement of the project work was on **evaluation** of the project work. It was urged by the students that the teachers should evaluate the projects judiciously and impartially. They demanded constructive remarks to promote the excellent students and to encourage the students whose performance was poor. Teacher's remarks and feedback helped them to prove themselves. Assessment should be done based on the quality of the project.

The ninth area for a step up in project work was on **utility** of the project works. The students claimed that the projects helped them to improve their time management, reference and conversation skills. The projects not only enhanced the knowledge but also built up the confidence of the students. Besides this they stated that the group projects helped for better job completion.

The tenth and the last area on the project improvement were on some **assorted points on the nature of the projects.** It was found the projects should be compulsorily given but in adjustment with the other academics, home work and preparation for competitive examinations. Accordingly little home work was good. The students plead that old and repeated projects should be given to them. Most of time the projects are in the form of power point presentations but other types projects on current topics to capture the attention of the students are demanded. Old and repeated projects are tiresome. Projects on computers should be encouraged for all. The teachers and the government must take special steps to motivate the students to make exemplary projects. Good projects should receive prizes and the students should be congratulated and encouraged so that others would also be promoted for the same. Projects must be given individually to know caliber and performance of the students.

4.8 Discussion

The ideas from the research studies and findings of the present study are pooled together to discuss on the present study.

The students adopted the policy of think, plan and proceed in project development. They made proper ground before making the projects. They accumulated the resources in the form of notes, library references, information from the internet and the school laboratory. Later on they prepared a flow chart/diagram outlines and proceeded. Mostly the students preferred simple projects like writing an assignment for a project or preparing a power point presentation. Probably this helped the students to learn more as the topics of the projects were more based on the content.

It may be noted that only five teachers out of 31 have undergone the in-service training course, ‘Getting Started With Project’ (GSWP) organized by the KVS, New Delhi, in May 2009. The teachers demanded that such kind of training programs must be organized periodically. The teachers made a statement on the application of this orientation that it was highly effective to and helpful for project work evaluation. As very few teachers had attended such good training program, there is a dire need for the organization of such programs to the teachers. According to the view of **Bencze, et al, (1981),** undoubtedly the pre service orientation or training programs are beneficial to the teachers. In fact the NIE, of CNERT also takes up training, research and developmental activities for the teachers and the students. Continuous and comprehensive evaluation emphasizes the formative and summative evaluation where the projects are one of the tools for formative evaluation. However, the teachers are trained in this regard.

Moreover the initiation of the concept of Mathematics Laboratory by the DESM, NCERT helped the teachers and the students to generate ideas for project development. Now almost every CBSE school had established the Mathematics Laboratory within its school.

The material resources which would help in the project development are inadequate. The text books also do not contribute much in this regard. There is no exclusive syllabus meant for project development. But the teacher handbooks on environmental education and the manuals on the continuous and comprehensive evaluation do discuss about the salient features about the project along with the evaluation criteria. These documents could be considered as a supplement to the knowledge and information the project work as they are meant for the secondary schools. Rather such subject wise guidelines are necessary for the higher secondary Science subject, i.e. Mathematics, Physics, Chemistry, Biology and Computer Science also. Guidelines to teacher in evolving environmental education related projects at +2 level are given in the handbooks.

The students are assigned one project per term in each subject. Therefore for all the four compulsory subjects at +level other than the languages, the number of the projects that are to be completed comes to a sum of 12 (four subjects and three terms) in an academic year. As per the findings of the study the most of the students had completed at least one project in each of the subjects. As the data was collected in the month of November and December, 2009, almost the second term was running. Therefore most of the students could complete one project. However, majority of the students had also stated that all the projects might be given in advance before the vacation period so that they could develop the projects and submit on time. Moreover the vacation period might be used for proper organization and presentation of the project. In this context the CCE guidelines also stress the need for distressful and joyful learning. It may be also noted that more number of projects are done in Physics and Chemistry. The reason for this could be that these two subjects are common to both the Mathematics and Biology subject students. Another reason to this could be that the students had stated that adequate resources are available in these subjects. According to the guidelines of JNNSEC, each school could participate in the exhibition with a maximum of two projects/exhibits on any of the themes following the stated themes.

The most common form of the projects developed by the students is in the form of written assignment, power point presentation and chart work. Probably the resources used in the development of these materials are easily available and are cost effective. The files and folders, papers, CDs, etc. are used for project development. File work was mostly on topics like biography of some Mathematician or derivation of some mathematical formulae. Moreover the students prepared power point presentations on the basis of the text content. Therefore this could be also used by the teachers as teaching aids. Even the students could use this material as learning material before the examinations. The charts were mainly in the form of depicting flow charts, logarithmic tables, pictures, diagrams, graphs, etc.

Only some students chose to research based investigatory study projects. Very rarely challenging and encouraging projects were taken up by the students. JNNSEC also emphasized and invited such investigation based (research) projects for exhibition. The items of the school kits designed and developed by the NIE also open up scope for variety in projects. Owing to the theoretical work load and the stress of the forth coming competitive examinations probably made the students to chose simple type of projects like file work, chart work and power point presentation which consumed less time. A variety in project making could be also brought in by periodic visits to local scientifically significant areas like Science City, Science Park, Science Museum, etc. Along with the project work of the students the teachers are also promoted to take up the development of technology based teaching aids for display in the JNNSEC. Awards and certificates are given to all the participants of the exhibition.

Most of the students encountered problems in project development. Particularly in group projects there were differences of opinion in relation to material collection, design of the project and time allotment to the project. This usually delayed the project completion on time. Time was another major constraint to the students. The vast syllabi and the urge to compete in the competitive examinations probably leave the students stressed. The students also made it clear that the weighate of marks allotted to the projects was very less; therefore they thought that much attention need not be paid to it. Technical constraints in the form of low typing speed, to browse, to select to edit, to compile on the computer was difficult to the students.

Most of the students affirmed the utility of the project works. Critical thinking and creative abilities were developed through the projects. In terms of relating the theory with the practical the projects proved to be highly beneficial to the students. The projects helped the students in reducing the learning gaps. They learnt the cognitive skills like computation, conversation and communication and presentation. Technical skills like arranging, assembling and manipulating were learnt by the students. Moreover social skills like cooperation were developed. Leadership qualities were built in group projects. The students learnt to work with team spirit in groups. In fact all domains were involved in project work, like learning, communication and training in scientific method (Cognitive domain), development of scientific attitude, interest and scientific temper (Affective domain) and experiential learning with hands-on minds-on activities (Psychomotor domain). Through the project work the students were inspired to learn more beyond the text books. They mentioned that through confidence building they would succeed in life in future. On the contrary some students stated that probably projects are simple copy and paste jobs.

Interest of the students can be capitalized with varied activities of the classroom. Most of the students showed interest in the project development. They mentioned that they appreciated the projects that they did as good. Projects are a part of the curriculum also. Owing to the enormous uses of the project work probably the students showed interest in the project work. Other than the routine studies the projects are change for the students to learn. Projects gave the students hands on learning experiences. Moreover according to **Lam Sherif (2009)**, the teachers and the students are intrinsically motivated through the projects. Most of the projects are in the form of power point presentations and file works. Therefore these could also help the students to show interest in the projects.

Majority of the students mentioned that as projects are a part of the curriculum, they need to spend money and money on them. Moreover knowledge is more important than money. They stated that time and money are to be spent to achieve success in good projects. According to them wonderful learning experiences are gained through the projects to succeed in their future lives. The students spent money mostly to buy the material resources like, drawing sheets, thermocole sheets, cardboard sheets, CDs, color papers, files, folders, and simple stationery items like color pencils, sketch pens, pins, clips etc. Moreover they also spent on cyber café for internet browsing. Parents were the major resources for monetary help for the students. In group projects they collected the amount from the members of the group. They minimum amount of money spent by them ranged from rupees 20 to rupees 50, whereas the maximum ranged from rupees 100 to 2000. Money was a constraint for some students. Some students were of the opinion that time was crucial for them to study. Projects could be also made from low cost materials or through recycling of the materials.

Time was one of the major constraints in development of the projects both to the teachers and the students. The socio economic aspects were one of the major hindrances in the project development. Of course expenses in the form of money were compulsory for good projects. Availability of the material resources in the form of laboratories, books and software are needed for good project preparation. Laboratories might be considered as the workshops for the activity based learning. The teachers did faced problems with deficiency of the laboratory assistants by which they were overburdened. Certain problems in development of the project work are overcome by the students themselves by discussing among the peer group. This view was supported by the study conducted by **Barak, Moshe; Zadok, Yair, (2009)** that the students often came up with inventive solutions to the problems by intuitively using the diverse kinds of heuristic searches.

The KVS dispatch with reference number F.64-1/2007-08/KVS(AR), dated 04.02.2008 confirmed that the weightage of marks assigned to the projects was reduced from 10% to 05% in the final assessment through its Amendment in Article 106(A) and (C). At present for higher secondary level Science stream students only 03 marks are allotted for the project work. Most of the students were aware of the weightage of the marks allotted to the projects. The projects were regularly assessed by the teachers almost immediately after submission. The assessment of the projects was followed with feedback mostly with oral comments. Sometimes the teachers discussed the evaluation criteria of the projects like initiative, cooperativeness and participation, creativity in presentation, content, observation and research done. After assessment the projects were returned to the students. Only the best, rare and the costly projects were safely preserved by the teacher. Probably the projects were retained by the teachers so that they could be used as teaching aids or to show as sample copies to the other needy students. The good projects which were retained by the school in the form of charts or posters are hung in the classroom. Some were also kept under the custody of the concerned teacher. Some are stored for future reference and records. The document analysis also confirmed that at least five best projects could retained by the school authorities for further reference and submission during inspection.

4.9 Retrospection

Science teaching should extend beyond the school and prepare the students to meet the challenges of life in scientifically and technologically advanced society. To achieve this goal, our science classrooms should become mini-laboratories where focus is shifted towards reflection on science content through productive peer interactions, inquiry approach, divergent student responses, reflective thinking and problem solving. As a result, students will become increasingly effective problem solvers, more reflective and rational in life situations, they will be able to solve more and more complex problems with greater independence and self-confidence.

In this context focusing on the role of the teacher it may be stated that the talent of the teacher matters in bringing about an ‘Excellency’ in the academic area of the institution. The educational qualifications and the teaching experience make them to stand as a ‘key stone’ in building the heightened arches of the student lives. Moreover the teachers are assumed to be in the role of a second parent at school satisfying the knowledge hunger of every student. Therefore it is imperative that updating the knowledge and skills in the respective subject area is a primary necessity. This helps in imbibing the teacher values by the student community.

Chapter 5

SUMMARY

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SUMMARY

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Chapter V

SUMMARY

5.0 Introduction

In the light of the interpretation of the data, conclusions and generalizations are formulated. This final step of research process demands critical and logical thinking in summarizing the findings of the study. Therefore the entire study that was conducted is presented in a nut shell in the forthcoming paragraphs. Suggestions in the form of scope for further research and the recommendations supplementing the subject under study are also given at the end of the chapter.

5.1 Purpose of the Study

The purpose of the present study was to find out the present status of implementation of Project Work in CBSE affiliated schools at higher secondary level in the Kachchh District. Looking into the purpose of the study, the following paragraphs elaborate the same.

A strong foundation in science education, which begins in the early years, enables the students to increase their knowledge, skills and understanding of the world in which they live. Therefore, all the students should have an opportunity to become scientifically literate. This effort must begin in the early grades when students are naturally curious about the world around them and eager to explore it (National Science Teachers Association, 1998). An understanding of science will occur when students have active and rich learning experiences with the natural and technological world. Under such circumstances, the students may learn and build their understanding through simple investigations.

When the student learning experiences involve process skills in organizing information, thinking critically and applying knowledge to new situations, they develop a firm content base for effective problem solving. Such problem solving could occur by determining how connections between bulb and battery produce light, and the duration of sustaining light. These learning experiences bring the hands-on world into the classroom.

Indeed the students have natural capacities for inquiry which can be seen when they observe, sort and categorize objects. Their ability to inquire becomes more experimental and is much more advanced than simple tests. Students generate simple hypotheses, conduct tests, and record and analyze the data to find evidence for supporting or not supporting the original hypothesis (National Science Teachers Association, 1998). An illustration of this could be that the students are provided with the challenge of building a bridge, from a variety of materials. The goal of this project is to determine the maximum number of objects the bridge can accommodate. The students are given several parameters to adhere to while building the bridge. After completion of the bridge, the students test the bridge by determining which one would hold the most weight. Then the students record the data of the performance of each test.

This undertaking of a learning project can be flexible: the investigations can be done by an individual student, a team of two, a small group, or the entire class. The project is a relatively long-term investigative study from which students produce something called culminating presentation. It is a way for the students to apply what they are learning. The culminating presentation is a final presentation that usually includes an oral and written report accompanied by a hands-on item of some kind (e.g., a display, play or skit, book, song or poem, multimedia presentation, diorama, poster, maps, charts, models and so on).

Accordingly, the concept of project work has been defined in different ways. As per the International Dictionary of Education, (G. Terry Page, J.B. Thomas, and A.R. Marshall, 1977) a project is

1. A general term for a task or activity undertaken by a student or suggested by a teacher.
2. A specific term for student activities which have many of the following characteristics:
    a. Originating as the result of natural curiosity,
    b. A concern for the development of attitudes and skills rather than specific knowledge,
    c. Presentation of the work in a form and manner determined by the student, at his/her particular level,

d. A guidance and resource role being played by a teacher as opposed to a didactic or authoritarian role and
e. Organization of the work and responsibility for learning are determined by the student rather than the teacher.

In fact, project method is a teaching strategy characterized by the project work. Through the project work the students involve themselves in engagement and exploration, in analysis and explanation, and in application and extension. It is a multifaceted activity that involves making observations; posing questions; examining books and other sources of information; planning investigations; reviewing what is already known in light of experimental evidence; using tools to gather, analyze and interpret data; proposing answers, explanations, and predictions; communicating the results; identifying assumptions; using critical and logical thinking; considering alternative explanations (National Research Council, 1996).

The project work is thus a curricular initiative, attempting to shift emphasis from testing to holistic learning. It aims at creating good citizens possessing sound health, appropriate skills and desirable qualities besides academic excellence. It is hoped that this would equip the learners to meet the challenges of life with confidence and success. The objectives of the project work are:

- to help develop cognitive, psychomotor and affective skills,
- to lay emphasis on thought process and de-emphasize memorization and
- to make the process of teaching and learning a learner-centered activity.

In this context, the following major recommendations of the Secondary Education Commission (1952-53), showing their concern regarding the methods of teaching in schools is focused.

1. They should aim not only at mere imparting of knowledge in an efficient manner, but also at inculcating desirable values, proper attitudes and habits of work in the students.
2. The emphasis in teaching should shift from verbalism and memorization to learning through purposeful concrete and realistic situation and, for this purpose, the principles of “Activity Method” and “Project Method” should be assimilated in school practice.

3. Students should be given adequate opportunity to work in groups and to carry out group projects so as to develop in them the qualities necessary for group life and cooperative work.

5.2 The Rationale for the Study

Science has a profound impact on one's individual life and culture. It plays a prominent role in almost all human endeavors (American Association for the Advancement of Science: Atlas 2001). The foundations of Science education would help students become responsible citizens, aid in decision-making and problem-solving, and care for the community in which they live. Accordingly, today's instructional strategy needs a paradigm shift in the process of instruction. The academic progress of a learner largely depends on the instructional strategy that is being followed or adapted in the educational system.

The foundation laid at school stage in general and at higher secondary stage in particular, equips the students with the basic knowledge of the concepts, their application, skills and attitudes towards making meaningful contribution in any field they choose. Therefore, education at this level has to focus on knowledge, skills, attitude and entrepreneurship. In order to equip the students to cope with the changes and challenges in life, it is essential to appropriately emphasize and carefully nurture the cultural and ethical values as well.

As stated earlier, the higher secondary stage of education offers maximum challenge in many ways. This is considered important as it offers diverse choices of study streams to the students according to their need, interest and aptitude. Passing through the crucial years of adolescence to youth, this stage may be the end of their formal education leading to the world of work; for others it may provide a foundation for higher education. They may either choose specialized academic courses or job oriented vocational courses. Therefore, the Education Commission (1964-66) made an emphatic recommendation about introducing a uniform pattern of school education in all States and Union Territories (the 10+2 structure). The importance of higher secondary stage of education as terminal stage for a large number of the student population and also as a feeder stage to professional education cannot be underscored.

Thus, the learning activities which boost up the goals relating to understanding, skills and attitudes are to be planned and executed to help the students.

Student goals are most efficient in directing energy over a period of time when they are in the form of a project to be completed, a problem to be solved, a higher level of skill to be reached. The students vary in many respects in maturity, capacity for learning, methods of work, intensity of motivation, and achievement. Therefore the activities which implement a developmental sequence in learning and at the same time take individual differences into consideration must necessarily be provided. A scope for such vital instructional methods for appropriate student participation in making and executing plans is essential.

Achievement in Science stream courses is highly significant at higher secondary level since it provides a base for higher studies. This in turn is inevitable for admission into various medical and engineering professions. In addition to this it is the potentiality of these subjects which creates multiple job opportunities. As a prerequisite for attending entrance examinations of many professions, the students choose Science group. Rote memorization of scientific facts devoid of meaningful understanding influences negatively on thinking capacities of the learners. So, the science teaching and achievement especially at this stage are to be scrutinized and redefined with broader perspectives.

This would automatically open up more opportunities to the students to expand and diversify their interest and find avenues for the exhibition of their talents. Since during these years of their lives, students step into the first few years of adolescence, it is the most appropriate stage for channelizing their energy. The schools need to take the responsibility in providing greater opportunities to learners to build desired life skill and empower them to take informed independent decisions.

But unfortunately, most of the teachers are not trained for teaching at higher secondary level. The postgraduate teachers are appointed with a minimum qualification of post graduation degree in the relevant subject and a bachelor's degree in education with the relevant methodology at the secondary level. The teachers are usually trained to teach only the secondary section by most of the teacher education providers. But the teachers may later on get a chance to teach the students of +2 level. Under these circumstances, whatever the teachers learn during their training is in fact relevant to secondary sections only. However, the same methods are adopted in teaching higher secondary classes also. The teachers may be under pressure to cover the vast syllabi. Many important aspects of learning such as practical and field trips; ways of learning such as reference work; project work and presentations are not fully utilized in the absence of enough guidelines provided to the schools for carrying on the project work, to the detriment of overall learning. Well-equipped laboratories, libraries, and unlimited access to internet browsing and clear guidelines for the effective implementation of project work are essential. Accordingly all efforts must be made to ensure that schools and junior colleges are well equipped with such resources. Therefore, the research based evidences were needed to throw more light on the present practices of the project work at +2 levels.

In the context of the literature reviewed by the researcher, it was clear that these studies were undertaken mainly in the area of methods of teaching in Science classrooms at primary and secondary levels. From +2 level points of view, the picture regarding the project work in Science streams was not satisfactory. The earlier research works undertaken concentrated mainly in the area of Science teaching, Science teacher behaviors, correlates of Science achievement, infrastructural resources available in terms of man and material. It was found that there was a trend from 1968 onwards to conduct studies mainly related to methods of teaching, various effects of methods of teaching and a comparison of different methods of teaching. This was observed in the research work conducted by **Kamala Kanthan, T. S. (1968), Jha, I (1979), Mohammad Miyan (1982), Gangoli S.G. and Gurumurthy, C. (1985) and Prabha Rashmi (1992).** However, from 1988 onwards in addition to this trend the effectiveness of different methods of teaching, evaluation of these methods and problems of teaching Science at higher secondary levels were investigated as observed in the work of **Sundararajan, S. (1998)** and **Alexander, P. (1989).** As observed by **Ekpo, Johnson, (1991)** the students lacked the laboratory skills.

It was also noticeable from the findings of a study conducted by **Umashree, P.S. (1999)** which revealed that the learners were not assigned any project during the Science curriculum transaction. It was only in **NCF for School Education, 2005** that the organization of curriculum at higher secondary stage has been covered for the first time. The emphasis was given to the modern methods of teaching at higher secondary level. Under the circumstances, the researcher as well as teacher educators have clues to know the answers for the natural questions often asked.

- What is the present status of practices of project work at +2 levels?
- Does the project work make any difference in extending the knowledge horizons of the students?
- What are the objectives of incorporating projects in schools and how far have they been achieved through the curriculum transaction in a particular subject like Mathematics, Physics, Chemistry and Biology?
- What are the basic parameters for implementation of the project work?

The introduction of project method at +2 level being a significant phenomenon in the system of education and it is quite essential to conduct a study to find answers to all the above posed questions. They might develop an insight into the present practices of implementation of the project work for future policies in terms of planning, management and organization at higher secondary level.

In the new millennium, there is change in the trend of activities taken up in the methodology of teaching learning process and the learning experiences provided in this context. Dewey (1916) has said, "when a pupil learns by doing, he is re-living both mentally and physically." There is an ensured need to look into the specific modes of providing learning experiences such as the project work relevant to the subjects at +2 levels as well as the real life situation. The project work is also considered as a part of curricular activity based on the time and need especially at the school exhibitions and science fairs. The project work did not carry any significance from the examination point of view. Under the recent circumstances and in the absence of enough research based evidences in Indian context, it opens up a new research area to study the implementation of project work at +2 level.

In the context of the above aspects, the investigator felt that the area of implementation of the project work has not been much explored. There is a dearth of studies and a clear gap exists in research and documentation in this significant area of education. Hence the need for research in this area is an imperative concern that merits immediate attention and action. Present study would be measurably a significant contribution to the same. After having realized the potentialities involved in the project work, the researcher feels to explore the possibilities of implementation of the same. Hence, at this crucial junction, the researcher proposed the present study to deal with the implementation of the project work in the CBSE based schools at higher secondary school level exclusively in Science stream in Kachchh district of Gujarat state. This work would open before us a door of enormous possibilities in a challenging way.

5.3 Statement of the Problem

Present status of implementation of Project Work in CBSE schools at higher secondary level in Kachchh District

5.4 Objectives of the Study

1. To study the set criteria in implementation of project work in CBSE schools
2. To study the practices of implementation of project work in CBSE schools at higher secondary level in terms of
    - The orientation given to the students and the teachers
    - The number and variety of projects given to the students in relation to the content matter of each subject
    - The problems encountered by the teachers and the students
    - The evaluation procedures
    - Preservation and maintenance of the projects
    - Further utility of the projects in life by the students
3. To study the students' opinions about the project work in relation to
    - availability of time
    - usefulness of the projects
    - interest
    - socio economical aspects related to the projects
4. To judge the present practices in the context of set criteria for implementation of project work

5.5 Explanation of the Term

Project Work

The term project work consists of two terms: Project and Work. Here the word project means a curricular-based activity given to the students, enabling them to develop their ability either individually or in groups. The term 'project work' encompasses the meaning of both the process and the product.

5.6 Delimitations of the Study

The present study is delimited to the CBSE affiliated schools in Kachchh District, Gujarat. Only Class XI Science stream students and the teachers teaching at higher secondary level for Science stream of these schools were considered for the study.

5.7 Procedure of the Study

The present research study design is a descriptive survey. Descriptive survey determines and describes the way things are. It provides necessary and valuable information to the organizations whose operations are closely related to the subject under study. The purpose of present survey is to reveal the present scenario of implementation of the project work in Kachchh district, Gujarat to furnish the evidence for future planning and decision making to bring betterment in its present state and future perspective. Therefore all the details about the implementation of the project work were mandatorily explored. In this regard it was imperative to analyze the documents that were relevant to the research that was undertaken. In addition to this the reflections of the teachers and the students those who were in immediate touch with this research area were also gathered.

A document according to **Lincoln and Guba (1985)** may be defined as "any written or recorded material" not prepared for the purpose of the evaluation or at the request of the inquirer. One of the purposes of analyzing the documents is to describe the prevailing educational practices or conditions (Best, J. W. & Kahn, J. V., 1989). The documents formed an important source of data that were relevant to achieve the objective of the set criteria in implementation of project work in CBSE Schools. As stated above, for achieving this objective, different types of documents that have discussed the issues pertaining to the subject under study were considered. These documents were thoroughly analyzed from the academic years 2003-04 to 2011-12 in order to understand the subject intensively. The analysis was concerned with the explanation of the status of the said phenomenon.

The archives of CBSE website have a store of all the documents/circulars from the year 2003 to till the date. These circulars have been dispatched to all its affiliated schools. The researcher had gone through all these circulars systematically and downloaded the documents pertaining to the subject under study. Apart from this the researcher had also collected CBSE Circulars; KVS Dispatches; CBSE Guidelines for the Jawaharlal Nehru National Science Exhibition for School Children; Compendium; Annual Reports, NCERT; CBSE Curriculum for Senior Secondary Sections in Science Stream; Textbooks; Teachers' Handbooks; Manuals and NCERT School Kits. As the study was conducted on the higher secondary school students following CBSE syllabi and those who were in Science stream, all the relevant documents were mainly surfed from the CBSE, the NCERT, the KVS and the Department of Secondary and Higher Secondary Education, under the Ministry of Human Resources Department and the associated web sites. The objectives of the study were kept in view while collecting the documents.

Apart from the accumulation of the documents, the researcher also constructed two separate questionnaires for the teachers and the students. Both the questionnaires contained the closed and the open-ended items. The items of both the questionnaires helped the researcher to gain sufficient amount of data substantiating the second and the third objectives of the research topic.

According to the feasibility and with the consent of the heads of the concerned institutions the data were collected from the teachers and the students. The investigator administered the tool personally under natural conditions and got reliable data. The teachers and the students responded to the evaluation instruments, i.e., two separate questionnaires.

The population for the present study includes all the schools affiliated with the CBSE and where +2 level Science Stream is available in the Kachchh district during the academic year 2009-10. The teacher population includes all the teachers those who taught Science stream students at +2 level in these schools. The student population includes all the students those who studied with Science stream at +2 level in the same schools. The sample includes all the teachers of higher secondary schools and all the students of class XI Science stream. The schools situated in Kachchh District were selected purposively according to the feasibility and with the consent of the heads of the concerned institution.

5.8 Major Findings

The documents in relevance to the implementation of the project work were content analysed along with the data collected from the teachers and the students. This data analysis helped to arrive at certain findings. The major findings thus arrived at from this analysis are presented in the following sections as given under.

- Major findings based on the documents analyzed
- Major Findings Based on the Data Analysis of the Teachers' Questionnaire
- Major Findings Based on the Data Analysis of the Students' Questionnaire
- Major Findings Based on Judging the Present Practices in the Context of the Set Criteria for Implementation of the Project Work

5.8.1 Major Findings Based on the Documents Analyzed

The findings based on the document analysis in relation to the implementation of the project work are given in the following paragraphs.

It was found that only one circular was released in the academic year **2003-04** which gave detailed guidelines on the project work for the students of class XII in Accountancy subject. Besides this it was found that the in **2004-05,** the circulars paid attention on the following areas:

a) Organization of the Regional Level and National Level CBSE-INTEL Science Exhibition Competition,
b) Provision of the opportunities to carry out project work to the students to use the time available at home in the form of alternatives to home work and
c) Provision of guidelines for effective implementation of the Project Work in Social Sciences.

It was found that 2005, being the year of 'Scientific Awareness' the CBSE had organized the Science Exhibition in collaboration with the INTEL for the first time. In Social Science education the projects were introduced to make learning more contextual, relevant, updated and centered on learning to be. In standard IX and X the projects were allotted five marks in each class.

It was found that the circulars released in the academic year **2005-06** emphasized on the implementation of the scheme of evaluation in Social Science in project work and learning. The salient features on project work were reiterated. The report of the project work should be hand written and restrict to 09 to 15 pages of A4 size. The projects need to be original, creative and innovative. Distribution of marks on project should be based on initiative, cooperativeness and participation; content accuracy and research work; creativity, originality; analysis of different situations and different perspectives; and viva or written test for content assimilation. The project reports need to be retained by the respective schools. They were to be submitted at the time of inspection/supervision by the Board. Simultaneously, the learning should also be made distressful, relevant, enjoyable and useful. Ultimately it should lead to the student involvement and participation in learning in order to avoid the learning gaps. Seriousness in evaluating the project work should be brought in because the students go through the documents, collect the relevant materials and analyze them to arrive at their own findings and conclusions. Boosting of internal marks should be avoided so as to evade the downscaling of internal marks.

It was found that in the year **2006-07** the circulars pointed out more specifications on implementation of project work. The circulars restated the seriousness in following the revised guidelines in internal evaluation of term and unit tests; assignments; project work; and maintenance of records. The revised topics and themes of the projects and a list of the suggested projects for class IX and class X were also specified.

It was found that the aspect of organization of the Regional Level and the National Level Science Exhibition for the year 2007 was marked in the circular with number 16 with reference number CBSE/ EO (Science)/ Sc.Exh./ 2007/145-9144, dated 14.03.2007. It added a new dimension in the list of the exhibits/modelsin the form of an investigation-based study report and a working model. There was an increase in the registration fee which rose from rupees 100 to 400. The best 20 exhibits/models/students from the National Exhibition would be awarded or given cash prizes.

In **2007-08,** it was found that the circulars reemphasized the significance of organizing Regional Level and National Level Science Exhibitions and paid attention to the organization of the same for the year 2008. It stressed that the foundations of scientific mind and thought are laid during the formative years of school education. .

Through these circulars it was found that greater emphasis was focused on the investigation-based innovative projects of students to kindle curiosity, originality and interest in the subject. Percentage wise distribution of marks for different criteria was displayed.

It was found through the circulars in the academic year **2008-09** that they expressed their concern over the guidelines for project work in Sociology in classes XI and XII. 20 marks were allotted to the practical project work whereas 80 marks were allotted to the theory work. Both of them were to be externally evaluated. .

It was established that the project work from Disaster Management would be from that area from where no assignment was done. Once the project was made it would be presented through interaction sessions like exhibition and panel discussion. The focus was to use eco friendly materials for project making with less expense. A hand written project report of 15 pages submitted by the students should be recorded for six months for further inspection and supervision, if any. A tentative list of topics/ themes for projects with a note to the teachers was supplemented.

It was found that a new initiative of establishing Mathematics Laboratory was taken up in the year 2003 to make Mathematics learning joyful and fun-filling. Through circulars, guidelines and orientation programs, 10 activities based on different concepts of Mathematics syllabus were in use.

It was found through the circulars released during the year **2009-10** that they focused on the issues of participation in Regional Level CBSE Science Exhibition-2009, examination reforms and continuous and comprehensive evaluation (CCE) in the CBSE affiliated schools. **Projects** were considered as a means of formative evaluation in CCE. Under group activities preferably in groups of 4-5 students, **investigatory or experimental projects** may be planned. The areas of assessment might include inquisitiveness of the students to quest, to observe, to think, to analyze, to apply, to comprehend, to compute and to conclude.

It was found that the circulars released in the academic year **2010-11,** discussed in detail about the Regional Level/National Level Science Exhibition 2010. It included all the aspects of the exhibition. Through the second document, it was requested to give publicity to the IGNITE competition amongst students, teachers and parents so as to activate the creative instinct in children to find solutions to the day-to-day problems. Every class teacher was persuaded to motivate students to pursue innovative ideas and projects during summer vacation. Further schools were also requested to start the Honey Bee Creativity Clubs (Clubs in school that promote creativity and innovation among children, projects done/ideas and innovations conceived by student members of the club may be linked to NIF during the IGNITE campaign or otherwise) as part of their enrichment activities if they have not already initiated action in this regard. In addition to this the schedule of the Regional Level CBSE Science Exhibition 2010 were pronounced along with the key parameters of participation.

It was found that the circulars issued in the year **2011-12** focused on the issues of organization of CBSE Science Exhibition – 2011 and 2012, participation in the regional Level CBSE Science Exhibition – 2011, clarification in evaluation scheme for class XI and XII practical examination in Physics and provision of Project Work in Business Studies for class XI and XII with effect from the academic year 2012-13. Details on practical examination evaluation for senior secondary classes like experiments, activities and project work were discussed. The details of records in practical examinations in XI and XII in Physics and the modification in the scheme of evaluation of this practical examination were discussed at length.

It was found through these circulars that as business were a dynamic process that brings together technology, natural resources and human initiative in a constantly changing global environment. With the purpose to understand the framework within which a business operates, and its interaction with the social, economic, technological and legal environment, the CBSE had introduced project work in the Business Studies Syllabus for Classes XI and XII. It was apprehended that this would provide the senior secondary students with a sound understanding of the principles and practices bearing in business (trade and industry) as well as their relationship with the society.

It was found that the objective of doing the project work in Business Studies and the role of the teachers were discussed at length. This was one of the first exhaustive circular wherein complete guidelines on implementation of the project work were in given to the teachers in Business Studies at higher secondary level.

It was found that the KVS is a premier organization in India administering Kendriya Vidyalayas (Central Schools) which are affiliated to the CBSE. It initiates and promotes experimentation and innovation in education in collaboration with the CBSE and the NCERT. In this regard, in addition to all the circulars released by the CBSE the Kendriya Vidyalaya Samithi also sends a copy of its **'dispatches'** to all the schools under its banner.

It was found that the **KVS dispatches** released in connection with the present study focused on the issues of organization of the State Level Science Exhibition for children 2007-08, 2008-09, 2009-10 and 2010-11, Amendment in Article 106(A) & (C) of KVS Education Code. The details on the themes and subthemes of the exhibition along with the participation parameters are discussed at length in these dispatches. It is noticeable that the contribution of the project work marks in session ending examinations was reduced from 10 to 05 as per the amendment Article 106(A) and (C) of KVS Education Code.

It was established that in order to ensure the widest possible participation and involvement of students and teachers in the Science Exhibition programme, the NCERT organizes **JNNSEC** in two phases.

It was found that in the first phase of the exhibition, the State Level Science and Environment Exhibitions for Children (SLSEEC) are held in all the States, Union Territories and other organizations like Kendriya Vidyalaya Sangathan (KVS), Navodaya Vidyalaya Samiti (NVS) etc. at District, Zonal, Regional and finally at the State level. These exhibitions are organized and monitored by the CBSE. The guidelines to these science exhibitions are issued by the CBSE well in advance to all its affiliated schools. These guidelines include the details for participation in the exhibition like the titles of the theme and subthemes, details of the registration and fee, date and venue of the exhibition, the number and nature of exhibits/projects. The participating schools are invited to prepare the exhibits/ projects on any one of the sub-themes satisfying one or more of the stated parameters. In fact the first phase of exhibition was a preparation for the second phase of exhibition.

It was found that in the second phase of the exhibition, the Jawaharlal Nehru National Science Exhibition for School Children (JNNSEC) or the National Level Science Exhibition is organized. The best exhibits selected from the entries at the State Level Science Exhibition are put on display at this exhibition. This exhibition is organized and managed by the Department of Education in Science and Mathematics (DESM), NCERT.

It was found that the CBSE publishes the **Compendium** of circulars issued to schools every five years. In 2005, ‘CBSE Update-Compendium of CBSE Circulars’ was published with six themes, viz., New Subjects, Changes in Curriculum, Evaluation, Support Materials and Publications, General and Enrichment Activities. In covered 67 circulars. Owing to the sheer number of circulars issued from 2005 to 2011, it was imperative to update it by including the important circulars issued on various subjects. The second publication of Compendium is available in two volumes and had been divided as per the themes. Some of the circulars enclosed in the Compendium in relation to the implementation of the project work were as follows.

- Project and Practical work in Accountancy for class XII
- Guidelines to Project work in Social Science
- Restructuring of Science practical work
- Continuous and Comprehensive Evaluation Regarding
- Introduction of Environmental Education as a compulsory subject in schools from Class I to Class XII
- Guidelines in Sociology (Code No. 039) subject for Project work and Marks distribution for class XI for the academic session 2008-09
- Project work Evaluation in Social Sciences
- Publication of the document ‘Science is Doing’ – an activity book for Class VII

It was noticed from the analysis of the **Annual Reports** that the JNNSEC were held at different States like Himachal Pradesh, West Bengal, Puducherry, Maharashtra and Chattisgarh. The number of the exhibits ranged from 150 to 160 and the total number of participants ranged from 310 to 330. The JNNSEC was organized in the months of November or December every year for six or seven days. An educational tour is also organized during these exhibitions.

Curriculum updating is a continuous process; as such the Board brings out the revised curricula every year. It is obligatory for the school and the students of a particular year to follow the syllabi, courses and the books prescribed by it for that year. The **Senior School Curriculum** comprises of two parts. The Part I of the curriculum speaks about the eligibility requirements, scheme of studies and scheme of examinations, whereas the Part II discusses the courses of studies in detail. The second part discourses about the languages and the prominent subjects like Mathematics, Physics, Chemistry, Biology, Biotechnology, Engineering Drawing, Home Science, Agriculture, Computer Science, Informatics Practices, Multimedia and Web Technology.

The prescribed **textbooks** are the sole basis of examination and it is one of the key reasons why other resources and sites of learning are ignored. The students are to be treated as participants in learning, not as receivers of a fixed body of knowledge. The text books included objectives in the form of key statements, diagrams, exemplary problems, historical details at required sites, scientific investigations and anecdotes, pictures of scientists at appropriate places, lesson end exercises and answers to some selected problems.

It was found that the **handbooks** for the teachers contained only exemplar projects in relation to the environmental education. Later on the NCERT made it imperative to develop a separate project book that would contain a wide range of projects. This project book would provide ample options to the students and teachers in the selection of the project to be undertaken. In addition to this, to ensure the continuation of proactive action towards the environment, NCERT proposed a project-based compulsory qualifying course comprising a core and projects for all students. These **project books** were to promote socio-cultural ethos which facilitated India's attempt to pursue the path of ethically sound and sustainable development. .

It was found that the activities included in **handbooks** provided meaningful interactions between the students and their world, encouraging sound scientific reasoning. The activities/investigations are preceded by a concise introduction to relevant concepts, to build their understanding. This resource contains illustrations and tables to guide students and teachers in carrying out the activities. To stimulate student reasoning, thought-provoking questions are included after each activity. Interesting and practical applications of scientific principles and concepts are introduced throughout the resource, helping students understand the relevance of environment to their everyday lives. Resources are based on learning theory, and are designed to stimulate student interest and involvement. As students engage in the activities of the project books, they develop higher order reasoning skills, and a deeper understanding of scientific concepts.

It was found that after the introduction of the Continuous and Comprehensive Evaluation (CCE) in schools affiliated to the CBSE in class during 2009-10, the Board felt it necessary to provide a holistic picture of CCE to all the stake holders particularly the teachers. Hence the Board had brought out **Teachers' Manuals** on School Based Assessment (SBA) – Class IX and X. Besides giving detailed information about the scheme of CCE, fundamentals of assessment of co-scholastic and scholastic areas, dimensions of school-based assessment and tools and techniques of evaluation for formative and summative purposes had also been included in the manual.

It was found that the **manuals** on Formative Assessment in the subjects of Hindi, English, Science and Social Science for class IX were detailed and exhaustive documents focusing on formative aspects of learning provided valuable guidance to the teachers in respective subjects. The nature of the projects, advantages of the projects, concerns regarding the projects and checklist for projects in different subjects were given. Suggestions for implementation of projects were as follows.

- Project topics should be decided or chosen, planned and conducted by the students largely with the teacher acting as a guide.
- Encouragement should be given to group projects. These would enable students to work together, share experiences and learn from each other.
- Keep on giving projects to the students to provide an opportunity to explore, investigate and work in groups.
- Children should be encouraged for judicious use of materials and keep them back after use.

It was found that the National Institute of Education (NIE) Workshop Department of NCERT, New Delhi is an independent department of NCERT. It was conceived in 1964 with a vision to build hands-on experience for meaningful education. Accordingly the focus of the NIE Workshop Department is to create activities that promise to motivate the students for significant educational experience in the field of science education in schools.

It was found that the activities which might be performed using the kits give scope for enhancing the skills of observation, tabulation and note taking. In addition to this some similar and open ended activities might also be planned with the help of these kit items. All the kits are supplemented with manuals.

5.8.2 Major Findings Based on the Data Analysis of the Teachers' Questionnaire

Analysis of the data on the teachers' questionnaire with respect to the implementation of the project work lead to the following major findings.

It was found that Mathematics, Physics, Chemistry and Biology teachers were Post Graduates in their respective subjects of teaching methodology with a professional degree of teaching, i.e., B.Ed. The Computer Science teachers were graduates with a Bachelors degree in Engineering or Masters Degree in Computer Applications.

It was found that there were seven Physics; eight Chemistry; six each in Biology and Mathematics; and four Computer Science post graduate teachers. The sum of teachers was 31.

It was found from the objectives stated by the teachers for assigning the project work was to focus on the significant relationship of theory with the practice.

It was found that lack of interest and resources stand as a barrier in completing the project work successfully.

It was found that 13 (41.93%) teachers have responded positively for having syllabi allocation for identification of the projects whereas 18 (58.06%) teachers have responded negatively.

It was found that the text books are the main sources for identification of the projects. There are no special syllabi or curriculum that is exclusively meant for project identification. It was found the Accountancy, Commerce and Geography subjects provided a list of projects that might be taken up by the students, whereas Science subjects did not.

It was found that the teachers selected the projects mostly based on the availability of the resources. The syllabus, performance of the student and the time affordable are the primary factors considered before selecting project by the teacher.

It was found that the specific reasons for assigning the projects to the students were to enhance critical thinking; to concentrate on learner based instruction; to integrate different skills; to give hands on experience; level of applicability of projects in real life and new situation; to inculcate social values; to use resources effectively; and to evaluate the student throughout the year.

It was found that 26 (83.87%) of the teachers gave a positive response for awareness of the set criteria in assigning the projects, whereas five (16.12%) teachers gave a negative response.

It was found that the set criteria explained by the teachers were the norms of KVS/CBSE; focusing on the learner; availability of the resources and utility.

It was found that only five (16.12%) teachers have undergone the orientation programs whereas 26 (83.87%) of the teachers have not. Two types of orientation programs were organized for the teachers. One was an in-service training course for teachers on project method of teaching entitled "Getting Started With Project" (GSWP) was organized by the KVS, Head Quarters, New Delhi in the month of May, 2009 for 21 days and another for 12 days.

It was found that after the orientation program of the teachers some 18 (58.06%) teachers oriented their students whereas some 13 (41.93%) teachers did not.

It was found that 15 (48.38%) of the teachers gave a positive response for obtaining guidelines when the syllabus changed while 16 (51.61%) teachers gave a negative response.

It was found that 27 (87.09%) teachers stated that the students referred and gathered relevant information for project development whereas four (12.90%) teachers did not.

Through the teachers' comments it was found that as per the KVS rules, the projects were assigned to the students. Guidance was given to the students while making the project. Three projects are given term wise in a year at regular intervals.

It was found that 23 (74.19%) of the teachers gave a positive response stating that the student involvement in project work was satisfactory whereas eight (25.80%) teachers gave a negative response.

Through the teachers' comments it was found that the projects satisfied the curiosity of the students. They learnt to take logical decisions and start thinking critically. By working in groups and the students realized the values of cooperation, team spirit and tolerance. The students developed leadership qualities. They gained self confidence and started liking the subject.

It was found all the schools assigned the projects to their students.

It was revealed that many (16) of the teachers stated that three projects were assigned per subject per year to each student. .

It was found that model or a working model was the first option of the teachers to assign the project followed with the written assignments; charts; and power point presentation in compact discs.

It was found that 20 (64.51%) teachers have affirmed the necessity of a regular class time table whereas 11 (35.48%) teachers have not affirmed the same. While clarifying the above apprehension, the teachers stated that projects were considered as a static routine work. But allocation of specific period in the time table would facilitate to give adequate time for project activities.

It was found that the teachers had prioritized the circulars and the evaluation procedures as first resource followed with manuals; relevant journals and periodicals published by the NCERT.

It was found that 22 (70.96%) teachers gave a positive response towards the utility of the documented resource material whereas nine (29.03%) teachers gave a negative response. It is marked from teachers' responses that the library reference books were the primary resource materials.

It was found that 25 (80.64%) teachers gave a positive reply for organization of tours and trips to the students whereas six (19.35%) teachers gave a negative reply.

It was found that majority (27) (87.09%) of the teachers have responded positively for the utility of the projects in teaching learning process and their utility as exhibits in Science fairs and Science exhibitions. On the contrary a minority (04) (12.90%) of the teachers have responded negatively.

It was found that a majority (28) (90.32%) of teachers have responded positively towards the utility of the projects as teaching aids whereas a minority (03) (09.67%) of the teachers have responded negatively.

It was found that the following projects were used as exhibits in Regional and National Level Science Exhibitions.

- A project built in C++ program language, i.e. a game TIC TAC TOE
- A project on rain harvesting, global warming and acid rain
- A project on transpiration and ascent of sap
- A project on "Satellite Communication"
- A project on the Periodic table
- A project on solid state and structure of different sub atoms

It was found that time (33.82%) was the main constraint, followed with economical aspects (19.11%), individual differences (14.70%), academic aspects (14.70%) and social aspects (11.76%)

It was found that workload of the theory subjects (32.87%) was the major problem for the students. This was followed with collection of the relevant resources material (27.39%), financial support from the parents (17.80), cooperation from the peer group (10.95%), and guidance from the teacher (10.95%).

It was found that application (22.22%) of the project was considered as the first priority parameter in evaluation of the projects. This was followed with the content (17.09%), quality (16.23%), objective (13.67%), expression (11.11%) and novelty (07.69%).

It was found that about half (31) (51.61%) of the teachers were aware of the framework to be adopted in evaluation of the projects. The rest (15) (48.38%) were unaware of the framework. From the teachers' point of view, the characteristics mentioned by them ranged from relating the project with the objective and theme to variety in construction and presentation of the project. Over and above the newness involved; reasoning ability; procedure adopted, applicability; observation, tabulation of the results and the conclusions drawn were also considered as reference in project evaluation.

It was found that viva (30.37%) was the most common method for project evaluation, followed with continuous and comprehensive evaluation (24.05%), through practical examination (16.45%) and by informal oral testing (12.65%).

It was found that most (25) (80.64%) of the teachers give due weightage to different aspects in project evaluation. Some (19.35%) of the teachers did not do so.

It was found that the teachers mentioned a range from 5% to 20% that should be assigned to the project work in final assessment.

It was found that the ground work was done before development of the project. Importance was given to collection of relevant literature or theory, working principle involved and a rough sketch or overall design of the project. On the basis of innovation, practicability/ application or easiness to use, working, sincere efforts of students the projects were evaluated.

It was found from the teachers' comments for improving the current system of project evaluation that the theoretical knowledge of the student should be verified with regard to the project designed. Project designing should not be carried on as a formality. The teachers and the students should get opportunities to undergo special training to widen their knowledge horizons to develop projects.

It was found that the projects were usually given to the students either individually or in groups. Under such circumstances the teachers distinguished the performance of each student by regular observation.

It was found that most (22) (70.96%) of the teachers returned the projects after the evaluation was completed. Some (09) (29.03%) of the teachers did not returned the projects after evaluation.

It was found that most (06) (66.66%) of the teachers preserved the projects after evaluation whereas some (03) (33.33%) of the teachers did not.

It was found that many (33.33%) of the projects were safely maintained in the Science laboratory or in the Science club.

Through the teacher's comments it was found that if the project work was carried on with all the seriousness and sincerity, it would prove to be more effective than teaching with the help of the books. In other words knowledge would be improved beyond the books.

It was found that the teachers' suggestions for improving the project work were in relevance to the following.

- The students should be properly motivated and guided for creative projects.
- The teachers are supposed to plan and take on practical, project and field visits.
- Curriculum must be based on practical skills supported by availability of technology to update the teacher and the student.
- The project work is ought to be taken up by identifying the skills, cooperation, integrity, aptitude and brother hood among the students.
- More educational tours must be organized for first hand learning experiences for some selected areas in sciences.
- Subject experts from various fields may be invited to speak, guide and train the teachers. On line experts' opinions may also be sought in the execution of a project.
- The weightage of marks allocated to the projects be supposed to be more so that the students work hard for real knowledge in their subject. Rather due weightage should be provided to project work, preferably as a separate and compulsory task/assignment/paper based on the projects. The ministry of education should think about including the weightage of projects in various competitive exams and entrances for higher studies.

- Through the project the students expertise in a special activity.
- Project work is ought to be assigned in relation to the syllabus and to bring awareness about the environment like global warming, pollution by non biodegradable wastes and importance of space programmes.
- There should be regular assignment of the project work. The students are supposed to complete their projects in close collaboration of the teacher. The students should be encouraged to participate at regional/national level science exhibitions or science fairs.
- As projects are compulsory in academics a separate time period should be allotted to the students to do their project work. This may encourage more and more students to involve wholeheartedly in completing the project work.
- Project work is ought to be investigatory in nature. Therefore appropriate provision of guidance, facility, time and finance are essential.
- Some exemplary projects may be selected given due recognition and may perhaps be awarded for encouragement at school level.
- The teachers and the parents should appreciate the applicability and importance of projects in the learning process.
- Projects must be child centered and child oriented.

5.8.3 Major Findings Based on the Data Analysis of the Students' Questionnaire

The findings obtained from the data of the students' questionnaire were categorized as per the objectives of the study and are presented below.

It was found that after assignment of the project work to the students 142 (96.59%) of the students properly planned and proceeded with the development of the projects, while five (3.40%) of the students did not.

It was evident that 108 (73.46%) of the students gave a negative response stating that they did not visited any institutes or research centers for hands on experience while 39 (26.53%) of the students gave a positive response.

It was confirmed that more than half (88) (59.86%) of the students were given guidance by the teachers whereas many (59) (40.13%) of the students did not obtain any guidance for project development.

It was noticed that the first option of the students for development and completion of the project was with the help of the peer group, followed with self help and help from the teachers. The help obtained from the parents was the last option.

It was found that majority (114) (77.55%) of the students adopted a systematic method in project development process. On the other hand some (33) (22.44%) of the students did not adopt any systematic method in project development. In addition it was found that the students tried to understand the concept and gathered all the information on the project. They discussed with the teacher and also referred the books like encyclopedia and browsed the internet for Encarta like software.

It was found that more than half (50.65%) of the responses opted by the students were for a single project completion, followed with the option of two projects completion (36.56%) and three projects completion (09.78%). In addition to this it was also clear that maximum number (25.21%) of the projects were done in Chemistry, followed with Physics (24.13%), Mathematics (21.73%), Computer Science (18.04%) and Biology (10.86%).

It was found that the first priority for a project was a written assignment, followed with the power point presentation and the chart work. This was followed with model preparation, projects involving reference and innovative investigations.

It was found that a majority of the students (123) (83.67%) have responded positively for the obligation of time limit for project completion and submission, whereas some (24) (16.32%) of the students have not. The students had explained that if the students were punctual, they set aside some time for both the projects and the studies. Due to time limitation, they paid attention to their work in general and thus increased their efficiency.

It was found that many (94) (63.94%) of the students had responded positively stating that a special period was necessary which should be exclusively allotted for the project work. Some (53) (36.05%) of the students have however asserted that there was no such need.

It was found that the student's first preference for project allotment in Mathematics, Physics, Chemistry, Biology and Computer Science was prior to the vacation.

It was revealed majority (114) (77.55%) of the students responded positively to the necessity of spending time and money on development of the projects. Whilst some (33) (22.44%) have responded negatively. They asserted that knowledge was more important than money.

It was found that majority (117) (79.59%) of the students gained financial support whereas some (30) (20.40%) of the students did not. In addition to this the financial support obtained by the different schools varied from 57.14% to 90.90%. It was confirmed that the parents were the major financial supporters for the students. This was followed with contribution from the classmates and from the school. The students established that they did not obtain any financial support either in the form of government scholarship or sponsorship from any agency.

As per the student responses it was found that the resources were not available (55.07%) in adequate quantities to develop the projects. In Mathematics (69.10%), in Physics (40.94%), in Chemistry (56.39%), in Biology (74%), in Computer Science (41.77%) the references and the resource materials were not available in sufficient quantities. On the other hand the students stated that some references and resources were available in Physics and the Computer Science subjects.

It was found that majority (125) (85.03%) of the students have affirmed the usefulness of the projects in improving their studies whereas some (22) (14.96%) students have not. It was evident from the responses of the students that the utility of the projects in learning runs in the following descending order. It started from thinking and creation; exploitation of resources; logic; development of organizational skills; arranging and assembling; cooperation and conversation; computations in Mathematics and enhancement of the manipulation skills. Above and all the projects helped in raising the art and craft talents of the students. Besides this the communication skills and the leadership qualities of the students were also enhanced.

It was found that the working models were more useful because the students could easily understand the processes behind certain phenomena. Moreover such projects were good to study and to explain. Projects make difficult theoretical concepts easy and gave inspiration to learn more. The projects of the senior students gave idea about how to make projects. Reading the texts before making the projects helped the students in their studies. Projects motivated the students. Projects gave freedom to the students to know more and more about them. The students developed a practical mind set. The projects gave scope to increase the skills, creativity and intelligence of the students. The factual information collected about the projects was always useful. The students stated that the projects showed the way to represent themselves and their work. The projects not only improved the knowledge but also increased awareness on general information. The projects made the learning attractive.

It was found that majority of the students (137) (93.19%) showed interest in the project work. On the other hand a few (10) (06.86%) of the students did not.

It was evident that half (74) (50.34%) of the students had appreciated and rated their projects as 'good.' The other responses in a descending order were many (39) (26.53%) students categorized their projects as excellent, some more (31) (21.08%) as average, very few (03) (02.04%) as poor to very poor category.

It was evident that majority (127) (86.39%) the students faced problems during implementation of the projects, whereas some (20) (13.60%) of the students did not.

It was found that for many (35.57%) of the students time was the main constraint in project development.

It was found that the problems of the students differed from person to person. Personal tuitions and different academic pursuits also affected their efforts for project development. The project expenses, time constraint and the unavailability of the resources made the project work a costly affair.

It was found that most (121) (82.31%) of the students were aware about the weightage of marks assigned to the projects in final assessment, whereas some (16) (17.68%) of the students were unaware of the same.

It was found that most (139) (94.55%) of the projects were regularly assessed by the teachers while very few (08) (05.44%) projects were not assessed.

It was revealed that most (65) (49.61%) of the projects were assessed immediately after the submission, whereas many (63) (48.09%) of the projects were assessed within the time or term period.

It was ascertained that many (96) (65.30%) a time feedback was given on the projects during assessment. Sometimes (51) (34.69%) no feedback was given.

It was found that majority (63) (60.57%) of the times oral comments or feedback was given whereas sometimes (31) (29.80%) written comments were given.

It was evident that 88 (59.86%) students gave positive response stating that the teachers gave information on the assessment criteria of the projects, whereas 59 (40.13%) students gave negative response for the same.

It was established that many 87 (59.18%) students were satisfied with assessment, whereas 60 (40.81%) students were not satisfied with the assessment. It was revealed that the basis of project checking was specific. The teacher gave instructions about what they see in a project like hard work, efficiency, creativity and neatness of the project.

On the contrary to the above it was found from the comments of the students that the project making was a formality in work and in reality it was a copying and pasting job.

It was found that most (110) (74.82%) of the students mentioned that the schools had retained the projects whereas some (37) (25.17%) students stated that the schools had returned the projects to them.

It was revealed that the reasons for retaining the projects by the school projects were to be used as a teaching aid (31.49%); to be shown as a model to the other students (26.51%); because it was a good and a rare project (22.09%); and that the project might be used as an exhibit in the forthcoming Science Exhibition/Science Fair.

It was the projects were preserved and maintained as wall posters (15.66%), as Science laboratory and Science club equipment (14.97%); under the subject teacher's control (14.74%); to be used as teaching aids (13.59%); to be kept in the general classroom (09.21%); and to be used as exhibits (08.75%).

It was found that the project work could be improved by focusing on information and guidance; availability of the resources; assignment of the projects; weightage of marks in final assessment; time allotted; finances involved; evaluation procedures adopted; utility of the projects and number of the projects.

5.8.4 Major Findings Based on Judging the Present Practices in the Context of the Set Criteria for Implementation of the Project Work

The documents clearly earmarked the details on the project work like themes, sub themes, parameters for project presentation, evaluation criterion for judging the projects. This information is available for the projects which are to be exhibited in different Science Exhibitions and Science Fairs outside the school. On the contrary such information and guidelines are wanting in the implementation of the projects which are to be carried on within the school by the students. This facility is particularly wanting at higher secondary level in Science subjects.

Undoubtedly there are enough number of documents in the form of circulars, dispatches, JNNSEC guidelines, Compendium, text books, teachers' manuals and handbooks to supplement the information on the implementation of the project work. Nevertheless, they are indirectly linked with the process of project work implementation in school Science subjects. However, such information is more specifically applicable to the subjects like Commerce, Accountancy, Geography and Business Studies and Social Sciences.

The teachers and the students reiterated the objective of the project work as relating the theory with the practical. The projects were identified based on the themes and sub themes as per guidelines given in the circulars and the JNNSEC norms. Irrespective of the availability of the resources the students were assigned the project works. Orientation to the teachers and the students was meager. However, the project work was developed with proper ground work by both the teachers and the students. Usually one project per term per subject was assigned to the students as per the CBSE and KVS norms. However time was the main constraint in completing the project work. The projects varied from simple chart work and file work to complicated working models and investigatory projects.

The problem of time limitation could be resolved with the allotment of a special period for project work in regular school time table. Enrichment of the library with the latest and the best books would boost the enthusiasm and curiosity of the students. Loading the computers with the latest version of software which would help in animation and power point presentations would kindle the curiosity of the students.

5.9 Conclusions

The findings were arrived at from the analysis of the data collected for this study. These findings were further discussed to draw the conclusions. These conclusions follow.

- Two types of project work activities are carried on by the CBSE schools. One type is in the form of regular curricular activity which is compulsory for all the students, whereas the other type is optional and is in the form of project work/exhibit which is to be exhibited in Science Exhibitions.
- School allots the regular curricular projects whereas themes and sub themes for projects/exhibits of the Science Exhibition are decided by the CBSE and the NCERT.
- Periodically the schools are guided through various documents.
- The documents are mainly in the form of CBSE circulars, KVS Dispatches and JNNSEC guidelines supporting the implementation of the project work. The teacher handbooks, manuals and curriculum supplement the guidelines on the project work.
- The JNNSEC guidelines includes the details on the themes and the sub themes along with the details like key parameters for participation; evaluation criteria for the exhibits/projects; exhibition schedule; programs organized during the exhibition like seminar, quiz, guest lectures, educational tours; and an exemplary write-up of an exhibit displayed in the earlier exhibition.
- Specific guidelines on project work in Physics, Mathematics, Chemistry, Biology and Computer Sciences are wanting,

- The specific reasons for assigning the projects to the students were to enhance critical thinking; to concentrate on learner based instruction; to integrate different skills; to give hands on experience; level of applicability of projects in real life and new situation; to inculcate social values; to use resources effectively; and to evaluate the student throughout the year.
- Ample resources are unavailable in the remote area like Kachchh and this stands as a barrier in developing good project work successfully.
- The text books were the major resources for project identification within the school.
- The project work was developed with proper ground work and appropriate outlines. The concept of the project was clarified; the resources were accumulated; and the project was developed according to the outlines drawn.
- Individual and group projects are assigned to the students based on the nature of the project and availability of the resources.
- Information and guidance are essential for improvement in the project work.
- The projects were assigned to the students in order to promote the scholastic, scientific and leadership dimensions of the students.
- The project work boosted the confidence levels of the students.
- Constantly motivation and guidance from the teachers were needed for the development of the creative projects.
- Very few teachers (five out of 31) had undergone the orientation (training) program for project work.
- The teachers needed more guidelines with respect to the project work implementation.
- A new initiative of establishing Mathematics Laboratory was taken up in the year 2003 in order to make Mathematics learning joyful and fun-filling.
- The contribution of the project work marks in session ending examinations was reduced from 10 to 05 as per the amendment Article 106(A) and (C) of KVS Education Code.

- Most of the teachers demanded exclusive publication like magazines on the project work in Science.
- One project per term per subject is assigned to the students.
- Most of the students preferred single project per subject per year.
- Written assignments, power point presentations and chart work were mostly made by the students in the form of projects.
- The teachers preferred to assign models as the project work to the students.
- The projects assigned to the students ranged from simple chart work to investigatory working models.
- Time was one of the major problems of the students for project development. Unavailability of the resources was another major problem in project development.
- Though time was the main constraint, the students preferred time limitation in project completion and submission.
- The projects have a high utility in the teaching learning process in the form of an exhibit and teaching aid.
- Working models helped to learn the content easily and this learning was retained for longer time.
- Group projects improved the leadership qualities, built team spirit and enhanced time management skills among the students.
- The students showed interest and appreciated their projects as 'good.'
- The project work expenses were mainly borne by the parents.
- A special period allotment in the regular school time table was demanded by all the teachers and the students to provide adequate time for project activities.
- Most of the students are aware about weightage of marks for the project work.
- Majority of the students do not know about the evaluation criteria for project work.
- In group projects the teachers followed observation method to evaluate the students.
- The projects were mainly evaluated on the basis of innovation, application and neatness in presentation.

- Conduction of viva was one of the most common methods for project evaluation.
- The teachers demanded for an increase in the weightage of marks from 5% to 20% that should be assigned to the project work in final assessment.
- Application of the project was the first priority parameter in evaluation of the projects.
- Most of the projects are assessed immediately after submission.
- Feedback on the project evaluation was in the form of oral comments.
- Most of the projects were returned to the students after evaluation.
- The projects, if retained were mostly used as teaching aids.
- The project work incorporates an integration and enhancement of all the three domains viz cognitive domain (thinking, learning and communication); affective domain (interest, scientific attitude and scientific temper) and psychomotor domain (hands-on minds-on learning experiences).
- A project built in C++ program language, i.e. a game TIC TAC TOE; a project on rain harvesting, global warming and acid rain; a project on transpiration and ascent of sap; a project on Satellite Communication; a project on solid state and structure of different sub atoms were presented as exhibits at Regional and National Level Science Exhibitions.
- According to the views of the students information and guidance on the projects; availability of the resources; assignment of the projects; weightage of marks on the projects; time factor; expenses involved; number of projects; evaluation criteria; utility of the projects were to be meticulously looked into in order to improve the implementation of the project work.

5.10 Suggestions

The researcher had arrived at the following suggestions after examining the discussion and conclusions of the study.

1. Pre service teachers should be thoroughly trained in the implementation of the project work as they may get a chance to work in Central Schools in future.

2. Measures like **refresher and orientation courses, seminars and workshops** may be organized from time to time to update the knowledge of the teachers for fruitful results of the project work.
3. Subject wise **in-service training program** may be organized whenever there is a change in curriculum. Copies in the form of Compact Discs (CDs), video clippings, movies, audio tapings may be sent to all the concerned teachers and the students and also displayed on the websites of the NCERT and the CBSE.
4. Project works may be assigned to the students well in advance, preferably before vacation to assist students for better performance.
5. Special period for project work may be allocated in the weekly time table of the schools.
6. **Recognition** should be given to the performance of the outstanding students in the project work in the form of certificates or awards. Recognition should be also given to the teachers for their outstanding support to the students in development of the projects. This may be in the form of some incentives like certificates and increments.
7. In group projects, provision of **anchor studies** i.e., former students discussing about their projects, by showing the results of their projects by suggesting Internet resources and readings that are likely to give some input to the other students. In addition to the above **Cross-age teaching** (some seniors teaching the juniors) and interdisciplinary thematic instruction may be proposed.
8. **Brainstorming technique** may be adopted for the graphic web or concept mapping or brain mapping can be used to investigate, to frame project outlines, to draw sketches, to construct models, to record findings, to predict items, to compare and contrast and discuss understandings.
9. **Coaching and guidance** may be provided to the students in topic selection, to initiate the project develop procedures, in identification of potential resources and in research techniques, in the processes of oral reporting and writing preliminary drafts, in giving them constructive feedback and encouragement along the way. Based on their investigations, the students would prepare and present their findings in culminating presentations.
10. The teacher can keep **track of the students' progress** by reviewing weekly updates of their work. Deadlines may be set with the groups. Meeting with

the groups may be planned daily to discuss any questions or problems the students may have.

11. The students should be promoted and insisted to **share their experiences** in both the progress and the results of their study with the rest of the class.
12. Writing is a required component of project-centered learning. Therefore the students should be provided with **opportunities that insist on writing and drawing** as a part of each student's work. It helps the learner to record his or her understanding to construct meaning.
13. Exclusive **publication** on project work with details on the skeletal frame works on some illustrative Science based themes lead to divergent and convergent thinking. It may contain certain guidelines with respect to the adoptable procedures, required man and material resources and width of the applicability. Therefore such type of literature may be procured for the enrichment of the library as a resource.
14. **Schools kits** are available for higher secondary level in Chemistry. So similar type of school kits may be made available in Physics, Mathamatics and Biology.
15. Separate and exclusive **supplementary material** in the form of handbooks, worksheets, handouts and instructional booklets should be published for the teachers and the students to development and complete the projects.
16. The **guidelines given for JNNSEC** contain themes and sub themes. But if these themes and subthemes contain the tentative frameworks for certain projects that would give wide scope to many more students to design the projects**.**
17. **Training** the students to use the diagrams, tables, graphs and charts to give an effective visual presentation. A software template for creation of the projects may be made available to the students in different subjects.
18. **Templates** should be made available with the details of the following information: activity title; author; school, including address and phone number; subject areas; grade level; goals/objectives of the project; background information or pre-lesson instruction; materials or equipment or technology; instructional strategies or procedures; student evaluation; follow-up activities; and suggestions for replication.

19. The final product of the project, including papers, oral reports, and presentations, should be **assessed and graded**. The method of determining the grade should be clear to students from the beginning, along with the weight of the project grade toward the term grade. The students should be provided with clear descriptions (rubrics) of how evaluation and grading would be done. Evaluation should include meeting deadlines for drafts and progress reports.
20. The teachers should not be **overloaded** with additional assignments other than teaching. Because the role of the teacher would be in the form of **a facilitator, an enabler, a supporter and a consultant** in project development**.** Therefore they need to prepare a mental plan; to provide help to the struggling groups; to provide a template/format for report writing; to discuss the rules of scientific writing; to discuss the protocol of presentation and criteria that will be used for evaluating the project reports.
21. Project work may be assigned to the groups on the basis of a **Sociogram,** in order to avoid differences of opinion in project making.
22. **Experienced professionals** with varied backgrounds in project work may be identified in the local area. The students should be given a provision to consult and discuss with them about planning and development of the projects in different Science subjects.
23. Some suggestive **illustrations** to find projects may be made available to the teachers and the students. Some of the illustrations are such as:

    an almanac, a collage, a contract, culturegrams, murals (word collage or talking murals), montages; photographs; sound recordings and transcripts of birds, wind, music, speeches, news broadcasts, debates, animal sounds, radio broadcasts may be taken up.
24. **A note on the Science Exhibitions** held in different regions of the country should be made available to the teachers and the students in the form of video films; photographs; literature on the exhibition; presentations and speeches; and the follow up action.
25. **Special Science workbooks** should be available to the higher secondary teachers and the students as starting points for independent projects to present at Science Exhibitions. The descriptions in these books may include background information and introduction; problem; time and materials

needed; methods (procedures) and references; safety precautions; data tables; and an analysis where applicable; along with a discussion on how to conduct a research project.

26. **Establishment of more Science Museums,** Mobile Science Vans, Science Express Trains and National Science Centers and Science Parks is mandatory. Visit to the Science city, Science Exhibition, Science Fairs and places of scientific importance should be a regular practice to develop the scientific temper among the students.
27. The students should be provided with an **access to appropriate and sufficient resources** about the project work such as informed teachers, time, materials and equipment, adequate and safe space, and access to the world beyond the classroom.
28. Projects need to be started with the things that are in hand. Within the stipulated time a sequence of work is to be performed. **Milestones should be selected** to reach the time based goals in completion of the project work. The tentative risks should be well managed with an understanding of the probable impact of these risks on the development of the project. A plan made to develop a project is not static. Therefore things are bound to change. As the time passes, the project should be continuously reviewed. Focus should be on the milestones. The railway station approach should be adopted, provided each station is reached on time, so that the destination is reached on time.

5.11 Scope for Further Research

It is well said that research is a process of making new discoveries, disproving old notions, establishing facts and improving current knowledge continually through tests and experiments which are repeatable and can be verified independently any time. On the basis of the findings of the present study, it is hoped that it could open paths for further research. The present study was confined to the implementation of the project work in the CBSE schools at higher secondary level in the Kachchh district, Gujarat. The study was delimited to only the Science stream of class XI. Therefore more comprehensive studies in parallel to the present study may be extended and conducted. Some of the possible suggestions in which further studies can be carried out in different areas are listed below.

1. Replication of the study i.e. implementation of the project work may be conducted in the Languages.
2. Replication of the study i.e. implementation of the project work may be conducted in the Arts subjects.
3. Replication of the study i.e. implementation of the project work may be conducted in the Commerce subject.
4. Implementation of the project work may be explored in primary and secondary level schools also.
5. More studies relating to the implementation of the project work may be conducted in schools affiliated to the State Boards of Education.
6. Implementation of the project work in other districts and States may be conducted.
7. Finances in the form of expenses incurred on the implementation of project work may be tracked down.
8. Studies in relation to the management of time by the students for generating the projects and on academics may be perused.
9. Creation of collaborative, cooperative and constructive learning environments through the project work may be experimented.
10. Interrelationship that exists and operates among the cognitive, affective and psycho motor domains through the project work may be explored.
11. Case study of a unique school organization may be done with reference to the project work implementation.
12. Studies in relation to the presentation aspects of the project work may be taken up.
13. Mentoring process is a complex task involving a variety of knowledge types, management activities and pedagogical aspects. Therefore, such a mentoring methodology may be taken up for further research studies, with relevance to development of the project work.
14. The implementation of project work in comparison with the other traditional and modern methods of teaching may be replicated and verified for its enormous advantages.
15. A survey may be conducted among the teachers of language, of secondary and primary level regarding their opinion about project work. Such a study will be helpful in analyzing the opinion of the teachers and also may give an insight

into practical difficulties that the teachers could encounter in conducting such classes.

16. A survey may be planned and conducted for the attitude of the parents and other stake holders regarding the implementation of the project work.
17. Studies relating to the correlation that may exist among memory, retention capacity and achievement can be carried out in relation to the implementation of the project work.
18. Studies relating to the dynamics operating behind the creativity and logical aspects in developing the project work may be enquired into.
19. Studies in relation to the nature and scope of the orientation and the refresher programs with respect for the project work may be taken up.
20. Processes involved in the generation of the projects in the main themes of JNNSEC, like Mathematical Modeling, Energy and its Conservation, Technology in Health may be thought about.
21. Replication of the study i.e. implementation of the project work may be conducted by considering a larger sample from educational organizations abroad in order to be able to conduct a cross-cultural comparison.

5.12 Implications of the Study

The project method is a teaching strategy characterized by project work; it helps to correlate the theory with the practice which may not be possible by the other conventional approaches. The project work encourages the students to understand and apply the scientific principles and phenomenae. It helps them to develop the skill of observation and to understand the scientific concepts more clearly and precisely. In addition to this the students go through an extended process of inquiry in response to a complex question, problem, or challenge. Rigorous projects help students learn key academic content and practice the 21st Century skills such as collaboration, communication and critical thinking.

The best results in theoretical concepts are obtained only when individual activities are given in the form of project work. The activity oriented method will help the students to learn the theory and apply the newly-acquired knowledge simultaneously. The project work helps to increase the achievement and retention capacity of the students. The content would be better imprinted in the students' memory. So they would be able to retain the subject matter for a much longer period. "Learning by doing" is encouraged. The method is helpful in de-formalizing Science education and also takes into account individual differences. Therefore the students have a more active role to play.

The teachers are also encouraged to learn more and test their knowledge when activity-oriented methods are used. In fact the teachers should have a thorough knowledge in their respective subjects to conduct such classes. The teachers should be able to clear all the doubts of the students. The classes remain lively leading to good teacher-pupil participation and interaction. All students actively participate in the discussions and none sits idle. They develop interdisciplinary developmental activities.

The local resources are also explored and the students are continuously and comprehensively evaluated. The primary objective of giving the project works is to develop the laboratory skills and to inculcate the social values amongst the students. The **laboratory skills** that are developed during project work include keen observation; recording of the data with accuracy and precision; adjusting and manipulating the instruments; assembling, arranging and rearranging the apparatus; experimenting; verifying; inferring; concluding; evaluating; analyzing and synthesizing; generalizing; substituting the formulae, etc. Similarly, **the social values** that are developed during project work include cooperation; collaboration; discipline; trustworthiness; patience; constructive interpersonal and vocational skills; tolerance, dignity of manual work; intrinsic motivation; self satisfaction; scientific temper; scientific attitude; beauty of projects (aesthetic value); self confidence; critical thinking; creative imagination; interest; political value to gain prestige, power, name, success and fame.

The students who have foundational knowledge and skills in application of scientific knowledge enhance their capability to hold meaningful and productive jobs in the future. Science skills develop scientific habits of mind through hands-on exploration, science literacy and applying scientific concepts and relationships to the world.

The categories of practical skills that are incorporated amongst the student community are the procedural and manipulative skills; observational skills; drawing skills; reporting and interpretative skills. Therefore through the projects the students work consistently and actively to identify group goals; work effectively to achieve their goals through excellent performance. They develop interpersonal skills and cooperate with group members by encouraging, compromising, and/or taking a leadership role without dominating; show sensitivity to feelings and knowledge of others. Ultimately it leads in contribution of significant information, idea, and talent to produce a quality product.

There is a dire need to bring in 'Experimental Culture' in the schools for teaching and learning the Science subjects so that the students learn to develop and use experimental designs in scientific inquiry. They employ the following throughout their learning career such as:

- Language of Science to communicate their understanding.
- Apply scientific concepts, skills, and processes to everyday experiences.
- Investigate phenomena using technology.
- Experience the richness and excitement of scientific discovery of the natural world through the historical and collaborative quest for knowledge and understanding.
- Make informed decisions regarding contemporary issues.
- Explore science-related careers and interests.
- Perform hands-on activities and actively participate.
- Connect Science to real-life experiences.
- Use text to supplement hands-on activities, not as the sole basis for instruction.
- Focus on student accountability.
- Integrate different school subjects.
- Start using Science journals.

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APPENDICES

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APPENDIX A

Request Letter to the Subject Expert

To

The Subject Expert

Dear Sir/Madam,

I am a research scholar working for my doctoral work at the CASE, Faculty of Education and Psychology, The M. S. University of Baroda, Vadodara. The topic of my research is "Present Status of Implementation of the Project Work in CBSE Schools at Higher Secondary Level in Kachchh District." As per the need of the study, I have developed tools (questionnaires) substantiating its objectives. As you are guiding and researching in the same field with genuine interest and insight I think that your valuable suggestions would help me in establishing the content validity of the tool. Therefore it is my humbly plea to you to give your valuable suggestions.

I hereby request your good self to kindly go through the items and give your valuable suggestions/comments in the form of additions/deletions/ modifications, etc. so that the same may be incorporated in the final draft of the tool.

Thanking you,

Yours sincerely,

Signature of the Researcher

Enclosures:

1. A copy of the proposal
2. Questionnaire for the teachers
3. Questionnaire for the students
4. A self addressed stamped envelope for smooth dispatch of your comments.

Date:

Place:

APPENDIX B

List of the Subject Experts

1. Dr. Chaya Goel, Lecturer, CASE, The M. S. University of Baroda, Vadodara
2. Dr. A. Ramakrishna, Associate Professor, IASE, Osmania University, Hyderabad
3. Dr. Jayesh Pandya, Lecturer, Gujarat Vidyapeeth, Ahmedabad
4. Dr. Deepuba Devda, Principal, Dada Dukhayal College of Education, Adipur, Kachchh
5. Ms. Sudha, Principal, Kendriya Vidyalaya, Railway Colony, Gandhidham, Kachchh

APPENDIX C

Request Letter to the School Principal

To

The Principal,

____________________School,

____

Dear Sir/Madam,

I am researcher at the CASE, Faculty of Education and Psychology, The M. S. University of Baroda, Vadodara, and presently I am working for my doctoral work on "Present Status of Implementation of the Project Work in CBSE Schools at Higher Secondary Level in Kachchh District." Since research investigation needs collection of the data based on the nature of the problem, I request your good self to kindly permit me to collect the data from the senior secondary science stream teachers and from the XI class science stream students of your school. I wish to collect the data as per the date and the time given by you.

Herewith I enclose a copy of the questionnaire to the teachers and a copy of the questionnaire to the students for your reference and record.

With warm and sincere regards,

Yours faithfully,

Signature of the Researcher

Name:

Address:

Contact No.:

APPENDIX D

Questionnaire for the Teachers

Dear teacher,

Here is a set of questions related to the school projects. Please go through each question and choose your response/s according to the instructions given. The information gathered is meant for the Ph.D. work entitled," Present status of implementation of project work in CBSE schools at higher secondary level in Kachchh District." Also, please note that your responses will be kept confidential and strictly used for research purpose only.

Research Scholar

Name: Date:

Designation:

Name of the School:

Gender: Male/Female

Age: _____years

Classes and Subjects that you teach:

Class/Standard	**Subjects**

Educational Qualifications:

Degree(s)	**Optional/Elective Subjects**

Teaching Experience:

Designation	**In Years**
As a PRT	
As a TGT	
As a PGT	
If any other ( )	

Contact telephone numbers:

Landline: (R) ______________________Time to contact ________________

(O) ______________________Time to contact ________________

Mobile ______________________ Time to contact ________________

e-mail ______________________

Please fill in the number of the projects that you have observed in your subject until today. _________________

1. (a) Why do you assign the projects to the students? Please encircle your option/s.
   - (i) In order to complete the content/syllabus
   - (ii) In order to concentrate on the learner based education
   - (iii) In order to consider the individual differences
   - (iv) In order to consider the level of applicability
   - (v) In order to integrate different skills
   - (vi) In order to inculcate social values like co-operation
   - (vii) In order to evaluate the students throughout the academic year
   - (viii) In order to utilize the time effectively
   - (ix) In order to use the resources efficiently
   - (x) In order to develop critical thinking
   - (xi) In order to give hands on experience
   - (xii) Because it is given in the curriculum
   - (xiii) If other than these, please specify ________________________

   (b) Are you aware of the criteria set in assigning the project work to the students? Yes/No

   (c) If 'yes', please mention the criteria in the space provided.

   ____
   ____
   ____
   ____

2. (a) How far does the objective of continuous and comprehensive evaluation achieved through the project work? Please encircle your option.
   - (i) Inadequately
   - (ii) Moderately
   - (iii) Adequately
   - (iv) If other than these, please specify ________________________

   (b) Please, clarify your **above** option with an explanation.

   ____
   ____
   ____
   ____

3. (a) Are you given any of the following resource materials for implementation of the project work during your teaching career? If 'yes', please encircle your option/s.
   - (i) Teacher's Handbook
   - (ii) Guidelines for the implementation of the effective projects
   - (iii) Manuals
   - (iv) Workbooks
   - (v) Relevant Journals/Magazines/Periodicals published by the NCERT
   - (vi) Circulars
   - (vii) Evaluation Procedures
   - (viii) If other than these, please specify __________________________

(b) If **'no'**, have you ever tried to get one out of your own interest? If so, please furnish the following details:

Context of getting the material	**Details of procuring the material/s**
Which material?	
When?	
How?	
Why?	
From where?	
If any other( )	

4. (a) Does/Do the above documented material/s help you in any way? Yes/No

(b) In **any case**, please explain.

____

____

____

____

5. (a) Have you undergone any orientation program/workshop/special training for the implementation of the project work? Yes/No

(i) If **'yes'**, please furnish the following details.

Name of the orientation program/workshop/training	Organizing authority	Duration and time period of the program	Your comment or remark on the effectiveness of the program

(ii) If **'no'**, please clarify the kind of help or orientation necessary to you.

____

____

(b) In the above context, do you reorient your students? Yes/No

(c) Whenever there is a change in the syllabus, are you given any guidelines for the implementation of the project work? Yes/No

6. How many projects do you give to your students? Please encircle your option/s.
   - (i) Three projects per subject per year
   - (ii) Two projects per subject per year
   - (iii) One project per subject per year
   - (iv) None
   - (v) If other than these, please specify____________________________

7. Which type of projects do you give to your students? Please encircle your option/s.
   - (i) A written assignment
   - (ii) A chart
   - (iii) A model/a working model
   - (iv) Projects involving reference work
   - (v) Projects involving innovations, inventions and discoveries
   - (vi) Projects which are challenging and encouraging
   - (vii) Projects which are relating to the relevant situations or contexts
   - (viii) Collecting and preserving specimen/s
   - (ix) If other than these, please specify ____________________________

8. List at least five titles of the projects that you have assigned in your subject.

   ____
   ____
   ____
   ____
   ____

9. (a) Do you have special syllabi/curriculum meant exclusively for the project work? Yes/No

   (b) If **'yes'**, please comment on its consideration as a subject meant for the projects.

   ____
   ____

10. (a) Which parameters do you consider while evaluating the projects? Please encircle your option/s
   - (i) Content
   - (ii) Novelty
   - (iii) Application
   - (iv) Expression
   - (v) Qualitative aspect
   - (vi) Quantitative aspect
   - (vii) Objective based aspect
   - (viii) Subjective based aspect
   - (ix) If other than these, please specify _________________________

   (b) Is there any framework for evaluation? Yes/No

   (c) If 'yes', please mention its characteristics.

   ____
   ____
   ____

11. How do you evaluate the projects? Please encircle your option/s.

(i) By oral testing
(ii) Through written examination
(iii) Through practical examination
(iv) By conducting viva
(v) By continuous and comprehensive evaluation
(vi) Based on the scholastic achievement of the student
(vii) Based on the general classroom performance of the student
(viii) Do not evaluate at all
(ix) If other than these, please specify ___________________________

12. (a) Do you consider the due weightage to be given to the different aspects of the evaluation of the projects? Yes/No

(b) According to you how much weightage should be given for the project works? Please comment in the space provided.

____

____

(c) Please give the details about how you evaluate the projects in your subject.

____

____

____

____

(d) How would you like to improve upon the current system of evaluation of the projects? Please mention.

____

____

____

____

13. If you have assigned the projects as a group activity, how do you distinguish the performance of each individual student? Please specify here.

____

____

____

____

14. (a) Which problems hinder your implementation of the project work? Please encircle your option/s.

(i) Individual differences
(ii) Time aspect
(iii) Evaluation aspects
(iv) Academic aspects
(v) Cultural aspects
(vi) Social aspects
(vii) Economic aspects
(viii) If other than these, please specify ___________________________

(b) Please explain your **above** response/s with illustration/s.

____
____
____
____
____

15. (a) According to you what is/are the problem/s faced by the students in the process of development and submission of the projects?
   (i) Collection of the relevant resource material
   (ii) Guidance from the teacher
   (iii) Financial support from the parents
   (iv) Co operation from the peer group
   (v) Workload of the theory aspect
   (vi) If other than these, please specify ____________________

   (b) Please, clarify your **above** option/s in the space provided.

____
____
____
____
____

16. (a) Are the projects ever used in Science Fairs or Science Exhibitions? Yes/No

   (b) Are the projects ever used as teaching aids? Yes/No

   (c) In any case, please explain.

____
____
____
____

17. Do you return the projects to the students after evaluation? Yes/No

   (a) If **'no'**, then is there any provision for preserving these projects? Yes/No

   (b) If **'yes'**, then how do you maintain these projects? Please encircle your option/s
   (i) By regular dusting
   (ii) By proper care and handling
   (iii) By using chemicals like naphthalene balls, etc
   (iv) Safely in the Science Laboratory or Science club
   (v) Under the subject teacher's custody
   (vi) By subject-wise and year-wise recording
   (vii) If other than these, please specify ____________________

18. (a) Do the students refer and gather relevant information for developing their projects? Yes/No

(b) In **any case**, please explain in the space provided.

____
____
____
____

19. Please state your objective in giving the project work to the students in the space provided.

____
____
____
____

20. (a) From where do you select the projects? Please encircle your option/s

(i) From the text book
(ii) From the (textbook) activities and exercises
(iii) From the workbook
(iv) From the library reference
(v) From the media
(vi) From the relevant environmental or social situations
(vii) Students choose on their own
(viii) From any prescribed projects by the board
(ix) From your own mental plans
(x) If other than these, please specify ______________________________

(b) Which attributes do you consider while selecting the projects? Please encircle your option/s

(i) Availability of the time
(ii) Consideration of the content/syllabus
(iii) Performance of the student
(iv) Availability of the resources
(v) Relevance of the project with the environmental issues like global warming
(vi) Novelty of the project
(vii) If other than these, please specify ______________________________

21. How do you proceed with the implementation of the project work? Please mention here.

____
____
____
____

22. (a) Is it necessary to have a ‘project period’ regularly in the class timetable? Yes/No

(b) In **any case,** please explain

____

____

____

____

23. (a) Are you satisfied with the involvement of the students in completing their project works? Yes/No

(b) In any case, please explain.

____

____

____

(c) How does this involvement affect the personality of the student?

24. Do you have the following facilities in your school for implementation of the project work? Please choose your option/s.
    (i) Relevant library (reference) books in sufficient numbers
    (ii) Essential Library Journals and magazines
    (iii) Sufficient number of computers with necessary networking
    (iv) Well equipped laboratories
    (v) Arrangement of field trips
    (vi) Provision of small and easy finances to the students
    (vii) Man power assistance (trainees)
    (viii) If other than these, please specify ______________________________

25. (a) Do educational tours and field trips intentionally organized prior to the submission of the projects help the students to gain insight in development of the projects? Yes/No

(b) In **any case**, please clarify your explanation.

____

____

____

____

26. (a) Please write below in the space provided anything that you would like to add/give information on consideration of the 'project work' as a means of teaching.

____

____

____

(b) Please, give your own suggestions to improve the implementation of project work in the space provided.

____

____

____

Thank you for your cooperation

APPENDIX E

Questionnaire for the Students

Dear student,

Here is a set of questions related to your school projects. Please go through each question and give response/s as per your experiences, in the context of the project work taken up by you in each subject. The information gathered is meant for a Ph.D. research work entitled, “Present status of implementation of Project Work in CBSE schools at higher secondary level in Kachchh District.” Your responses to this questionnaire will be used for the research purpose without disclosing the respondent’s name.

Research Scholar

Name: Date:
Age: Class:
Gender: Male/Female
Name of the School:

Please encircle your class subjects and mention the number of the projects you submitted.

School Subjects	Number of the projects submitted in class XI
1. Mathematics	
2. Physics	
3. Chemistry	
4. Biology	
5. Computer Science	
6. Biotechnology	
7. If any other ( )	

Contact telephone numbers:

Landline: (R) ______________________
Mobile (if any) ____________________
Time to Contact ____________________
e-mail ____________________________

1. (a) Which type of project work/s are done by you? Please encircle your option/s.
   - (i) A written assignment
   - (ii) Chart Work
   - (iii) A model
   - (iv) Projects involving reference work
   - (v) Projects involving investigations, innovations and inventions
   - (vi) Projects which are challenging and encouraging
   - (vii) Projects which are relating to the relevant situations or contexts
   - (viii) Projects with Power Point Presentation
   - (ix) If any other, please specify________________________________

   (b) Please list some of the titles of the projects submitted by you in class XI in the space provided.

Name of the Subject	**Title of the projects**
Mathematics	
Physics	
Chemistry	
Biology	
Computer Science	
Biotechnology	
If any other ( )	

2. (a) Do you think that there should be a time limit in the submission of the projects? Yes/No

   (b) In **any case**, please explain in the space provided.

   ____

   ____

   ____

   ____

3. (a) When is the project work taken up? Please tick mark in the respective cell.

Time	Subjects					
	Mathematics	Physics	Chemistry	Biology	Computer Science	Bio-technology
In the beginning of the year						
Prior to the vacation						
After relevant theory						
If any other ( )						

4. Do you know the weightage given to the projects in your final assessment? Yes/No

5. Are your projects regularly checked by the teachers? Yes/No

. (a) If **'yes'**, when are they checked?

(i) Immediately after the submission
(ii) Within the term/time period
(iii) At the end of the session
(iv) If other than these, please specify ____________________________

6. Are you given a feedback after the projects are checked? Yes/No

(a) If **'yes'**, what is the nature of the feedback?

(i) Oral
(ii) Written comments
(iii) Material resource
(iv) If other than these, please specify ____________________________

7. (a) Do the teachers give you information about the criteria/basis for checking the projects? Yes/No

   (b) Are you satisfied with the process of checking of your projects? Yes/No

   (c) In **any case,** please explain

Subjects	**Your explanation**
Mathematics	
Physics	
Chemistry	
Biology	
Computer Science	
Biotechnology	
If any other ( )	

8. Does the school retain your projects? Yes/No

   (a) If **'yes'**, please encircle your reason/s

   (i) It is a good project
   (ii) It is to be used as a teaching aid
   (iii) It is one of the exhibits in the forthcoming science exhibition/science fair
   (iv) It is to be shown to the other students
   (v) If other than these, please specify ______________________________

9. How are your projects preserved and maintained? Please encircle your option/s

   (i) As wall posters
   (ii) As documents
   (iii) As teaching aids
   (iv) As exhibits
   (v) With proper care and handling
   (vi) By use of insecticides/naphthalene balls
   (vii) By dusting regularly
   (viii) By renovating
   (ix) By reorganizing and rearranging
   (x) By subject wise and term wise recording
   (xi) Under the subject teacher's control
   (xii) In science laboratory and science club
   (xiii) In the general classroom
   (xiv) If other than these, please specify ______________________________

10. Are the projects useful for improving your studies? Yes/No
    (a) In **any case**, please explain in the space provided.

    ____
    ____
    ____
    ____

11. What did you learn along with the development of the projects? Please encircle your option/s from the following list
    (i) How to arrange
    (ii) How to organize
    (iii) Logic
    (iv) How to manipulate
    (v) Cooperation
    (vi) Conversation
    (vii) Computations and Mathematics
    (viii) Thinking and Creation
    (ix) How to use resources, like library, internet, etc.
    (x) If other than these, please specify ________________________

12. (a) Do you show interest and appreciate the projects that you take up? Yes/No

    (b) If **'yes'**, how do you rate them? Tick mark your option.

Excellent	**Good**	**Average**	**Poor**	**Very Poor**

13. (a) Do you plan your projects before you proceed with them? Yes/No

    (b) Do you get facility of visiting institutes/research organizations where relevant work is going on, for hands on experience (or for practical knowledge)? Yes/No

14. (a) How do you develop and complete your projects?
    (i) Individually
    (ii) Along with the peer group
    (iii) With the help of the parents
    (iv) Under the guidance of the teacher
    (v) If other than these, please specify ________________________

    (b) Do you adopt any systematic method in development of your projects? Yes/No

(c) Please explain how you proceed with, in different subjects.

Subject	Your procedure to develop the projects
Mathematics	
Physics	
Chemistry	
Biology	
Computer Science	
Biotechnology	
If any other( )	

15. (a) Are you given any guidance in completing a project as per your expectations? Yes/No

(b) Do you need any special period in your timetable to complete the projects? Yes/No

(c) For a particular project how long time do you want?

Please comment on this question in the space provided.

____

____

____

____

16. Are sufficient reference and resource material available in your school in order to complete the projects? Please give the details.

Subject	Yes/No	If 'yes', type of the material with the details
Mathematics		
Physics		
Chemistry		
Biology		
Computer Science		
Biotechnology		
If any other( )		

17. (a) Is it necessary to spend time and money on the development of the projects? Yes/No

(b) In **any case**, please give your reason/s

____

____

____

____

18. Do you get financial support in development of the projects? Yes/No

(a) If ‘**yes**’, from whom do you get this support? Pease tick mark.
   (i) From the school
   (ii) From the parents
   (iii) From the classmates by collection
   (iv) From the government scholarship
   (v) From any sponsoring agency/individual
   (vi) If other than these, please specify ______________________

(b) If **‘yes’** how much support do you get per project? ________________

(c) If **‘no’**, do you drop your project work? Yes/No

(d) Mention the maximum amount that you have spent on a single project.
   Rs. _______

(e) Mention the minimum amount that you have spent on a single project.
   Rs. _______

19. What is your average expenditure on a given project? Please give the details

Subject	**Money spent in Rupees**	**Time spent in hours**
Mathematics		
Physics		
Chemistry		
Biology		
Computer Science		
Biotechnology		
If any other ( )		

20. (a) Do you face any problem/s while taking up the projects? Yes/No

(b) If ‘yes’, please encircle your options

(i) Individual differences
(ii) Time aspect
(iii) Evaluation aspects
(iv) Academic aspects
(v) Cultural aspects
(vi) Social aspects
(vii) Economic aspects
(viii) If other than these, please specify ____________________________

(c) Please comment on your above option/s.

____
____
____

21. Please write in the space provided anything that you wish to add/inform/suggest regarding the project work that is taken up by you.

____
____
____
____
____

Thanks for the cooperation

APPENDIX F1

CBSE Circulars – 2003-04

CENTRAL BOARD OF SECONDARY EDUCATION
2, COMMUNITY CENTRE, PREET VIHAR, DELHI

No. CBSE/ACAD/03 28.08.03

CIRCULAR No. 19

To
The Heads of
All CBSE affiliated
Senior Secondary Schools

Sub: - Project & Practical Work in Accountancy for Class XII

Dear Principal,

As you are aware the new modular curriculum in Accountancy for the examination year commencing from 2004 contains Project work in Financial Accountancy Part and /Practical work for Computerized Accountancy part for Class XII in its Unit No. 6

The first optional unit of Unit 6 titled 'Analysis of Financial Statements' contains Project work for 20 marks. As an alternative to this the second optional unit titled 'Computerized Accounting System contains Practical work of 20 marks.

The Board has brought out detailed guidelines with respect to each in its document titled 'Practical Work on Computerized System in Accountancy and Project Work in Accountancy'. The guidelines give an overview of the scope of work in both the optional sub-units and how the teachers are expected to deal with these optional units while teaching and evaluating the students.

In the Project work, the students are expected to work on at least three types of problems out of which one will be of comprehensive nature. Specimens of these comprehensive problems are given in the booklet for the guidance of students. Two problems will be short and specific relating to ratio analysis and cash flow statements. The main objective behind all these problems is to enable the students to prepare the financial statement involving real life business situations and analyze and derive meaningful information for taking decisions relating to investment, expansion, financing, etc.

Similarly a set of exercises are given for practical work in computerized accounting. We expect students to document at least eight exercises, which will include designing 2 tables, 2 forms, 2 sets of queries and 2 reports. The practical examination of both project work and practical work will be conducted by external examiner appointed by the CBSE along with the internal examiner (the teacher concerned). Division of 20 marks for both will be as follows:

Project Work	
File work	4 marks
Written test	12 marks consisting of two applications oriented problems of 6 marks each on ratios and cash flows
Viva	4 marks
Practical Work	
File Work	4 marks
Practical examination	12 marks
Viva	4 marks

Copies of the publication titled 'Practical Work on Computerized System in Accountancy and project work in Accountancy' are available in your regional office. Kindly place your order on payment @ Rs. 30/- per copy.

You are advised to bring the above information to the notice of all concerned.

Yours faithfully,
Sd/-

(G. BALASUBRAMANIAN)
DIRECTOR (Academic)

CENTRAL BOARD OF SECONDARY EDUCATION

SHIKSHA KENDRA, 2, COMMUNITY CENTRE,
PREET VIHAR, DELHI-110092

CBSE/DIR/(ACAD)/Text/2004/ **30th April, 2004**
Circular No:23

To

All the Head of Institutions
Affiliated to CBSE

SUB: Regional level and National level CBSE - INTEL Science Exhibition Competition

Dear Principal,

You are aware that Central Board of Secondary Education has been taking several initiatives to provide additional academic inputs to bring greater academic vibrance among its affiliated schools. Keeping in view the fact that the current calendar year 2004 has been designated as the year of scientific awareness, the Board has decided to organize different activities related to the subject of Science and Technology. One such activity relates to conduct of regional level and National level CBSE - INTEL Science Exhibition Competition from the current academic year culminating into participation of the selected schools in the Jawaharlal Nehru National Science Exhibition for children organized by National Council of Educational Research and Training, New Delhi in the month of November. The Board is also organising an exhibition on Science projects in collaboration with Intel India. The following will be the key parameters of the competition.

a) Every participating school will be represented by not more than two exhibits/ projects and two/three students. The exhibits/models may include working models or simulations/schematic designs. The students may be studying in any of the classes from IX-XII.

b) Every participating school will submit an advance report/synopsis on the project/ model in the enclosed format on any one of the given sub-themes. The format of the report synopsis is enclosed alongwith the registration form.

c) The participating school will pay a nominal fee of Rs. 100/- (Rupees One hundred) per exhibit towards registration fee. Payment should be made in the form of demand draft in favour of Regional Officer, CBSE payable at respective centre. Besides, the school will bear the entire expenditure for lodging/boarding/travelling expenses incurred during participation in the Science fair.

d) The said exhibition will be organized at Regional/National level by CBSE. The selected few schools at the national level will be nominated to participate in the annual Jawaharlal Nehru Science Exhibition organized by NCERT in the month of November.

e) The registration form alongwith the brief report/synopsis and the demand draft is to be **submitted to the respective regional officer.**

f) The last date for registration for the competition is **July 15, 2004.**

g) The regional level competition is likely to be held in the 2nd/3rd week of August. The participating schools will be informed through website as well as individually. The selected schools will participate in the national level exhibition of the Board in the month of September 2004.

h) The main theme and sub-themes for preparing working models/exhibits/projects for the exhibition are as under:

Main Theme	:	Science and Technology in the changing World
Sub Themes	:	Food and Health
	:	Energy
	:	Information Technology
	:	Industry
	:	Transport and Communication
	:	Biotechnology

The models/exhibits may include :

- Working model to demonstrate
- Schemes/Designs of devices or machines
- Simulations/Schematic designs
- Indigenous designs of devices/machines
- Schemes/designs to reduce production cost
- Working models of equipment to control and measure
- Improved/Improvised models
- Applications of basic principles.
- Models of equipment/devices/gadgets/Techniques
- Innovative/inexpensive designs and techniques.

It may be noted that every participating school should prepare the model/exhibits on any one of the sub-themes which may satisfy any or more of the above parameters.

A brief report of themes and sub themes is enclosed for your convenience and support.

Yours faithfully,

(G. BALASUBRAMANIAN)
DIRECTOR (ACAD.)

Regional level and National level CBSE Science Exhibition competition

Main Theme and Sub Themes for Exhibits

Brief Description

Main Theme : Science and Technology in the Changing World

This theme aims at :

i) highlighting the role of science and technology in improving upon the quality of life in view of the fast changing world scenario;

ii) developing awareness about the importance of science and technology in the national development vis-à-vis the global changes;

iii) emphasizing the role of science and technology in producing good quality materials for the use of the society;

iv) making the children realize the ways in which science and technology have helped in the development of such areas as agriculture, energy, transport and communication, industry and spread of information technology.

v) Providing an opportunity to get acquainted with different kinds of equipment, devices, gadgets and techniques that science and technology have helped to develop.

Sub-themes :-

I FOOD AND HEALTH

The main objective of this 'sub-theme is to make the children appreciate how improved agricultural practices have made the world, specially our country, self-sufficient in the production of food grains, besides bringing about a general improvement in the quality of life of the people.

The exhibits/models under this sub-theme may include :

1) Innovative/improved designs of farm machinery;

2) Inexpensive and improved techniques of farming;

3) Working models of major irrigation projects and designs/plans for improving irrigation facilities;

4) Working models of fertilizers, biofertilizers and pesticides manufacturing plants and improved pits for producing manure by vermiculture;

5) Innovative/inexpensive improved techniques/methods of storage/preservation/ conservation/transport of agricultural inputs/products and related materials;

6) Application of biotechnology for the improvement of breeds of seeds, plants and animals and processing of various food products;

7) Improvement in the quality of livestock;

8) Working models of diagnostic tools against major diseases of animals and plants.

II ENERGY

The main purpose of this sub-theme is to make the students feel a need to study and analyze various aspects of energy generation, transmission, distribution and management.

The exhibits in this sub-theme may include ;

1 Working models to demonstrate structure and working of different types of power plants, such as thermal, hydel, nuclear, solar, geothermal, tidal and windmills.

2 Schemes/designs of devices or machines to harness energy from non-conventional sources;

3 Schematic designs/working models of fuel-efficient engines/machines/hearths/ chullahs.

4 Working models/simulation/designs of devices for harnessing energy from non-conventional sources.

5 Simulations/schematic designs to demonstrate the use of new materials (like super-conducting material, nanomaterials, optical fibres etc.)

III INFORMATION TECHNOLOGY

The exhibits in this sub-theme may include:

1. Working models demonstrating the principle and functioning of modern devices of communication, such as television and radio (AM/FM), E-mail, Internet, etc.

2. Working models/exhibits to show how the information in any of the areas mentioned earlier can be accessed;

3. Working models showing the use of information technology for presentation and conservation of soil; water management and mapping of world's water resources;

4. Models showing application of information technology for improving upon the quality of seeds of fruits; vegetables and flowers.

5. Working models showing the use of information technology in developing improved designs of machineries for textiles, engineering goods, machine tools, chemicals, drugs and pharmaceuticals and plastics and eco-friendly materials;

6. Demonstrating the use of information technology in developing improved designs/indigenous designs/working models of devices;

7. Working models to show the use of multimedia in making the teaching-learning process more interesting and effective.

8. Development of such software which may help individual students to learn at their own pace.

9. Development of design/models of multimedia, equipment/materials.

IV INDUSTRY

The exhibits/models in this sub-theme may include:

1. Use of innovations/improvements that may help in increasing production in various industries, such as textiles, engineering goods, machine tools, chemicals, drugs and pharmaceuticas including life-saving drugs, vaccines and devices;

2. Working models of improved versions of various types of machines and manufacturing plants;

3. Improved/indigenous design/working models of devices which may be used on small scale for production/manufacture of utility items of daily life;

4. Schemes/designs to help reduce production cost.

5. Working models of devices/equipment to demonstrate the control and measurement of noise, air, water and soil pollution.

V TRANSPORT AND COMMUNICATION

The exhibits/models in this sub-theme may include:

1. Indigenous/Improvised/improved devices for world-wide communication of verbal/printed/Pictorial information.

2. Improvised/indigenous models for efficient transport and fast communication.

3. Working models of fuel efficient/pollution-free designs of automobiles.

4. Innovative ideas for efficient management of road; rail, water and air transport systems.

5. Models showing preparedness for disaster.

6. Working models of devices for recording and reproduction of audio-visual material.

7. Working models of printing technology.

VI BIOTECHNOLOGY

The exhibits/models under this sub-theme may include innovative working models on :

1. Application of micro-organisms, systems or processes to manufacturing and service industries;

2. The use of living organisms and their components in substantial agriculture, food, industrial process and health;

3. Genetically modified crops/food; Recombinant proteins and single cell protein;

4. DNA finger printing;

5. Protein synthesis.

CBSE - INTEL SCIENCE EXHIBITION

REGISTRATION FORM

1. Name of the School ....
2. CBSE Affiliation Number ....
3. Complete Postal Address ....

   of the School (with Pin Code) ....
4. School Phone Number ....

   (With STD / ISD Code) ....
5. School E-mail Address ....
6. School Fax No. ....
7. Title of the Model / Exhibit(s) ....
8. Amount and details of the draft ....
9. Signatures of Principal ....
   (with school seal & date)

Mail to :

Regional Officer

....

....

....

Important : The last date for submission of report / synopsis of the exhibit is **15th July, 2004**

APPENDIX F2

CBSE Circulars 2004-05

CENTRAL BOARD OF SECONDARY EDUCATION
2, COMMUNITY CENTRE, PREET VIHAR, DELHI – 110092

NO.D(A)/PA/2005 25th January, 2005

Circular No: 05/2005

All the Heads of Institutions affiliated to CBSE

Subject : Alternatives to Home work – Reg.

Dear Principal,

The Board had introduced the concept of Alternate to Home work from class III of the current academic year (2004-05). The objective of the course was to provide opportunities to the students to use the time available at home for enhancing their emotional rapport with family and to address to certain core issues like admiration for nature, appreciation of aesthetics, eco-sensitivity, communication skills etc., The Board had also prepared guidelines to schools on Alternatives to Home work so that the schools get a formal design of the content, pedagogy and strategy envisaged by the Board. I am pleased to forward to you a complimentary copy of the Book. You may obtain more copies for your school from the Book stores either at the Head quarters of the Board or from the Book stores of the Regional offices of the Board.

The concept of alternative to home work calls for adequate planning on the part of the teachers and school to design child-friendly activities that would enhance their love for the environment, family and help them to develop as competent citizens of the country. The skills identified either through activities, role-plays or projects could be made a part of co-scholastic activities also. These skills are not to be evaluated formally but the behavioural changes brought out by the empowerment of these skills could be reflected as positive inputs in the School Achievement Record of the individual learners. The training of teachers will be conducted from April 2005. You may like to avail of the facility and all such training schedules will be put up in the Board's website. Alternatively if, the Sahodayas do come forward for training, adequate support will be provided by the Board. It may also be necessary to take the parents into confidence in implementing the activities enlisted so that they understand the spirit of this concept and provide necessary assistance and support to their wards in their learning situations outside the school premises.

Your co-operation in effective implementation of the above scheme is solicited.

Yours faithfully,

(G.BALASUBRAMANIAN)

APPENDIX F2

CBSE Circulars – 2004-05

CENTRAL BOARD OF SECONDARY EDUCATION

2, Community Centre, Preet Vihar, Delhi – 110092

NO.D(A)/PA/2005

February 4, 2005

Circular No: 07/2005

All the Heads of Institutions affiliated to CBSE

Dear Principal,

In continuation of this office Circular No. 06/2004, I am pleased to forward a copy of the guidelines to Project work on Social Sciences. You are requested to kindly bring it to the notice of the concerned subject teacher(s) of your school for effective implementation.

Yours faithfully

Sd/

(G. BALASUBRAMANIAN)

DIRECTOR (ACADEMIC)

INTRODUCTION

Education is a developmental process, which transforms learners. It brings about a change in the mental and physical behaviors of students. To bring about this change, teachers need to introduce their students to concepts, generalizations, issues and skills, which seem relevant to their lives. Social Science is one of the subjects which brings students closer to one's environment, society and the intricacies of the geographical, social , economic and political processes . It enables them to understand the process of social change and the role that they can play towards this change.

With the onset of new millennium, many challenges have been thrown in the school education system. Information explosion and widespread use of information technology has further emphasized demands on the education system. It is imperative to be sensitive to changing societal needs and expectations. In Social Science education particularly there has been a felt need to make its learning interesting, motivating and participatory in nature. Sensing this need of its schools the CBSE introduced Internal Evaluation in Social Science at secondary stage since the 2004 academic session of class IX.

The Internal Evaluation of 20 marks for each of classes IX and X will have the following break up:

Part 1	Class tests, term tests, etc. -	10 marks
Part 2	Assignments -	5 marks
Part 3	Project work -	5 marks

As each of these different types of assessment evaluates different aspects of learning, the evaluation should reflect the actual effort and performance of the learner. No changes should be made to the marks given by the evaluator to enhance overall performance of the students. Brief guidelines with respect to Internal Evaluation in Social Science at the Secondary Stage have already been sent to schools. The present guidelines Part 3 pertain to evaluation of Project work.

Part 3: PROJECT WORK

Need for introducing Project work in Social Science was being felt for quite some time. Many schools had also expressed their desire to have projects in Social Science for enhancing students' understanding of different concepts, principles and generalizations inherent in the subject. This also introduces an alternative mode of learning in class rooms with a purpose to increase student's participation in the process of learning and enabling them to become independent thinkers. It is expected that by introducing Project work, learning will become more contextual, relevant, contemporary and centered on Learning to Be.

A. PROJECT WORK REQUIREMENTS

The project work in Social Science entails the following requirements

1. The project work will be of 5 marks in each of classes IX & X.
2. In class IX, students will do two projects of which one should be related to Disaster Management and the other from the list of projects specified.
3. In class X, students will do any one project out of the list of projects specified.
4. The list of projects is only suggestive. Teachers and students through mutual discussion can devise their own projects suited to the social, cultural and economic conditions and common environmental issues of their locality.

B. PREPARATION AND SUBMISSION OF PROJECT REPORT

At the end of the stipulated term each student will prepare and submit her/his project report. Following essentials are required to be fulfilled for its preparation and submission-

1. The total length of the project report will not be more than 15-20 written pages
2. The project report will be handwritten and credit will be awarded to original drawings, illustrations and creative use of materials.
3. The project report will be presented in a neatly bound simple folder.
4. The project report will be developed and presented in this order
   - Cover page showing project title, student information, school and year
   - List of contents with page numbers.
   - Acknowledgements (acknowledging the institution, offices and libraries visited and persons who have helped).
   - Chapters with suitable headings
   - Planning and activities to be done during the project, if any
   - Conclusions (summary and suggestions or findings, future scope of study)
   - Bibliography

- All the photographs and sketches should be labeled and related to the theme
- Appendix (if needed)
- Teacher's report
- Teachers will initial the preface page
- At the completion of the evaluation of the report, it will be punched in the centre so that the report cannot be reused but is available for reference only
- The Project report will be returned to the students after evaluation. The school may keep the best reports.

C. SCHEME OF EVALUATION

Following are the salient features of the scheme of evaluation of the project work.

1. The projects will be evaluated internally and continuously.
2. All the concerned Social Science teachers in consultation with each other should share evaluation of the projects.
3. Topics covered by the project work will be included in the examination/tests.
4. Questions based on the conclusions of the project will be given as a test (oral or written) of 10 minutes duration after the submission of the project.

D. ALLOCATIONS OF MARKS

Total Marks will be allocated over the different aspects of the Project Work in the following manner:-

Sl. No.	Aspects	CLASS IX (MARKS)
1	Initiative, cooperativeness and participation	1
2	Content accuracy and research work	1
3	Creativity, originality	1
4	Analysis of different situations and different perspectives	1
5	Viva or written test for content assimilation	1
	Marks for one project	5
	Total marks for two projects (Class IX)	10
	Total marks for internal evaluation (Class IX/X)	5 (10 divided by 2 for class IX)

E. PROJECT EVALUATION PROFORMA

Teachers' report in the given proforma will be attached at the end of the report –

PROJECT EVALUATION PROFORMA

SCHOOL'S NAME ___________________________________

ADDRESS____

STUDENT'S NAME__________________________________

ROLL NO.___________CLASS___________SECTION_________

Teacher's Remarks

1. Initiative cooperativeness and participation ____________________________
2. Aesthetic presentation, visual appeal, expression and neatness

   ____
3. Content accuracy, creativity, originality, analysis of different perception, performance in the oral/written tests

   ____
4. Date of submission ________________
5. Total marks ______________________
6. Overall remarks ____
7. Teacher's signature _________________________ Date ___________________

F. MONITORING OF IMPLEMENTATION OF PROJECT WORK IN SCHOOL

It is very essential that the project work in Social Science be implemented in schools in the right manner and spirit.

Out of the two projects that are to be done, one can be given for summer vacation. However, the student should select the topic in the beginning of the new session. Methodology of study and research work should be completed before the vacation and during vacation the project can be systematically organized for presentation and preparation for viva.

The second project can be done in the school. Approximately 30 periods can be allotted for project work, which will enable the students to do the project under the supervision of the teacher. For the implementation of the project in the right spirits, if possible the help of Sahodaya School Complexes or schools in the vicinity may be taken.

CENTRAL BOARD OF SECONDARY EDUCATION
SHIKSHA KENDRA, 2 COMMUNITY CENTRE,
PREET VIHAR, DELHI-110092

CBSE/DIR(ACAD)/Sc.Exh. /2005/ **7th March.2005**
Circular No. 15/2005

To
All the Heads of the Institutions
Affiliated to CBSE

SUB: Regional level CBSE Intel Science Exhibition Competition

Dear Principal,

You may be aware that Central Board of Secondary Education organized its first Regional level and National level Science Exhibition in the preceding year. The response and participation of the schools all over the country was immensely encouraging and satisfying. These exhibitions are aimed at sensitizing the learners to the applications of Science and Technology in today's society and increasing the awareness of the role of Science & Technology in the service of mankind.

You will be glad to know that the Board has again decided to organize Regional level and National level Science Exhibition in collaboration with Intel India. The main theme and sub-theme for models/exhibits/projects for this year's exhibition are as under:-

Main Theme - Recent Trends in Science & Technology

Sub Theme -
1) **Agriculture**
2) **Energy & its conservation**
3) **Industrial Development and Environment**
4) **Educational Technology**
5) **Technology in Health**
6) **Mathematical Modeling**

The Models/Exhibits/projects may include

- Working model to demonstrate
- Schemes/Designs of devices or machines
- Simulations/Schematic designs
- Indigenous designs of devices/machines
- Schemes/designs to reduce production cost
- Working models of equipment to control and measure
- Improved/Improvised models
- Applications of basic principles

- Models of equipment/devices/gadgets/Techniques
- Innovative/inexpensive designs and techniques
- **Research-based investigatory study projects**

The following will be the key parameters of the competition:-

a) Every participating school will represented by two exhibits/projects and a maximum of three students. These exhibits may include **working models or research based projects**. The participating students may be studying in any of the classes from IX to XII.

b) Every participating school will submit an advance report/synopsis of the project/model in the enclosed format on any one of the given sub-themes. The format of the report synopsis is enclosed alongwith the Registration form.

c) Every participating school will pay a nominal fee of **Rs.100/- towards registration fee**. Payment should be made in the form of a **demand draft in favour of Regional Officer, CBSE** payable at **respective Regional Office**. Besides, the schools will bear the entire expenditure for lodging/ boarding/ traveling expenses incurred during participation in the competition.

d) The said exhibition will be organized at regional level by the Board at the identified centers.

e) The participating schools will be informed about the same shortly. The selected few schools at the regional level will be eligible to participate in the National level exhibition.

f) The Registration form (Form A) along with the brief report/synopsis (Form B) and the demand draft is to be submitted to the respective Regional Office. In no case this form be sent to Headquarters.

g) The last date for registration for the competition is **July 15, 2005.**

h) The Regional level competition is likely to be held in the month of August. The participating schools will be informed through CBSE website as well as individually. A brief information about the themes and sub-themes is enclosed for your convenience and reference.

It may be noted that every participating school should prepare the models/exhibits/ projects on any of the sub-themes which may satisfy any or more of the above stated parameters.

Yours faithfully,

(G.BALASUBRAMANIAN)
DIRECTOR(ACADEMIC)

APPENDIX F3

CBSE Circulars 2005-06

CENTRAL BOARD OF SECONDARY EDUCATION, DELHI
SHIKSHA KENDRA, 2 COMMUNITY CENTRE,
PREET VIHAR, DHLHI-110092

Acad./Dir(Acad.)/2005 25th May, 2005
Circular No. 26/05

The Heads of all CBSE

Affiliated institutions

Subject: School based evaluation in Social Science at secondary stage

Dear Principal,

Kindly refer to circulars no. 02/04, dated 28th January, 2004 and 06/04 dated 11th February, 2004 vide which the Board had introduced the scheme of school based evaluation in Social Science at secondary stage and also issued relevant guidelines for its implementation from the academic year 2004-05 for class IX and 2005-06 for class X.

The schools must have now been in the process of planning its implementation for class X in 2006 examination. For the guidance of the schools, the salient features of the scheme are being reiterated here.

1. A total of twenty (20) marks have been allotted for internal evaluation as per the following details:
    - Tests (formative and summative) 10 marks
    - Assignments – school and home assignments 05 marks
    - Project work 05 marks
2. Regarding the evaluation of formative tests, the teachers are expected to give a variety of oral and written questions for recapitulation, review and diagnostic purposes. The purpose is not to assess learning but to identify learning gaps, deficiency in teaching and to bring improvement in teaching-learning process. However, for evaluation of unit tests (written), it is suggested that a record of at least three unit tests, term tests and half yearly tests should be maintained. In class IX, students can be given

marks out of 10 and average can be calculated out of 10 marks. Alternatively, students can be assessed in the unit tests on a five-point rating scale and Grade Point Average (GPA) can be worked out. Then, the final scores on written tests can be worked out of 10 marks. These grades will have the following numerical values:

Excellent -A-5, Very Good -B-4, Good -C-3, Fair -D-2, Unsatisfactory -E-1

In class X, 10 marks will be awarded on the basis of final performance of students in class IX and also on the basis of at least two unit tests held in class X. Then the average can be calculated for marks to be given out of 10. For example, if any student has got 60 per cent marks in aggregate in class IX home examination and has got 7 and 8 marks out of 10 respectively in tow unit tests in Class X, the above can be added up in proportion to 10 which comes out 21 which will then be divided by 3 to get the average marks out of 10. In the instant case, it comes to 7. The teachers may note that too many tests increase the stress level of students. The tests should be conducted in stress free, non-threatening environment to help the student in revising the learn concepts.

3. Regarding assignments, it is suggested that for recording purpose, every month, well-planned assignments may be given to the students. Since Social Science has components of History, geography, civics, etc. assignments may consist of 1 or 2 questions which test the understanding of different concepts in these components. There can be 4 to 5 assignments in class IX and 3 to 4 such assignments in class X. Assessment can be made on a 5-point rating scale. Record of such 5 assignments may be kept. Based on their suggested numerical values, Grade Point Average (GPA) can be calculated to arrive at final award in marks out of 5.
4. Regarding evaluation of project work, 5 marks have been assigned for the project work done by the students in the academic session. The Board had also sent detailed guidelines regarding evaluation of project work; vide circular no. 7/2005 dated 4th Feb. 2005. For class IX, a student is required to do any two projects out of which one will be compulsorily on Disaster Management. In class X, the students will do any one project and marks

will be awarded out of 5. It may be pointed out that the project work in no case should be voluminous and must be restricted within 9 to 15 pages of standard A-4 size but it should be original, creative and innovative. Break up of marks over different aspects will be as follows:

Aspects	**Marks**
Initiative, cooperativeness and participation	1
Content accuracy and research work	1
Creativity, originality	1
Analysis of different situations and different perspectives	1
Viva or written test for content assimilation	1
Marks for one project	5
Total marks for two projects (Class IX)	10
Total marks for internal evaluation in project work (Class IX/X)	

5. Schools are requested to keep the records of internal assessment along with the project files which have been prepared by the students and make these available for inspection. Board will be sending its observers to the schools for the purpose.
6. It may be noted that all the schools are required to send roll number wise marks statement with respect to internal evaluation to the Board between 15th January, 2006 to 15th February, 2006. The marks statement should clearly reflect breakup into different components of internal evaluation.

I would like to emphasize here that the entire purpose of introducing internal evaluation has been to distress learning and make it more relevant useful and enjoyable for the students. The objective of entire exercise is not to increase the learning load among the students but to ensure that the students are enthusiastically involved in the learning process.

With best wishes,

Yours faithfully,

(G. BALASUBRMANIAN)
DIRECTOR (ACADEMIC)

APPENDIX F3

CBSE Circulars 2005-06

CENTRAL BOARD OF SECONDARY EDUCATION, DELHI
SHIKSHA KENDRA, 2 COMMUNITY CENTRE,
PREET VIHAR, DHLHI-110092

Acad./Dir(Acad.)/2005 25th May, 2005
Circular No. 26/05

The Heads of all CBSE

Affiliated institutions

Subject: School for Project Work Evaluation in Social Sciences

Dear principal,

Your attention is drawn to the office circular no. 07/2005 issued on 4th February, 2005 wherein guidelines for project work evaluation in Social Sciences were issued to the schools. It is reiterated that schools should seriously follow the laid down guidelines in evaluating different aspects of internal evaluation i.e. term/unit tests, assignment and project work and maintain proper assessment records.

Project Work is an important aspect of internal evaluation wherein children are helped to do and learn on their own by going through the documents, collecting relevant materials and analyzing them to arrive at their own findings and conclusions. The schools should continue to assign the projects to students based on the guidelines and topics specified. They must also ensure that the total length of the Project report should not be more than 12-15 (size A4) foolscap size handwritten pages. Evaluation should be strictly in terms of the criteria laid down in the guidelines. Boosting of internal assessment marks should be avoided. Any such thing may lead to downscaling of internal marks or its cancellation and the result will be declared on the basis of eternal marks alone.

The Board will be very shortly sending you the revised topics/themes for project for classes in IX and X to be followed during the current academic session 2006-07.

Yours faithfully,

(Sugandh Sharma)
Education Officer (Com.)

Central Board of Secondary Education
Shiksha Kendra, 2 Community Center, Preet Vihar
Delhi 110092

ACAD/EO(COM)/2006. 23/06/2006

Circular No.13

The Heads
of all CBSE affiliated institutions

Dear Principal,

Your attention is drawn to the office circular no.07/2005 issued on 4th February, 2005 wherein guidelines for Project Work Evaluation in Social Sciences were issued to the schools. It is reiterated that schools should seriously follow the laid down guidelines in evaluating different aspects of internal evaluation i.e. term/unit tests, assignments and project work and maintain proper assessment records.

Project Work is an important aspect of internal evaluation wherein children are helped to do and learn on their own by going through the documents, collecting relevant materials and analysing them to arrive at their own findings and conclusions. The schools should continue to assign the projects to students based on the guidelines and topics specified. They must also ensure that the total length of the Project report should not be more than 12-15 (size A4) foolscap size handwritten pages.Evaluation should be strictly in terms of criteria laid down in the guidelines. Boosting of internal assessment marks should be avoided. Any such thing may lead to downscaling of internal marks or its cancellation and the result will be declared on the basis of external marks alone.

The Board will be very shortly sending you the revised topics/themes for project for classes IX and X to be followed during the current academic session 2006-07.

Yours faithfully,

(Sugandh Sharma)
Education Officer (Com.)

APPENDIX F4

CBSE Circulars – 2006-07

Central Board of Secondary Education
2, Community Centre, Preet Vihar, Delhi-110 092

CBSE/)/EO (Science)/Sc.Exh. /2007/145-9144 14th March .2007

Circular No. 16

To
All the Heads of Institutions
Affiliated to CBSE

Subject: CBSE Science Exhibition 2007 – Promoting creativity and Innovation

Dear Principal,

You are aware that the Central Board of Secondary Education has taken series of initiatives in the recent past in order to encourage and promote creativity and innovation amongst learners studying in its affiliated schools. Organization of Regional level and National level Science Exhibitions for the past three years has been one such major initiative taken by the Board.

Some of the broad objectives of organizing Science Exhibitions are:-

- To promote interest of students in the subject of science and develop a scientific temper

- To create awareness about the role of Science and Technology as a major instrument for achieving goals of self-reliance and socio-economic development.

- To highlight the applications of scientific concepts and technological advancements in the fields of agriculture, energy, industry, health, natural resources, transport, communication, computers, Bio-technology, Nano-technology and many other emerging fields.

- To create awareness about the role of Science and Technology in producing good quality material for use of society.

- To develop awareness amongst the learners about the importance of Science and Technology in the national development vis-a-vis the global changes.

- To provide opportunity to students to give shape to their creative ideas and innovations.

There has been immense response in the past three years and the schools have participated in this activity with great enthusiasm at two levels. The Board has decided to conduct the Science Exhibition in the coming academic session 2007-08 too. It is proposed to hold the Regional level Science Exhibition in the month of July 2007. The National level Exhibition is likely to be held in the month of September/ October.

The main theme and sub-themes for this year's exhibitions are:

Main Theme: **Science and Technology for sustainable development**

Sub-Theme:

- **Food and Agriculture**
- **Industry and Environment**
- **Energy**
- **Educational Technology and Mathematical modeling**
- **Transport and Communication**

The following aspects may be kept in mind for participation in the proposed exhibition.

a) Every participating school will prepare a maximum of **two exhibits** / projects.

b) The school team may be represented by **one/ two students per exhibit** and one **escort teacher.** The participating students may be studying in any of the classes from IX to XII.

c) **Every school / team will have to bear all expenses related to participation in the event.**

d) The exhibit/ project may be either
i) Investigation - based study/ project
ii) A working model

e) The exhibit/ model/ project may include

- Working model to demonstrate a concept, principle or a process.
- Indigenous design of machine/ device
- Innovative/ inexpensive design or technique
- Application of basic principles of science/ technology
- Scheme/ design of the device/technique to reduce the production cost
- Investigatory study

f) The request for participation along with the enclosed Registration form and fee is to be sent directly to the respective **Regional officer. In no case it is to be sent to the Headquarters, Delhi.**

g) Every participating school will pay a registration fee of **Rs. 400/-** . Payment should be made in the form of a **demand draft** in favour of **Regional Officer, CBSE payable at respective Regional office.**

h) The last date for registration for participation in the event is **May 15, 2007.**

i) The first stage of the exhibition will be held at two different centers in every region at identified venues.

j) The selected best fifteen exhibits/ schools at the Regional level will be eligible to participate in the National level exhibition.

k) The actual dates for Regional level competition will be informed individually to the participating schools as well as through CBSE website **www.cbse.nic.in**

l) A brief information about the **main theme and sub-themes is enclosed for reference**. The participating school may prepare the exhibit/ project on any one of the sub-themes satisfying one or more of the stated parameters.

m) **Maximum emphasis** should be given to **investigation-based innovative projects** of students to kindling curiosity and interest in the subject.

n) Attractive awards/ cash prizes are given to the exhibits/ students who are among the best twenty models at the National level.

The above information may be brought to the notice of all concerned and the request for participation along with other requirements and details be sent to the **respective Regional Officers** with intimation to the undersigned at the following address.

R.P.Sharma
Education Officer (Science)
CBSE
17, Rouse Avenue
New Delhi-110 002
(Ph.-011-23211200)

Thanking you

Yours faithfully,

(R.P.SHARMA)
EDUCATION OFFICER (SCIENCE)

APPENDIX F4

CBSE Circulars – 2006-07

Central Board of Secondary Education

Shiksha Kendra, 2 Community Center, Preet Vihar
Delhi 110092

ACAD/EO (COM)/2006. 21/07/2006

Circular No.18

The Heads of all CBSE affiliated institutions

Dear Principal,

In continuation of the office circular no.13 dated 23rd June, 2006, I am pleased to forward a copy of the revised guidelines, topics/themes for Project Work in Social Science for classes IX & X to be followed during the current academic session 2006-07. You are requested to kindly bring it to the notice of the concerned Social Science teachers of your school for effective implementation.

Yours faithfully,

(Sugandh Sharma)

Education Officer (Com.)

Guidelines on Internal Evaluation in Social Science

Part III: PROJECT WORK

CLASS IX & X

(For the Academic Session 2006 – 2007)

CENTRAL BOARD OF SECONDARY EDUCATION

DELHI

INTRODUCTION

Education is a developmental process, which transforms learners. It brings about a change in the mental and physical behaviors of students. To bring about this change, teachers need to introduce their students to concepts, generalizations, issues and skills, which seem relevant to their lives.

Social Science is one of the subjects which brings students closer to one's environment, society and the intricacies of the geographical, social, economic and political processes. It enables them to understand the process of social change and the role that they can play towards this change.

With the onset of new millennium, many challenges have been thrown in the school education system. Information explosion and widespread use of information technology has further emphasized demands on the education system. It is imperative to be sensitive to changing societal needs and expectations. In Social Science education particularly there has been a felt need to make its learning interesting, motivating and participatory in nature.

Sensing this need of its schools the CBSE introduced Internal Evaluation in Social Science at secondary stage since the 2004 academic session of class IX.

The Internal Evaluation of 20 marks for each of classes IX and X will have the following break up:

Part 1 Class tests, term tests, etc. - 10 marks

Part 2 Assignments - 5 marks

Part 3 Project work - 5 marks

As each of these different types of assessment evaluates different aspects of learning, the evaluation should reflect the actual effort and performance of the learner. No changes should be made to the marks given by the evaluator to enhance overall performance of the students.

Brief guidelines with respect to Internal Evaluation in Social Science at the Secondary Stage have already been sent to schools. The present guidelines Part 3 pertain to evaluation of Project work.

Part 3: PROJECT WORK

Need for introducing Project work in Social Science was being felt for quite some time. Many schools had also expressed their desire to have projects in Social Science for enhancing students' understanding of different concepts, principles and generalizations inherent in the subject. This also introduces an alternative mode of learning in class rooms with a purpose to increase student's participation in the process of learning and enabling them to become independent thinkers. It is expected that by introducing Project work, learning will become more contextual, relevant, contemporary and centered on Learning to Be.

A. PROJECT WORK REQUIREMENTS

The project work in Social Science entails the following requirements-

1. The project work will be of 5 marks in each of classes IX & X.
2. The topics for project work have been specified in the guidelines.
3. However, the list of projects is only suggestive. Teachers and students through mutual discussion can devise their own projects suited to the social, cultural and economic conditions and common environmental issues of their locality.
4. In class IX, students will do two projects of which one should be related to Disaster Management and the other from the list of projects specified.
5. In class X, students will do any one project.

B. PREPARATION AND SUBMISSION OF PROJECT REPORT

At the end of the stipulated term each student will prepare and submit her/his project report. Following essentials are required to be fulfilled for its preparation and submission-

1. The total length of the project report will not be more than 15 written pages of foolscap size (A-4 size).
2. The project report will be handwritten and credit will be awarded to original drawings, illustrations and creative use of materials.
3. The students should continuously discuss with the teacher and prepare a draft before finalizing the report.
4. The project report will be presented in a neatly bound simple folder.
5. The project report will be developed and presented in this order
    - **Cover page** showing project title, student information, school and year
    - **List of contents** with page numbers.
    - **Acknowledgements** (acknowledging the institution, offices and libraries visited and persons who have helped).
    - **Project Overview**: Purpose, Aim, Methodology and experiences while doing the project.
    - **Chapters** with relevant headings.
    - **Summary and conclusions** based on findings.
    - Planning and activities to be done during the project, if any giving a calendar of activities.
    - **Bibliography**: should have the Title, pages referred, author, publisher, year of publication and if a website the name of the website with the specific website link which has been used.

- All the photographs and sketches should be labeled and acknowledged.
- **Teacher's evaluation report**

6. Teachers will initial the Project Review page
7. On completion of the evaluation of the Project, it will be punched in the centre so that the report cannot be reused but is available for reference only.
8. The Project report will be returned to the students after evaluation. The school may keep **five reports** each representing of different levels from Class IX and X for record.

C. SCHEME OF EVALUATION

Following are the salient features of the scheme of evaluation of the project work.

1. The projects will be evaluated internally and continuously.
2. All the concerned Social Science teachers in consultation with each other should share evaluation of the projects.
3. Questions based on the conclusions of the project will be given as a test (oral or written) of 10 minutes duration after the submission of the project.

D. ALLOCATIONS OF MARKS

Total Marks will be allocated over the different aspects of the Project Work in the following manner:-

Sl.No.	Aspects	Marks
1	Content accuracy and originality	2
2	Presentation and creativity	1
3	Process of Project Completion : Initiative, cooperativeness, participation and punctuality	1
4	Viva or written test for content assimilation	1
	Marks for one project 10/5	5
	Total marks for 2 projects in Class IX/1 Project in class X	10/5
	Total marks for internal evaluation (class IX/X)	5

E. CRITERIA FOR PROJECT WORK

Following will be the criteria for evaluating Project Work:-

Content accuracy and originality	Reads original sources and chooses content from books and internet
Presentation	Presents report with original thoughts and opinions supported by facts.

Process of Project Completion	Chooses topics on one's own, shares information willingly, interacts with teachers and peers willingly, takes responsibility
Viva Voce	Answers of all questions in written or oral form should • Be relevant and appropriate • Reflect original thinking • Reveal confidence in believing in the work done

Teachers' report in the given proforma will be attached at the end of the report –

Project Evaluation Proforma

School's Name ____________________________________
Address ____
Student's Name ___________________________________
Roll No. ____
Class ____
Section ____
Teachers' Assessment

1. Content accuracy and originality
2. Presentation and creativity
3. Process of project completion
4. Viva – Voce'
5. Overall remarks ____
6. Teacher's signature ______________________ Date ________________
   with school stamp

F. MONITORING OF IMPLEMENTATION OF PROJECT WORK IN SCHOOL

It is very essential that the project work in Social Science be implemented in schools in the right manner and spirit. For such implementation of project work, if necessary the help of the Sahodaya school complexes or schools in the vicinity may be taken. The student should select the project topic or theme in the beginning of the new session. The project preparation time for the student including discussion should be about four months and sufficient time must be available for evaluation by the teacher. Marks once allocated should not be amended or re-scrutinized.

LIST OF SUGGESTED PROJECTS FOR CLASS IX

Group 1 (Students to choose any one project)

Project 1 – Imperialism and its impact

Project 2 – Pastoral Economy Communities in Asia or Africa

Project 3 –Clothing – A Social History of Development

Project 4 –Women’s Role in History

Project 5 –Changing trends in society as reflected in cinema in the 20th Century

Project 6- World Peace and Security

Project 7 – Population Distribution

Project 8 - Gender Status (Sex Ratio pattern and its implications)

Project 9 – Adolescent – Myths and issues

Project 10 - Population characteristics of my school

Project 11 – Changing area under Forest and its impact on Environment

Project 12 - Conservation of Natural Resources

Project 13 - Water Resources

Project 14 - Working of Institutions

Project 15 – Rights

Group 2 (Students to choose any one project)

Project 16 – Managing Disasters – The Role of Students

Project 17: Preparedness for a disasters

CLASS IX

Project 1 – Imperialism and its impact

1. Agriculture and Forestry – Deforestation impact as reflected in environment in the 18th – 20th century.
2. Colonialism and its impact on Environment both positive and negative.

Project 2 – Pastoral Economy Communities in Asia or Africa

1. Choose at least 2 communities from Asia or Africa
2. Prepare a photo essay on the life of the community using pictures and drawings
3. Describe the impact of colonialization through policies of the colonizers - steps taken for the development of these communities and impact of colonization on their development in the 18th and 19th Centuries.

Project 3 –Clothing – A Social History of Development

1. Interview different classes of people on the clothes they wore when they were young.
2. Trace the trend in clothes worn at work, leisure, sports in the early 19th C and today in the World and India
3. Trace the impact of colonization on the handloom workers and industry and compare it with changes in Handloom and Khadi industry since Independence.

Project 4 –Women's Role in History

Choose 2 women from each field and document their lives, writings and their contribution. The women are to be chosen from women philosophers, political workers, revolutionaries, lawyers, doctors, soldiers, and social workers of the 19th and 20th century.

Project 5 –Project on changing trends in Cinema in the 20th Century

1. View at least 15 feature films of different time periods in the 20th century in Hindi or regional languages.
2. Evaluate the changing values that the film reflects about society.
3. Describe the change in the depiction of heroes and heroines over the years in the films.
4. Write a film review of at least 2 of the films for the newspapers.

Project 6 – World Peace and Security

Choose either of the Armed Forces or Civil Defense Forces in India and study

1. The role that they play in India today.
2. Collect information about areas where the Force has been called upon to maintain peace.
3. List the International Humanitarian Law and the Universal Declaration of Human Rights.
4. Interview at least one officer and soldier to find out what their duties involve and how they preserve Human Rights and Peace.

Project 7 – Population characteristics and change in India

1. Collect data and interpret trends, in growth by using maps and graphics of data related to 1990-2001 census of population based on male, female, total population and growth rate.
2. Rank the states based on (i) Total population (ii) Male population (iii) Female population (iv) Growth rate

Represent it using maps. Interpret the maps and draw conclusions.

Project 8 – Gender Status (Sex Ratio pattern and its implications)

1. Find out the sex ratio of your school/locality. Represent this data through graphs.
2. Analyze the sex ratio pattern for your school class wise and stage wise. If you have collected the data for your locality analyze it according to income level and family size.
3. Interview at least 5 children from each stage (Primary, Upper Primary , Secondary, Higher Secondary) or from the families in your locality surveyed, on how they feel about having equal number of boys and girls in the class and how those lesser in number feel.

Project 9 - Adolescent – Myths and issues

1. Prepare a questionnaire for an 18 year old boy/girl
2. Questionnaires should cover aspects like
   i. Status and freedom at home and school
   ii. Ways in which drug abuse, smoking, consuming alcohol, rash driving are viewed and prevented.
   iii. Freedom to earn and spend
   iv. Views on freedom and independence
   v. Preferences and eating habits and concern for nutritional values
   vi. Views on sex and reproductive health
   vii. Attitude towards external compulsions such as economic and social disparities, gender discrimination, peer pressure etc.

Analyse each question and draw conclusions about how adolescents view themselves.

Project 10 – Population characteristics of my school

Do a survey from sources like attendance registers/admission forms of children on

(i) Age
(ii) Religion
(iii) Parental education level
(iv) Occupation of parents
(v) Family size and their sex and age

Based on this write a report analyzing of the Population Composition of your school with suitable diagrams and tables

Project 11 – Changing area under forest and its impact on environment

(i) Collect data of area under forest in different states of India since 1980 and interpret the trends.
(ii) Collect case studies on shifting agriculture and its impact in India/world.

(iii) Collect information on Forest Rights and Environmental Policy of the Government in the Eighth, Ninth and Tenth Five Year Plans. Give your views on how these policies would help/hinder conservation.

Project 12: Conservation of Natural Resources

Collect information on Bioreserves, National Parks and Wildlife Sanctuaries focusing on the policy of conservation of endangered species. Collect pictures, travel writings, photographs and brochures to describe the special characteristics of these natural reserves.

Project 13: Water Resources

Choose any one river/water body in India and prepare a project. Some Guidelines are given:

1. For Rivers make Maps on the source, course, catchment area, the tributaries, States benefited,
2. Collect Data on the length of the river, the frequency of flooding, and Dams and reservoirs on them.
3. Geographic features formed by the river along its upper , middle and lower course – pictures, drawings etc
4. For the water body identify the special characteristics of the water body, its location and extent, the geographical and geological history of the formation of the water body. Pictures and data on depth and area.
5. Legends associated with the river, songs related to water and river,
6. How the river/water body benefits the people – system of water distribution in an urban or rural area.
7. Problems associated with the river/water body.
8. Conservation of the river/water body – Traditional or modern method of water conservation – some methods used.
9. Issues related to water such as Big Dam development, contamination and purification of water, sharing of water resources.

Project 14: Analysing the composition of the Lok Sabha

Study the current composition of the Lok Sabha –

1. What is the number of representatives who have studied upto class 10, completed class 12, graduates, post-graduates, and have a professional degree.
2. Identify the number of representatives on the basis of religion, caste, sex and age group.
3. In the light of a truly representative Lok Sabha, evaluate the composition of the current Lok Sabha and draw your conclusions.

Project 15: Elections in India

- Analyze the general election results or elections held in a State for Vidhan sabha.
- What were the emerging trends in the voting patterns?
- What in your view would have been the reasons for this? Collect the opinion from various resources e.g. newspaper, editorials, interviews and current affairs programmes and interviews of ordinary citizens.
- Read a few manifestos of political parties – draft a manifesto of your own and design an election symbol.

Project 16 – Rights

- Write the Bill of Rights of any two countries.
- Collect 10 news articles of each country where you find these rights have been violated
- Write your own Bill of Rights.

GROUP II: Disaster Management related Projects : Do any one of the following:

Project 17 – Managing Disasters – The Role of Students

Choose any man made or natural disaster which your area may be vulnerable to e.g gas leaks, building collapse, rail or road accidents, laboratory accidents, health hazards due to toxic waste disposal , earthquakes, Floods, volcanic eruptions etc.

1. Prepare a survey schedule detailing the different areas that are posing threats due to the various natural and manmade disasters in and around your school for example factory/slum/dump yard located nearby.
2. Collect the data and prepare a report.
3. Develop posters and skits for awareness generation in your school.
4. Make a plan to deal with any one of the disasters likely to affect your school.

Project 18: Preparedness for Disasters

1. Create activities to make people particularly primary children and school workers aware of disaster mitigation.
2. Write a manual of instructions and make kit lists for use by teachers to manage – Laboratory, classroom, corridors and school building security, buses etc.
3. Prepare instructions to deal with any accidents in school or in the bus.

LIST OF SUGGESTED PROJECTS FOR CLASS X

(Students to choose any one project)

Project 1 – Cultural Heritage of India

Project 2 – The development and changes in Agriculture/Industry in the world till today

Project 3 – Consumer Awareness

Project 4 – Globe Issue – Human Rights

Project 5 – Administering Disaster Management

Project 6 – Manual for Disaster Management

PROJECT 1 – Cultural Heritage of India

Select anyone of the following aspects for the study and work out the details.

I. Architecture in the Ancient and Medieval times in India

The project will cover aspects related to the monuments listed in the social science text book such as Konark, Khajuraho, Kailashnath. Buddhist sites, Sanchi, Bull capital, Ajanta and Ellora, architecture of the Sultanate and the Mughal period. For each monument, information is to be presented on following points –

- Who built it and the historical significance
- Location on the map
- Physical environment at the monument at present
- Features of the monument
- Materials used in construction
- Stories and legends associated with the monument
- Ways to protect the monument
- The need to preserve and protect the monument

II. Language and Literature in Ancient and Medieval times in India

- Scripts and their evolution to today's alphabets in the different languages
- The important literary works in different languages.
- Drawings of the manuscripts – decorations etc.
- Authors and their life sketches
- The role of this information for understanding history

III. Music and Art in the Ancient and Medieval times

- Themes and samples of the music and Continuation of styles in each period
- Instruments and their uses in classical and folk music
- Themes and samples of the art and Continuation of styles in each period
- Materials, styles and colors used in the art work
- Information that can be inferred from the pictures about jewellery, clothes, activities, beliefs, and life styles.

PROJECT 2 – The Development and Changes in Agriculture/Industry in the World till Today

A. The development and changes in agriculture in the world till today.

- The evolution of Agricultural practices from the Stone Age through the Medieval period till the Colonial times in India.
- The types of agriculture in different parts of the world shown on a map.
- The food and cash crops and their distribution on a map with details of conditions needed
- for their growth. Case study of farming in any country of the world.
- The issues affecting farmers and farming
- Conditions of present day farmers in India in terms of availability of agricultural inputs.
- Collect pictures ad newspaper articles related to the socio economic conditions and issues faced by farmers in India.

B. Case study of the development of an Industrial region

- Case study of any three industrial areas from different continents.
- The needs of modern industry – raw material, land, labour, capital, energy and space.
- The agro-based and mineral – based industries developed in the regions in the different continents.
- Pictures and news articles on work and living condition of workers in these areas.
- Rights of the workers and the conditions of workers and problems faced in the industrial region.
- Collect information about any one entrepreneur who started industries in the region.

PROJECT 3 – Consumer Awareness

- Consumer awareness and its need.
- Various forms of consumer exploitation
- Role of producers in protecting consumer rights.
- Case study as one incident of violation of consumer rights and the decision by the Consumer Courts.

Suggested Methodology

- Survey different products and the information given as the packaging.
- Interview consumer courts officials and develop case study.

PROJECT 4 – Global Issue – Human Rights

Develop a project on issues of

- Violation of human rights with respect to, children and refugees
- List the Human Rights charter on Children and Refugees.
- Efforts of various Human rights organization
- Collect 2-3 case studies related to these issues.

- Make use of newspaper writings along with pictures, cartoons, stories of sufferings. Interview people about human rights.

PROJECT 5 – Administering Disaster Management

1. Interview any of the Govt./Non-Government functionaries in your locality on their role in Disaster Management:
    - Senior District Magistrate
    - Additional District Magistrate
    - Sarpanch
    - Head of any NGO – dealing in Disaster Management
    - Police inspector, Superintendent of Police
    - Civil Defense Warden
    - Home guard personnel
    - NCC Commandant in the school
    - Municipal authorities
2. Enquire from at least 20 persons from different walks of life in your locality or school on the areas in disaster management and preparedness plans developed by them.
3. Prepare a report on the areas where awareness is needed and find out the local resources available to create awareness.

PROJECT 6 – Manual for Disaster Management

1. Choose to be any authority on Disaster Management, such as Village Sarpanch, Disaster Magistrate, Police Inspector or Fire Services officer.
2. Formulate laws or rules to be followed in a disaster for the most vulnerable groups.
3. Prepare a manual for your department's officials to follow in an emergency. It should include rules to follow for health, safety, relief availability and distribution, law and order etc

APPENDIX F5

CBSE Circulars – 2007-08

Central Board of Secondary Education
Shiksha Kendra, 2 Community Center, Preet Vihar
Delhi 110092

ACAD/EO(COM)/2007 14/05/2007

Circular No.24/07

The Heads

of all CBSE affiliated institutions

Sub.: Topics/themes for Project Work in Social Science for class X

Dear Principal,

Your kind attention is drawn to the office circular no.18 dated 21.07.2006 detailing Project Guidelines for classes IX and X for the academic session 2006-07. With the introduction of the new curriculum and textbooks, topics/themes for Project Work in Social Science for Class X have been revised for the current academic session 2007-08 and the same is forwarded for further dissemination to the concerned teachers in your school. The guidelines and other details on project work requirements and evaluation for classes IX and X and the themes for class IX project work specified in the above circular no.18 remain unchanged.

Yours faithfully,

(C. GURUMUTHY)
DIRECTOR (ACAD.)

LIST OF SUGGESTED PROJECTS IN SOCIAL SCIENCE FOR CLASS X
(ANY ONE PROJECT)

UNIT 1 : INDIA AND THE CONTEMPORARY WORLD II

1.Nationalism in Europe and India

Compare the policies and methods used by Otto von Bismarck and Sardar Vallabhai Patel in unification of Germany and integration of States of India respectively. The report should include :-

- Condition of Germany before 1871 (unification)
- Condition of India immediately after 1947
- Why the need for unification in both the places
- Emergence of Bismarck and Sardar Patel, their brief life history
- Their role in unification and integration.
- Similarities and differences between the methods adopted by the two leaders
- How did the unification affect the growth of the respective countries.

You may refer to the following websites:

http:/en.wikipedia.org/wiki/Otto_von_Bismark
http://www.cyberessays.com/History/73.htm
http://www.cyberessays.com/History/73.htm
http://www1.bartleby.com/65/bi/BismarckO.html
http://en.wikipedia.org/wiki/Political_integration_of India

Books : Any European History book on 19th century and Integration of States by V.P. Menon

2.Evolution and significance of the symbols associated with India's freedom movement

- Need for symbols in general and during Freedom struggle
- Evolution of the symbols over a period of time. (Any two symbols out of the flag, a song, an object like the Charkha, a khadi, a novel, a place a newspaper like Harijan etc. may be selected).
- The impact of symbols on common people during the course of the freedom movement – how and in what occasions were they used
- How did they help in the making of the Indian nation-did they give a sense of identity?
- What do these symbols mean to you today?
- Design a symbol for 21st century reflecting its nationhood-Explain the symbol

You may refer to the following websites :

Flag: http://www.geocities.com/dakshina_kan_pa/art 16/flag1.htm
http://brilliantgnorance.blogspot.com/2005/08/history-of-indian-flag.html.

Sabarmati Ashram: http://en.wikipedia.org/wiki/Sabarmati_Ashram

http://www.mkgandhi.org/gandhiyatra/sabarmati.htm

http://www.indcast.com/ms/ASHRAM%20HISTORY.htm

Khadi: http://en.wikipedia.org/wiki/Khadi

http://www.kvic.org.in/v4/khadi.asp

3.Growth of a city – Mumbai or Kolkata or Delhi or Chennai or any other city of India in the 19th and 20th centuries

- Trace the growth of the chosen city from 17th century onwards
- Reasons for its growth and importance
- New administrative set up like municipalities, railway stations, post offices
- Change in population pattern
- Maps pertaining to this period
- Some imporant monuments and the new architecture in the cities
- The city today and its importance

Colonial architecture websites:

http://www.postcolonialweb.org/india/art/architecture/colonial/colov.html

http://www.scholars.nus.edu.sg/post/india/art/architecture/colonial

4. Series of inventions/ discoveries during the Industrial revolution in England (Any two)

- The need for the inventions in 18th & 19th century in England
- The inventors and their story
- Technique/science behind the inventions
- Opposition/reaction of the society
- Evolution of the invention till Modern Times
- Do we use any of these today? How and where?
- Which, according to you was the most important of all inventions? Why?

You may refer to the following websites**:**

http://www.blupete.com/Literature/Biographies/Science/Inventors.htm

http://en.wikipedia.org/wiki/Industrial_Revolution

http://members.aol.com/TeacherNet/Industrial.html#Inventions

Refer to any books of British history of 18th and 19th centuries

5. Recreating the history of a period through a book.

Suggested books for reading:-

- Exodus by Leon Iris for formation of Israel
- Armaggden by Leon Uris for the aftermath of a war
- All quiet on the western front for First World war
- Oliver Twist, David Copper Field by Charles Dickens for society during Industrial Revolution
- Good Earth by Pearl S Buck;
- Roots by Alex Hailey;
- Godaan and Chess Players by Prem Chand,
- Broken Nest by Rabindranath Tagore;
- Neel Darpan by Din Bandhu Mitra
- Plain Tales from Raj by Charles Allen
- Raj by Gita Mehta
- The city of djinns by William Dalrymple
- My experiments with truth by M.K Gandhi
- To kill a mocking bird by Harper Lee

Or any regional language book (any one book) or any other book of your liking. The report to include -

1. Gist of the story
2. Narrate specific incidents that reflect some features of the society.
3. Have some or any of these features changed over a period of time?
4. Comparison with modern times.
5. Which character do you like the most and why?

UNIT 2 INDIA – RESOURCES AND THEIR DEVELOPMENT

6. Multipurpose River Valley Projects and alternate water supply methods

- Role of multipurpose river valley projects
- Evaluation of positive and negative aspects of river valley projects
- Case study on one river valley and one local area conservation project

➢ Narmada Bachao Andolan
➢ Tehri Dam Andolan

The case study should include the following:-

- Rehabilitation of the displaced population
- Environment Impact Assessment

7. Development and changes in Agriculture of India since independence

- Transition from subsistence to commercial farming

- Change in the cropping pattern in Punjab, Maharashtra and Tamil Nadu
- Green Revolution I and II and its impact both positive and negative

8. Industrial Pollution and Environmental Degradation

- Types of pollutants
- Ill-effects of different pollutants
- Consequences of pollution study of any local river, factory or land fill.

9. Tourism

- Development of different types of tourism
- Important destinations of foreign and Indian tourists in at least 2 States of India
- Tourism as an upcoming industry
- Hindrance in the development of tourism in India

UNIT 3: DEMOCRATIC POLITICS - II

10. Comparative study of India and any one country from the United States of America/ Australia/Canada/South Africa

The study report to include:

- Meaning of Federalism.
- Why Federalism required in India and the "chosen" country
- Features of Federalism in both—similarities and differences
- Working of Federalism-- Federalism in theory and practice—give examples of center and state relationships and conflict and tension between center and state and state and State
- How successful has federalism been in both the countries
- Which system—a federal or unitary, do **you** favour for India? Why?

11. Political Parties

- Meaning of Political parties.
- Kinds of political parties.
- Political party system in Great Britain, United States of America, India, Switzerland, China, Cuba, USSR, North Korea . Take political party systems from any of the two countries mentioned here and compare their organization, manifestoes, policies and programs, their success and failure.
- Participation in political parties and participation of political parties in the democratic process.
- If you had to join a political party in India today, which one would it be and why?
- What would be your manifesto?

12. Judicial Activism

- Meaning and scope of judicial activism
- Judicial activism in the developed countries/developing countries. Students can take one from a developed country such as USA, UK and one from a developing country e.g. India.
- What is the need for judicial activism?
- Judicial activism and the role of NGOs.
- Extent of success achieved by judicial activism.
- Judicial activism and judicial structure in India.

Students are required to read the newspapers of recent times and take up a case study like Jessica Lal case and explain judicial activism.

13. Need of Media role in a Democratic system

- Meaning of media.
- Kinds of media : print and electronic
- Media and democratic system
- Freedom of press, its necessity and role in India
- The success achieved in India - a comparative study with any other country
- Media and the latest technologies adopted pertaining to sports, elections, discoveries, wars, inventions etc.
- Do the electronic media sometimes go overboard covering celebrities?
- Is media always fair in India—give examples from recent times.

14. Challenges facing the Democratic system

- Kinds of challenges (any one)
  - Poverty
  - Illiteracy
  - Regionalism
  - Unemployment
  - Communalism
  - Linguism
  - Political violence--insurgency

The challenge and its present scenario

- Steps taken by Government for tackling the challenge.
- Extent of success achieved pertaining to the challenge.
- Is the extent of success satisfactory? If not, why not?
- Suggestions for improvement.

UNIT 4 - UNDERSTANDING ECONOMICS II

15. Globalization and its impact on agriculture and industry

- What is Globalization?
- Factors that have led to globalization in the 21st century
- Effects of globalization on the Indian farming sector – both positive and negative
- Effects on Indian industry
- WTO and Globalization
- Globalization and the future of the Indian economy.

16. Changes in the occupational patterns of India since independence

- Transition from primary sector to secondary and tertiary sector
- Comparison between India and anyone developed economy such as USA, Japan or Germany.
- Emerging role of tertiary sector in India.
- New kinds of jobs that have emerged in the last decade—Which of these excites you the most?

17. Indicators of Development

- Different indicators of development.
- Regional disparities in development seen through the indicators.
- Comparisons of development between Indian and any one developed country of the world.

18. How to become an aware consumer?

- Who is a consumer?
- Rights of a consumer
- Problems faced by consumers – give examples from everyday life.
- What are consumer redressal forums/courts? What do they do?
- How to seek justice from these? Steps needed to be taken by an ordinary consumer
- When you go to buy a product what all do you check? Give examples of different types of products.
- Interview a consumer activist
- From newspaper reports, give an example of a case when consumers have won their rights.

UNIT 5 - DISASTER MANAGEMENT

19. Role of Govt./Non-Government functionaries in your locality in Disaster Management.

- Interview any of the Govt./Non-Government functionaries in your locality on their role in Disaster Management.

- Senior District Magistrate
- Additional District Magistrate
- Sarpanch
- Head of any NGO – dealing in Disaster Management
- Police inspector, Superintendent of Police
- Civil Defence Warden
- Home guard personnel
- NCC Commandant in the school
- Municipal authorities

- Enquire from at least 20 persons from different walks of life in your locality or school on the areas in disaster management and preparedness plans developed by them.
- Prepare a report on the areas where awareness is needed and find out the local resources available to create awareness.

20. <u>Manual for Disaster Management</u>

- Choose to be any authority on Disaster Management, such as Village Sarpanch, Disaster Magistrate, Police Inspector or Fire Services Officer.
- Formulate laws or rules to be followed in a disaster for the most vulnerable groups.
- Prepare a manual for your department's officials to follow in an emergency. It should include rules to follow for health, safety, relief availability and distribution, law and order etc.

APPENDIX F5

CBSE Circulars – 2007-08

CENTRAL BOARD OF SECONDARY EDUCATION
SHIKSHA KENDRA, 2 COMMUNITY CENTRE,
PREET VIHAR, DELHI-110092

CBSE/EO (Sc)/Sc.Ex./2008 **7.3.2008**
Circular No. 10/08

All Heads of Institutions
Affiliated to the Board

Subject: CBSE Science Exhibition 2008

Dear Principal,

You are aware that the foundations of scientific mind and thought are laid during the formative years of school education. Children are known to be naturally curious to know and learn and they construct new knowledge on the basis of variety of active learning experiences provided to them. With the objective of providing such experiences and in order to promote creativity and innovativeness in learners, the Board has been organizing regional level and national level science exhibitions since 2005. The response has been both encouraging and enthusiastic.

The Board has now decided to announce the conduct of this event for the year 2008-09. The events are likely to be organized in the months of July/ August at Regional level and September/ October at the National level.

The main theme and sub-themes for this year's exhibition are:-

Main Theme: **Science and Technology and Planet Earth**

Sub-Theme:

- **Water Management**
- **Agriculture and Food**
- **Energy Resources**
- **Disaster Management**
- **Mathematical Modeling**
- **Educational Technology**

The following aspects may be kept in mind for participation in the proposed exhibition:

a) Every participating school will prepare a maximum of **two exhibits/ projects/ models.**

b) The school team may be represented by a maximum of **three students and one escort teacher.** The participating students may be studying in any one of the classes from IX to XII.

c) Every school/ team will have to bear all expenses related to participation in the event.

d) The exhibit/ project may be either

i) A working model
ii) Investigation-based study/ project

e) The exhibit/ model/ project may include

- A working model to demonstrate a concept, principle or a process.
- Indigenous design of a machine/ device.
- Innovative/ inexpensive design or technique.
- Application of basic principles of science/ technology.
- Scheme/ design of the device/ technique to reduce the production cost.
- Investigatory study.

f) The request for participation along with the enclosed registration form and fee is to be sent **directly to the respective regional officer**. **In no case it is to be sent to Headquarters, Delhi.**

g) Every participating school will pay a participation fee of **Rs. 400/-.** Payment should be made in the form of a **demand draft in favour of Regional Officer, CBSE payable at respective regional office**.

h) The **last date** for registration for participation in the event is **May 15, 2008**.

i) The first stage of the exhibition will be held at two different centers in every region at identified venues. However, if the number of participating schools from a particular state is large, the number of venues may be increased further and the exhibition can also be held at the additional venue in that state.

j) The selected best 15 exhibits/ schools at every regional level venue will be eligible to participate in the National level Exhibition.

k) **The main criteria for judging the exhibits will be**

• Students' own creativity and imagination	20%
• Originality and innovation in the exhibit/ model	15%
• Scientific thought/ principle/ approach	15%
• Technical skill/ workmanship/ craftsmanship	15%
• Utility/ educational value for layman, children	15%
• Economic aspect, portability, durability	10%
• Presentations like demonstrations and explanation	10%

l) The actual dates for the regional level competition will be informed individually to all the participating schools as well as through **CBSE website www.cbse.nic.in**

m) A brief write-up about the Main theme and sub-theme is enclosed for reference. The participating school may prepare the exhibit/ project on any one of the sub-themes satisfying one or more of the stated parameters.

n) **Greater emphasis** should be given to **investigation-based innovative projects** of students to kindle curiosity, originality and interest in the subject.

o) Attractive awards/ cash prizes are given to exhibits/ students who are among the best twenty models at the national level.

The above information may be brought to the notice of all concerned, particularly the science faculty in the school, and the request for participation along with other requirements and details be sent to respective regional officers with intimation to the undersigned at eoscience@hotmail.com or the following postal address:

R.P Sharma
Education Officer (Science)
Central Board of Secondary Education
Institutional Area, Shiksha Sadan
17, Rouse Avenue,
New Delhi-110 002

Specific suggestions/ observations, if any, with regard to this event may also be sent to the undersigned at the above address.

Thanking you

Yours faithfully,

(R.P.SHARMA)
EDUCATION OFFICER (SCIENCE)

APPENDIX F6

CBSE Circulars – 2008-09

Central Board of Secondary Education

Shiksha Kendra, 2 Community Center, Preet Vihar

Delhi 110092

ACAD/EO(COM)/ 2008 **15-04-2008**

Circular No.14/08

The Heads of all CBSE affiliated schools

Subject: Guidelines in Sociology (Code no.039) subject for Project Work and Marks distribution for class XI for the academic session 2008-09

Dear Principal,

Consequent upon revision of syllabus as per National Curriculum Framework 2005 the new textbooks in Sociology have been introduced in class XI in the year 2006-07 and in class XII in the year 2007-08.

Sociology as a discipline also is more a mode of enquiry rather than a fixed body of knowledge and hence the importance of Project Work. Projects in Sociology are not only a tool facilitating construction of knowledge by the students and fostering creativity in them, but also a major contributor in infusing the right attitude for social issues and concerns in an individual and capacity building for problem solving.

It has, therefore, been decided to introduce Practical Project Work in the subject of Sociology for 20 marks in class XI for the academic year 2008-09 and the theory paper will consist of 80 marks. The same pattern will be introduced in class XII in the subsequent year. Thus, the Sociology paper (code 039) in class XII examination 2010 will consist of 80 marks in theory and 20 marks in practical project both of which will be externally evaluated.

The apportionment of the 20 marks prescribed for the Practical Project Work which will be evaluated by the external examiner is as follows:

Practical examination

Max. Marks 20		**Time allotted: 3 hrs.**
A	Project (undertaken during the academic year at school level)	**07 marks**
	i. Statement of the purpose	2 marks
	ii Methodology/Technique	2 marks
	iii Conclusion	3 marks
B	Viva-based on the project work	**05 marks**
C	Research design	**08 marks**
	iv Overall format	1 mark
	v Research Question/Hypothesis	1 mark
	vi Choice of technique	2 marks
	vii Detailed procedure for implementing of technique	2 marks
	viii Limitations of the above technique	2 marks

B & C to be administered on the day of the external examination

Scheme of examination for class XI in 2008-09 and for class XII 2010 and onwards (academic session 2009-10) along with detailed guidelines on various components, conduct of the activity and evaluation of the projects for both Class XI & class XII are enclosed as Annexure I & II respectively.

This circular may be brought in the notice of the concerned teachers.

Yours faithfully,

(C. GURUMURTHY)

DIRECTOR (ACAD.)

Class XI (For session ending examination 2009 and onwards)

1. One paper theory 80 marks Time: 3 hours

Unit wise Weightage

Units		Marks
A. Introducing Sociology		**34**
I	Society, Sociology and relationship with other social sciences	6
II	Basic Concepts	8
III	Social Institutions	10
IV	Culture and Society	10
V	Practical Sociology : Methods & Techniques	Evaluated through practicals
B. Understanding Society		**46**
VI	Structure, process and stratification	10
VII	Social change	10
VIII	Environment and Society	10
IX	Western Social Thinkers	8
X	Indian Sociologists	8

The appointment of 20 marks prescribed for the Practical Project Work is as follows:

Practical Examination

Max. Marks 20 **Time allotted: 3 Hrs.**

A. Project (undertaken during the academic year at school level) **07 marks**

- **i.** Statement of the purpose : 2 marks
- **ii.** Methodology/Technique : 2 marks
- **iii.** Conclusion : 3 marks

B. Viva-based on the project work **05 marks**

C. Research design **08 marks**

- **i.** Overall format : 1 mark
- **ii.** Research Question/Hypothesis : 1 mark
- **iii.** Choice of technique : 2 marks
- **iv.** Detailed procedure for implementation of technique : 2 marks
- **v.** Limitations of the above technique : 2 marks

Class XII (For session ending examination 2010 and onwards)

1. One paper theory 80 marks Time: 3 hours

   Unit wise Weightage

Units		Marks
Indian Society		**32**
I	Introducing Indian Society	Non-evaluative
II	Demographic Structure & Indian Society	6
III	Social Institutions-Continuity and change	6
IV	Market as a Social Institution	6
V	Pattern of social Inequility and Exclusion	6
VI	Challenges of Cultural Diversity	8
VII	Suggestions for Project Work	Non-evaluative
Changes and Development in Indian Society		**48**
VIII	Structural Change	6
IX	Cultural change	6
X	The Story of Democracy	6
XI	Change and Development in Rural Society	6
XII	Change and Development in Industrial Society	6
XIII	Globalization and Social Change	6
XIV	Mass Media and Communications	6
XV	Social Movements	6

The apportionment of 20 marks prescribed for the Practical Project Work which will be evaluated by the external examiner is as follows:

Practical Examination

Max. Marks 20 Time allotted: 3 hrs.

A. Project (undertaken during the academic year at school level) **07 marks**

   i. Statement of the purpose : 2 marks

   ii Methodology/Technique : 2 marks

   iii Conclusion : 3 marks

D. Viva-based on the project work **05 marks**

E. Research design **08 marks**

   i. Overall format 1 mark

   ii. Research Question/Hypothesis 1 mark

   iii. Choice of technique 2 marks

   iv. Detailed procedure for implementation of technique 2 marks

   v. Limitations of the above technique 2 marks

B & C to be administered on the day of the external examination.

APPENDIX F6

CBSE Circulars – 2008-09

Central Board of Secondary Education
Shiksha Kendra, 2 Community Center, Preet Vihar
Delhi 110092

ACAD/EO(COM)/ 2008 **14-05-2008**

Circular No.20 /08
Very Important

The Heads
of all CBSE affiliated schools

Subject: Approach to the Internal Evaluation of Disaster Management, Unit 5 of Social Science, class X, March 2008 examination of Board.

Dear Principal,

Reference is made to circular no.15/08 dated 11.04.2008 intimating the Board's decision to evaluate Disaster Management in Social Sciences of class X through projects from the academic session 2008-09 and the Board Examination 2009 in Social Science of class X.
The Board has further decided that in addition to Project Work, Disaster Management will be evaluated through assignments also. Following is the revised marks distribution over the three components:

1. *Tests – Formative and summative 10 marks*
2. *Assignments – class and Home 4 marks*
3. *Project Work 6 marks*

Detailed guidelines in this regard are as follows :-

1. **Tests - Formative and Summative:**

The Unit/ Term tests in Class X will not include testing of theory in Disaster Management. Other things remain the same and the marks will be allotted taking the average of student's performance in Class IX and also unit tests in Class X. Kindly refer to Board's Circular No.26/05 dated 25.05.2005 in this respect.

2. **Assignments – Class and Home**

Hereafter, students are expected to do 4 different assignments in Social Science in Class X during an academic session. Out of these, one assignment must be from Disaster Management. All assignments would carry 1 mark each. The remaining three assignments can be given on the other components of Social Science as per discretion of the teacher after ensuring that questions cover all the units of Social Science syllabus and also no component of Social Science should carry more than one assignment.

The purpose of the assignment in Disaster Management is to evaluate the students understanding of the different methods of managing disasters. These assignments could be based on the suggested activities in the textbook or through using diagrams, pictures, comprehension of texts and descriptions given in all the seven chapters of the CBSE textbook, 'Together Towards a Safer India, Part III'. This assignment should be from any chapter other than that selected by the student for project work. Records of assignment done by the students should be kept for a period of six months after board's examination is over for verification.

3. Project Work:

Every student has to compulsorily undertake one project on Disaster Management. A list of topics for project work is enclosed for ready reference in annexure 1. These projects have been carefully designed so as to –

a) Create awareness in learners
b) Enable them to understand and co-relate all aspects of Disaster Management.
c) Relate theory with practice
d) Provide hands on experience.

In order to realize the expected objectives completely, it would be required of the Principals to muster support from various local authorities and organizations like the Disaster Management Authorities, Relief, Rehabilitation and the Disaster Management Departments of the States, Office of the District Magistrate/ Deputy Commissioners, Fire Service, Police, Civil Defence etc. in the area where the schools are located. The textbook entitled *"Together Towards a Safer India,* Part III", by CBSE so far in use for theory examination is the recommended primary source for successfully carrying out the project work. The teachers must ensure judicious selection by students of projects covering a maximum number of listed projects.

The revised distribution of marks over different aspects relating to Project Work is as follows:

S.NO.	ASPECTS	MARKS
1	Content accuracy and originality	2
2	Presentation and creativity	1
3	Process of Project Completion : Initiative, cooperativeness, participation and punctuality	1
4	Viva or written test for content assimilation.	2
	Total marks for project in Class X	**6**

The projects carried out by the students in different topics should subsequently be shared among themselves through interactive sessions such as exhibitions, panel discussions, etc. All documents pertaining to assessment under this activity should be meticulously maintained by concerned schools. **A Summary Report** should be prepared highlighting:

- objectives realized through individual or group interactions;
- calendar of activities;
- innovative ideas generated in this process ;
- list of questions asked in viva voce

and subsequently sent to the undersigned. It is to be noted here by all the teachers and students that the projects and models prepared should be made from eco friendly products without incurring too much expenditure. The Project Report should be handwritten by the students themselves and comprise of not more than 15 foolscap pages. The record of the project work should also be kept for a period of six months for verification, if any.

There being no change right now in Class IX syllabus and Evaluation Scheme, the component of Internal assessment pertaining to this aspect will remain the same.

This may be brought to the notice of all concerned.

Yours faithfully,
(C. GURUMURTHY)
DIRECTOR (ACAD.)

<u>Topics/Themes for Project Work on Disaster Management</u>

<u>CLASS X</u> (Do any one of the following)

<u>PROJECT 1 Role of Govt./Non-Government functionaries in your locality in Disaster Management.</u>

Interview any ***two*** of the Govt. /Non-Government functionaries in your locality on their role in Disaster Management.

- Senior District Magistrate
- Additional District Magistrate
- Sarpanch/MP/MLA
- Head of any NGO working in your locality – dealing in Disaster Management
- Police inspector, Superintendent of Police
- Civil Defence Warden/elected representatives
- Home guard personnel
- NCC Commandant in the school
- Deputy Commissioner of Municipality
- School Principal

Carry out a survey by enquiring from at least 20 persons from different walks of life (such as shopkeepers, housewives, senior citizens, college students, etc.) in your locality on the hazards prevalent, and preventive measures they have taken or would like to take to reduce the impact.

Prepare a Survey report highlighting the areas where awareness is needed and the local resources available in the locality to create awareness.

*(***Note for Teachers***: The teachers can select any two of the functionaries based on their availability in that city/town. This topic can be taken up individually by students or by a group consisting of two students. In case of group work where two students are involved, work should be divided equally so that distribution of marks is easier).*

<u>PROJECT 2: Generating Awareness on Disaster Management</u>

Design a 10 minute skit on Disaster Management.
Design posters on do’s and don'ts of various hazards prevalent in that area.
Visit a slum community and enact the skit by using the posters. The Skit and the posters can also be used to make the junior students aware.

(**Note for the Teachers**: *Better awareness and preparedness amongst the community members have saved a lot of life and property. As responsible future citizens of the country, students can play a major role in awaring the community to be better prepared for natural hazards (flood, cyclone, landslide, tsunami etc) and human induced hazards (fire, rail road and air accidents). Local language should be used so that the community is able to have a better understanding. The Principal along with the teachers can help the students in organizing a meeting with the local slum community).*

PROJECT 3 - Preparation of Models of Disaster Resilient Structures

Make layouts of models based on structural improvement in buildings in a rural/ urban community in coastal areas prone to floods/cyclones or in areas prone to earthquakes/landslides. Show the special features of the buildings and indicate the early warning system that could be best used in that community.

(Note for Teachers: *To carry out the project, there is a need to have a good understanding about the subject. The class X textbook on Disaster Management will help the teachers and the students to have a fair understanding about the topic. However, the school also needs to seek support from qualified engineers, and architects who have knowledge on safe construction practices from either the Government or private sector and also from academic institutions. Qualified engineers and architects can be invited by the principal of the school for lectures and also to suggest methods of carrying out the models. For assessing the project carried out by the school, these qualified persons may also be invited*.)

PROJECT 4 - Pocket Guide on First Aid

Prepare a pocket guide on First Aid for your school. The First Aid pocket guide should contain aid that needs to be given for fractures, poisoning, cuts and burns, heat and cold wave and other threats that are prevalent in that area. The content shared in the guide should be supported with adequate pictures so as to give a clear and elaborate understanding about the topic. Choose awareness campaign strategy for either senior citizens or illiterate people and prepare a brief write-up.

(Note for the Teachers: *The project can be carried out by a group of students in a class and work can be equally divided amongst the students so that the teachers are able to evaluate them easily. Doctors, local health practitioners, trained volunteers of Red Cross and professionals from other agencies/bodies/institutes, proficient in this field can be consulted to prepare the first-aid pocket guide. This guide can be printed by the school administration and shared with all the students, teachers and other staff members of the school. It can be used as a ready reckoner for any First Aid related information.*

PROJECT 5 - Institutional Case Study on Disaster Response

Visit a local NGO/agency such as the United Nations, Red Cross/ Voluntary Youth Organisations like Nehru Yuva Kendra Sangathan (NYKS), National Cadet Corp (NCC), Bharat Scouts and Guides etc; and prepare a case study on how the agencies played a major role in Disaster Response.

*(***Note for the Teachers***: The teachers may select the organisation/agency that they would like the students to be associated with. It can be mentioned here that each district in India has a Red Cross wing headed by the District Magistrate/Collector/Dy. Commissioner. The students before analysing the role played by various agencies can give a brief background of the organisation/agency on its mandate, objectives and goals and role during disasters).*

PROJECT 6 - Communication facilities for Disaster Management

Choose any one method of communication from various means of communication like radio/satellite/television/ Ham radio which are used by Government departments such as the Indian Meteorological Department to disseminate information. Find out how the information is disseminated by them at various levels during disasters. Prepare a report.

(Note for the Teachers: *The students can visit the government departments such as the All India Radio, Doordarshan etc. Principals are expected to issue a letter to the concerned Government Department so as to inform the department that the information collected will be solely for project purpose. Case studies can also be collected to make the project more interesting).*

PROJECT 7: Preparation of Disaster Contingency Plan

Prepare a Contingency Plan either for your school or home/community.. The Plan should be based on an actual survey of your area/locality or school. The Plan prepared should consist of the following maps, inventory of resources available and a seasonality calendar highlighting the seasons prone to various hazards prevalent in that locality/school.

- A social map
- A Resource map
- A Vulnerability map on the outline map of your locality.

(**Note for the Teachers:** *The teachers need to help the students while preparing the plan for the locality/school. It should answer the questions given under the sub-heading 'community contingency plan' in the lesson, called 'Planning Ahead' of Class X Disaster Management textbook.*

APPENDIX F6

CBSE Circulars – 2008-09

CENTRAL BOARD OF SECONDARY EDUCATION
SHIKSHA KENDRA, 2 COMMUNITY CENTRE,
PREET VIHAR, DELHI-110092

CBSE/008/ **Dated: 30.09.2008**

Circular No.38/08

All Heads of Institutions
Affiliated to the Board

Subject: Strengthening of Mathematics Laboratory activity work in Classes III to VIII

Dear Principal,

You are aware that the concept of Mathematics Laboratory was introduced by Central Board of Secondary Education in its affiliated schools few years back. Every school was advised, through a detailed circular, to establish Mathematics Laboratory in order to promote teaching learning of the subject through activity work and hands on experiences. It was also suggested that the concept may be introduced from class III to class X.

With the objective of implementation of the concept in the right earnest, activity and project work was made an integral part of the prescribed syllabus at secondary stage and the scheme of internal assessment in Mathematics was introduced in class X examination from the academic year 2006-07. A detailed circular dated 18th July, 2005 including related information was sent to all the affiliated schools. March, 2007 class X examination was conducted according to the new scheme. A series of initiatives including publication of guidelines to schools on Mathematics Laboratory for classes IX and X giving detailed activities and suggestive project work, were taken by the Board during this period. Additional guidelines have also been provided in the form of circulars issued from time to time and through orientation programs for Mathematics teachers. Schools have also been asked to ensure greater objectivity in internal assessment in the subject vide circular no.02/07 dated 10th January, 2007. It is expected that every care is being taken by the schools to implement Board's policies in the true spirit and make learning of Mathematics more joyful and fun-filling.

In order to strengthen the concept of Mathematics Laboratory further, specific syllabus related activities in the subject have now been identified for classes III to VIII with the help of practising teachers. Latest NCERT textbooks have been kept as the base for generation of ten activities based on different concepts included in the syllabus for every class. Care has been taken to ensure that the teachers and students are able to perform these activities with relative ease, no expensive materials are required to perform these activities and these do not increase the curricular load in the subject. The list of all these activities for classes III to VIII is enclosed with this circular for ready reference. The same is also available on CBSE website

www.cbse.nic.in . The Board expects that the listed activities will be performed by the students of respective classes from the current academic session 2008-09. Additional supplementary material related to these activities is also being developed and will be made available to schools shortly. Your co-operation in meaningful transfer of Board's efforts to classroom situations is solicited.

Yours faithfully,

(C. GURUMURTHY)
DIRECTOR (ACAD.)

APPENDIX F6

CBSE Circulars – 2008-09

CENTRAL BOARD OF SECONDARY EDUCATION
SHIKSHA SADAN, 17-ROUSE AVENUE, INSTITUTIONAL AREA, NEW DELHI-110002

CBSE/Sc.Exh./Cons./2009/ **Dated: 23.03.09**

Circular No.08/09

All Heads of Institutions
Affiliated to the Board

Sub: CBSE Science Exhibition 2009

Dear Principal,

All children are naturally curious to know and learn. They learn through interaction with the natural environment, material things and people around them and construct new knowledge based on their existing ideas and variety of new active learning experiences provided to them.

With the objective of providing such experiences, the Board has initiated a variety of meaningful steps to strengthen Science education at school level. One such step refers to the organisation of Science exhibitions at regional level and national level. These exhibitions are aimed at promoting students' interest in the subject as well as provide common platform to them to give shape to their creative and innovative ideas. Based on past experiences and an encouraging and enthusiastic response from schools, the Board has again decided to announce the conduct of this event for the year 2009-10. The events are likely to be organised in the month of July/August at regional level and September/October, 2009 at the National Level.

The main theme and sub-themes for this year's Science Exhibition are:

Main Theme: Science and Technology for global sustainability

Sub-Themes:

- **Agriculture and Food Security**
- **Harnessing Energy**
- **Conservation of Natural Resources**
- **Combating climate changes**
- **Disaster Management**
- **Mathematical modelling**

The following **key aspects** of the event may be kept in mind for participation:

(i) Any participating school can prepare a maximum of **two** exhibits/projects/models.

(ii) The Participating school/team will have to **bear all expenses** related to participation in this event.

(iii) The exhibit/project may be either
 (i) a working model or
 (ii) An investigation-based project

(iv) The school team may be represented by a maximum of **two students per exhibit** and **one escort Science Teacher.**

(v) The exhibit/project may include

- A working model to explain a concept, principle or a process
- An indigenous design of a machine/device
- An innovative/inexpensive design or technique.
- Application of basic principles of Science/technology
- Scheme/design of a device or machine to reduce the production cost
- Investigation-based study

(vi) The request for participation alongwith the enclosed registration form and fee is to be sent directly to the **respective regional officer. In no case it is to be sent to the Headquarters.**

(vii) However, the schools in Delhi region may send it to **Regional Officer**, **Central Board of Secondary Education**, **PS 1-2, Institutional Area, I.P. Extension, Patparganj, Delhi-110 092.**

(viii) Irrespective of the number of exhibits, every participating school will pay a participation fee of **Rs.400/-.** This payment should be made in the form of a demand draft in favour of **Regional Officer, CBSE** payable at respective regional officer.

(ix) The last date for registration for participation in the event is **May 20, 2009**.

(x) The first stage of exhibition will be held at two different venues in every region. However, if the number of participating schools from a particular region is very large, the number of venues may be increased to three.

(xi) The selected **best fifteen** exhibits/ schools at every regional level venue will be eligible to participate the National level exhibition.

(xii) The exhibits/projects will be **evaluated** by the experts as per the following **criteria:**

- Students' own creativity and imagination 20%
- Originality and innovativeness 15%
- Scientific thought/principle/approach 15%
- Technical skill/workmanship 15%
- Utility/educational value 15%
- Economic aspect, portability, durability 10%
- Presentation-Explanation and demonstration 10%

(xiii) The actual dates for the regional level exhibition will be communicated to every school **individually** as well as through CBSE website **www.cbse.nic.in** in the month of June, 09.

(xiv) A brief **write-up** about the main theme and sub-theme is enclosed for reference. The participating schools may prepare the exhibits/projects on any one of the sub-themes satisfying one or more of the stated parameters.

(xv) Greater emphasis should be given to **investigation based innovative projects** to kindle curiosity. Originality and creativity in the students.

(xvi) Attractive awards/cash prizes are given to exhibits/students who are among the best twenty models at the national level.

The above information may be brought to the notice of all concerned, particularly the science faculty in the school and the students. The **request for participation** alongwith enclosed registration form, registration fee and other details may be sent to **respective Regional Officers** before due date. The undersigned can be contacted at **011-23211200** or **sharmarp1984@gmail.com** for any further clarification, if need be.

You may also send any specific suggestions or observations in this regard to the undersigned at the above e-mail address.

Thanking you,

Yours faithfully,

(R.P. SHARMA)
Consultant, CBSE

APPENDIX F7

CBSE Circulars – 2009-10

<u>Regional level CBSE Science Exhibition 2009</u>

The Regional Level CBSE Science Exhibition, 2009 will be held in the month of August, 2009 as per the following schedule. Every participating school is also being informed individually. A copy of the letter being sent to every school is given below for complete information. Consultant CBSE, Mr. R.P. Sharma, may be contact at 011- 23211200 or science.cbse@gmail.com in case of any further clarification in this regard:

<u>COPY OF THE LETTER SENT TO EVERY PARTICIPATING SCHOOL</u>

CBSE/Cons/2009/ **2nd July, 2009**

The Principal

<u>Subject: Participation in Regional Level CBSE Science Exhibition-2009</u>

Sir/Madam,

This has reference to your application for participation in Regional Level CBSE Science Exhibition 2009, It is to inform you that the said exhibition will be held on ----------------------- (two days) at the following venue in your region:----------- Travel schedule of the team may be planned accordingly. You are requested to note the following points in this regard.

a) The participating students must be accompanied by **one escort teacher.**
b) The participating teams will have to make their **own** travel and stay **arrangements** at venue city.
c) Travel and lodging/boarding **expenses will be borne by the participating** team/school.
d) Every team should report to the venue school Principal one day in advance (Morning) and ensure the space and other facilities required for the display of the exhibit. The model should be arranged and set in all respects well in time one day in advance. The school name and title of the exhibit should also be displayed

properly. The teams are advised to bring all necessary materials like bed-sheet, markers, cello-tape, all-pins, drawing pins, gum stick etc. for proper display of the exhibit.

e) The timings of the exhibition will be from **9.00 a.m. to 5.00 p.m. on both the days**. The students from other schools are also likely to visit the exhibition and get benefited.

f) Your exhibit/model will be evaluated by a team of subject experts for selection for National Level Exhibition. Both or at least one of the members of the team should always be present at the exhibit for explanation to the visitors. The major parameters of evaluation of exhibits include originality, scientific principle, technical skill, utility, economic viability and presentation. The participating students should be well prepared for proper explanation and presentation.

g) As far as possible, one exhibit should not require more than 6'X3' (approx.) of space for display. The project/exhibit must be supported with Charts/Reports and other support materials.

h) You are required to submit a brief **write-up** of the model/exhibit displayed by the team. The write-up should include the title**, objective/aim, scientific principle involved, material used, figure, working investigation/findings, approx. cost, utility and further scope of the project etc. along with the name** of the participants and the school with complete address. The write-up is to be submitted to the Principal of Venue School or the organizers on the days of exhibition and should not exceed three typed pages.

i) The information/**confirmation about participation** of your school and your exact requirements for display of exhibit should be **sent to the venue Principal** well in advance under intimation to the Regional Officer.

In case of any further clarification in this regard, you may contact the undersigned at **science.cbse@gmail.com**, 011-23211200 or the Regional Officer. This information is also available on CBSE website **www.cbse.nic.in.**

Thanking you,

Yours faithfully,

R.P. Sharma

Consultant (CBSE)

APPENDIX F7

CBSE Circulars – 2009-10

CENTRAL BOARD OF SECONDARY EDUCATION
2, COMMUNITY CENTRE, PREET VIHAR, DELHI-110 092

No. CBSE/ACAD/2009 20th September, 2009
Circular No. 39/20-09-2009

All the Heads of the institutions
affiliated to CBSE

Subject: Examination Reforms and Continuous and Comprehensive Evaluation (CCE) in the Central Board of Secondary Education (CBSE)

Dear Principals,

The larger context of education is to prepare futuristic citizens for a meaningful and productive life in a globalised society. There is a dire need to strengthen the education system even more so in a pluralistic society which addresses itself to a heterogeneous group. Evaluation is a means of realizing the extent to which we have been successful in imparting such an education. Evaluation is an indispensable part of the educational process as some form of assessment is necessary to determine the effectiveness of teaching learning processes and their assimilation by learners.

External examinations 'are largely inappropriate for the 'knowledge society' of the 21st century and its' need for innovative problem solvers', Questions if not framed well, "call for rote memorization and fail to test higher-order skills like reasoning and analysis, lateral thinking, creativity and judgment. External exams make no allowance for different types of learners and learning environments and induce an in-ordinate level of anxiety and stress" (NCF-Position paper on Examination Reforms).

This calls for a functional and reliable system of School-Based Evaluation.

We need to look at the holistic assessment of a learner which also includes co scholastic area of Life Skills, Attitudes and Values, Sports and Games as well as Co-Curricular activities. The CCE scheme aims at addressing this in a holistic manner. A number of National Committees and Commissions in the past have consistently made recommendations regarding reducing emphasis on external examination and encouraging internal assessment through School-Based Continuous and Comprehensive Evaluation. Therefore, the CCE scheme brings about a paradigm shift from examination to effective pedagogy.

National Curriculum Framework 2005, while proposing Examination Reforms has also stated – "Indeed, Boards should consider, as a long-term measure, making the

Class X Examination Optional, thus permitting students continuing in the same school (and who do not need a Board certificate) to take an internal school exam instead “.

Hon’ble Union Minister for Human Resource Development also announced “Push the process of examination reform in accordance with NCF 2005. This will include making the Class X examination optional, thus permitting students continuing in the same school (and who do not need a board certificate) to take an internal school assessment instead”.

In the light of the above background, surveys and consultations with various stakeholders across the country and the given mandate of CBSE, the Board, on the advice of the Ministry of Human Resource Development, Government of India has decided to introduce the following Scheme:

1. Scheme of the Board

1.1 Senior Secondary Schools

a) There will be no Class X Board Examination w.e.f. 2011 for students studying in CBSE’s Senior Secondary schools and who do not wish to move out of the CBSE system after Class X.
b) However, such students of Senior Secondary Schools who wish to move out of the CBSE system after Class X (Pre-University, Vocational course, Change of Board, etc.) will be required to take the Board’s External (pen and paper written/online) Examination.
c) Further, those students who wish to assess themselves vis-à-vis their peers or for self assessment will be allowed to appear in an On Demand (pen and paper/ online) Proficiency test.

1.2 Secondary Schools

The students studying in CBSE’s Secondary schools will however be required to appear in Board’s External (pen and paper written/online) Examination because they will be leaving the secondary school after Class X.

1.3 All Schools

1.3.1 The Continuous and Comprehensive Evaluation (CCE) will be strengthened in all affiliated schools with effect from October, 2009 in Class IX.

1.3.2 An Optional Aptitude Test developed by the CBSE will also be available to the students. The Aptitude Test along with other school records and CCE would help students, parents and teachers in deciding the choice of subjects in Class XI.All students of Class X in the current academic year will be taking the CBSE Board’s Class X 2010 Examination. The CBSE will be conducting this Examination. The weightage of the school based assessment will remain the same as per past practice, i.e. 20% each in the subjects of Science, Social Science and Mathematics.

1.3.3 The new Grading system will be introduced at Secondary School level (for Classes IX & X) effective from the Academic Session 2009-10. The details of grading scheme are being circulated in a separate advisory to schools.

Details of the scheme are annexed at (Annexure-I) all for ready reference.

2. How would the Scheme help?

The above steps would help the learners and parents, who are the primary stakeholders of school education, in the following manner:

a) It will reduce stress and anxiety which often builds up during and after the examination which could have an adverse impact on young students especially in the age group of 13-15 years.
b) It will reduce the dropout rate as there will be less fear and anxiety related to performance.
c) In the past there was practice to often finish the entire syllabus much before time and follow it up with Pre-Board(s) and study leave. Now there will be greater focus on learning rather than teaching to the test.
d) The emphasis on conceptual clarification through experiential learning in the classroom will increase since there will be more time available for transaction of curriculum.
e) It will help the learners to develop holistically in terms of personality by also focusing on the co-scholastic aspects which will be assessed as part of the Continuous and Comprehensive Evaluation scheme.
f) It is expected to prepare the students for life by making students physically fit, mentally alert and emotionally balanced. g) The students will have more time on their hands to develop their interests, hobbies and personalities.
g) It will enable the students, parents and teachers to make an informed choice about subjects in Class XI.
h) It will motivate learning in a friendly environment rather than in a fearful situation.
i) It will equip students with Life Skills especially Creative and Critical thinking skills, social skills and coping skills which will keep them in a good stead when they enter into a highly competitive environment later on.

3. Addressing the Concerns

The CBSE has been discussing the matter with its stakeholders all over the country. A number of issues are likely to be raised by students/parents regarding this initiative, as it is being done for the first time by any Board in India. A compilation of such issues, and solutions offered by the Board in the form of FAQs (Frequently Asked Questions) will be soon available on the CBSE website. In case of any clarification you may write through the CBSE's website (detailed below) or mail your queries to the Chairman CBSE by superscribing "CBSE Examination Reform" on the top of the envelop.

4. CCE Guidelines

Many of the Schools are already aware about the CCE and are implementing the same. However, in order to improve the quality of CCE, the detailed guidelines are being issued and will reach the schools shortly. These will also be available on CBSE website (www.cbse.nic.in).

5. Training Workshops

Teacher training workshops will be conducted simultaneously from October 2009 onwards. These training workshops will be compulsory for the Heads of Schools and two teacher representatives. Details of these will be available on the CBSE's website. Principals and trained teachers will be thereafter interacting with parents during Parent Teacher Meetings to create awareness regarding the Board's Scheme and address their concerns.

6. Request to School Principals

The CBSE is committed to the enhancement of quality in school education and it plans to empower schools to assess the students without compromising on any quality parameter. It has full faith in the Principals and teachers of its affiliated schools and hopes that the following action will be taken in the shortest possible time:

a) Explain the above scheme in detail to the parents, teachers and students specially those in Classes IX and X and interact with parents of these students to create awareness and sensitize them.
b) Collect and forward the information about number of students in Class IX in the current academic session.
c) Forward this data to the Regional Office concerned in the enclosed Proforma definitely by 15th October 2009.(Annexure 2)

7. Further Clarification

Comprehensive guidelines on various aspects of CCE will be available in the Teachers' Manual on School Based Assessment shortly. This will also be hosted on the CBSE website (www.cbse.nic.in)

In case you need any further clarification, please log on to www.cbse.nic.in and click on the 'Interact with Chairman on Class X Board Examination' button. Your queries on this issue will be replied expeditiously.

All Heads of Schools are directed to make necessary preparations so as to implement the above scheme in letter and spirit. The Board is also sure that all Principals would help in implementing the above mentioned reforms.

Waiting for an early response.

Yours faithfully,
(VINEET JOSHI)
CHAIRMAN & SECRETARY

Annexure 1

Scheme of Examination Reforms and Continuous and Comprehensive Evaluation (CCE)

A. Class IX -2009 –10 Academic Session

Strengthening Continuous and Comprehensive Evaluation (CCE) in Class IX

(Second Term October 2009 – March 2010)

1. The Central Board of Secondary Education introduced Continuous and Comprehensive Evaluation in Primary classes in 2004 (Circular No. 5/18/25/04). The achievement records and its format was also circulated for Classes I to V with the objective of facilitating holistic learning in the school. The focus was on identifying the talents of the learner and empowering with positive inputs. The Board recommended a five Point rating scale, it also recommended the elimination of the pass /fail system at the primary classes (Circular No. 31/04/21/05). The Board has also followed it up by extending this scheme up to Classes VI to VIII and developed a CCE card on School Based Assessment for the same (Circular No. 2/06).
2. The scheme of Continuous and Comprehensive Evaluation (CCE) will be now further strengthened in all affiliated schools from October 2009. The Class IX students will be assessed through the CCE by the school itself. The strengthened CCE scheme will be applicable for the second term (October 2009 – March 2010) of the current academic year in Class IX.
3. In general, for the purpose of the CCE, an academic year has been divided into two terms. The first term will be from April – September and the second term from October – March.
4. The CCE in classes IX & X is intended to provide holistic profile of the learner through evaluation of both Scholastic and Co-Scholastic areas spread over two terms each during two academic years.

4.1 Evaluation of Scholastic areas:

Each term will have two Formative assessments and one Summative assessment for evaluation of Scholastic areas.

4.1.1 Formative Assessment:

Formative assessment is a tool used by the teacher to continuously monitor student progress in a non-threatening and supportive environment. If used effectively it can improve student performance tremendously while raising the self esteem of the child and reducing the work load of the teacher. Some of the main features of Formative assessment are that it is diagnostic and remedial, provides effective feedback to students, allows for the active involvement of students in their own learning, enables teachers to adjust teaching to take account of the results of assessment and recognizes the profound influence that assessment has on the motivation and self-esteem of students, both of which are crucial influences in learning.

It is highly recommended that the school should not restrict the Formative assessment to only a paper-pencil test. There are other means of testing such as through quizzes, conversations, interviews, oral testing, visual testing, projects, practicals and assignments.

For this year there will be only two Formative assessments for Class IX for the (remaining) second term.

It is advised that the Schools may conduct more than two such assessments and take the best two out of those.

Assessments done periodically will be shown to the students/ parents so as to encourage continuous participatory improvement.

4.1.2 Summative Assessment:

The Summative assessment is the terminal assessment of performance at the end of instruction. Under the end term Summative assessment, the students will be tested internally based on the following criteria:

a) Curriculum and Syllabus for Classes IX will be the same as circulated by the Board earlier.
b) The Summative assessment will be in the form of a pen-paper test conducted by the schools themselves. It will be conducted at the end of each term.
c) In order to ensure standardization, and to ensure uniformity, the Question Banks in different subjects to generate question papers will be forwarded by the Board to schools in March 2010.
d) In order to cater to difference in the pace of responding, the Schools will give flexible timing to the students during end term Summative assessment.
e) For this year, there will be only one term end Summative assessment for the (remaining) second term to be conducted in March 2010 for Class IX students.
f) Evaluation of answer scripts will be done by the school Teachers themselves on the basis of the Marking Scheme provided by the Board.
g) There will be random verification of the assessments procedures carried on by schools by the Board officials/nominees appointed by the Board.

The Weightage of Formative Assessment (FA) and Summative Assessment (SA) shall be as follows:

Term	Type of assessment	% of weightage in academic session	Term wise weightage	Total
FIRST TERM (April-Sept)	Formative Assessment-1	10%	Formative Assessment1+2=20%	Formative =40%, Summative =60% **Total 100%**
	Formative Assessment-2	10%		
	Summative Assessment-1	20%	Summative Assessment1=20%	
SECOND TERM (Oct-March)	Formative Assessment-3	10%	Formative Assessment3+4=20%	
	Formative Assessment-4	10%		
	Summative Assessment-2	40%	Summative Assessment2=40%	

Note: For this year as the scheme is being introduced from the Second Term only, the weightage of each Formative Assessment shall be 20% and that of Summative Assessment shall be 60%.

4.2 Evaluation of Co-Scholastic areas:

4.2.1 In addition to the Scholastic areas, co-scholastic areas like Life Skills; Attitudes & Values; Participation & Achievement in activities involving Literary & Creative Skills, Scientific Skills, Aesthetic Skills and Performing Arts & Clubs; and Health & Physical Education will also be evaluated. Most of the schools are already implementing activities involving these areas. The schools have been trained under Adolescence Education Programme (AEP), emphasizing upon Life Skills; the schools are also aware about Comprehensive School Health Programme introduced in 2006 (Circular No. 9/06/29/07, 27&48/08). However, for ready reference and convenience of the schools, the activities under Co-Scholastic areas and evaluation thereof are also included in the comprehensive guidelines on various aspects of CCE (Refer Para 5 below).

5. This year, the students in Class IX will follow the CCE for the second term only as already stated above. For this, the schools will give the Report Card on the model format to be supplied by the Board in its guidelines. This Report Card will reflect both Formative and Summative assessment of second term of Class IX in scholastic as well as co-scholastic areas.

6. Comprehensive guidelines on various aspects of CCE will be available in the Teachers' Manual on School Based Assessment shortly. This will also be hosted on the CBSE website (www.cbse.nic.in)

7. This scheme will continue for further academic sessions also.

B. Class IX -2010 – 11 Academic Session onwards

These students will undergo the CCE as described above spread over two terms, one from April 2010 to September 2010 and the second from October 2010 to March 2011. As already detailed in Para 4.1.1 and 4.1.2, the Formative Assessment will be part of School Based Assessment and Summative Assessment at the end of each term will be based on the Question Banks being sent by the Board.

C. Class X -2009 – 10 Academic Session

1. All students of Class X in the current academic year will be taking the CBSE Board's Class X 2010 Examination. The CBSE will be conducting this Examination.
2. The weightage of the School Based Assessment will remain the same as per past practice, i.e. 20% each in the subjects of Science, Social Science and Mathematics.
3. The new Grading system will be introduced at Secondary School level (for Classes IX & X) effective from the Academic Session 2009-10. The details of grading scheme will be circulated in a separate advisory to schools.
4. The syllabus and examination specifications in all subjects remain as reflected in Secondary School Curriculum Document 2010 (printed by the Board) with minor modifications as notified to schools through circulars during the current session. The Curriculum Document and the circulars are available on the CBSE website (www.cbse.nic.in).

D. Class X-Academic Session 2010-11 onwards

1. Senior Secondary Schools

In Senior Secondary Schools, there will be no Board examination at Class X since the students will be entering Class XI in the same school.

These students will be assessed through the CCE internally by the school as per the strengthened CCE Scheme as described above for Class IX (for the second term from October 2009 to March 2010) and Class X (for two terms, the first term from April 2010 to September 2010 and the second from October March 2011).

At the end of the academic year 2010-11, students will be issued the CCE certificate on the pre-printed stationery to be supplied by the Board. **These CCE certificates, once they are complete in all respects, (for both Class IX and X) will be required to be sent to the Regional Offices for the signatures of the Board official.**

However the Board will provide **flexibility** to the following students in Senior Secondary schools also to appear in Board's external (pen and paper written/ online) examination (described separately below):

- The students wanting to terminate their studies in the school for admission in Pre-University, vocational course, etc.
- The students wanting to shift to the other schools of other State Boards due to local reasons.

Moreover, those students who wish to assess themselves vis-à-vis their peers or for self motivation will be allowed to appear in an On Demand (pen and paper/ online) Proficiency test.

2. Secondary Schools:

In all schools upto secondary level there will be Board's external (pen and paper written/on-line) Examination at the end of Class X as detailed in para 3 below since the students will be moving out of these schools.

Note: The students in Classes IX and X in Secondary Schools also will follow the CCE as described above. At the end of the Class X, students will be issued the CCE certificates on the pre-printed stationery supplied by the Board.

3. External (pen and paper written/online) Examination

- These mainly application oriented external (pen and paper written/ online) Examinations will be based on the same syllabi as detailed in the Curriculum Document 2011.
- These will be certified by the CBSE.

E. Concessions being given to the Differently Abled

All the relaxations such as use of scribe for visually challenged, choice of optional subjects, use of computers for visually challenged being provided the present Board Examinations of Class X to the differently-abled children need to be continued in the School Based Assessment also, at the formative as well as Summative level. Due consideration will also be given to these students in coscholastic evaluation too.

F. Aptitude Test

1. The Board will offer an Aptitude Test (optional) which along with other school records and CCE would help the students, parents and teachers in deciding the choice of the subjects at Class XI.
2. The Board proposes to provide an opportunity to students to undertake the Aptitude Test twice, once at the end of Class IX and then at the end of Class X.

G. Admission in Class XI (Academic Session 2011 – 12)

1. For the purpose of admission in Class XI the CCE certificate will be relied upon.
2. It is also recommended that some amount of weightage be assigned to the co-scholastic aspects especially Life Skills and excellence in sports for allotting subjects in class XI. A multi-pronged approach for assigning subjects needs to be adopted. Aptitude test, Scholastic Performance and Co-Scholastic Achievements, all need to be given weightage.
3. Students of the same school may be given preference over the students coming from any other school for admission in Class XI.

***

Annexure-2

CENTRAL BOARD OF SECONDARY EDUCATION
Proforma for Data Collection in Class IX
For academic session (2009-10)

Name of the School____

Complete Address____

School Code (Examination Code)____

Affiliation Number ____

Affiliation Status (Secondary/Senior Secondary)____________________________

Contact Number Tel (O)_______________ (R)____________Mob_______________

Email id: School____

Email id: Principal ____

Total number of:

a. Sections in Class IX______________________________________
b. Students in Class IX_____________________________________
c. Teachers teaching Class IX_________________________________

Differently abled students if any with specific details **(Please attach a separate sheet)**

Certified that the above information is correct.

SIGNATURE WITH DATE ___________________________

NAME OF THE PRINCIPAL ___________________________

STAMP OF THE SCHOOL __________________________

***

APPENDIX F7

CBSE Circulars – 2009-10

Website: www.cbse.nic.in 23237779

CENTRAL BOARD OF SECONDARY EDUCATION
(An autonomous Organisation under the Union Ministry of Human Resource Development, Govt. of India)
'Shiksha Sadan', 17-Rouse Avenue, New Delhi – 110 002

CBSE/EO(SD)/CIRCULAR/2009 30.11.2009
Circular No. 62

All Heads of Institutions
Affiliated to the Board
Dear Principal,

In continuation to Circular No. 42 issued by CBSE regarding CCE in Class IX for II Term (Oct 2009 to March 2010) dated 12.10.2009, the design of the question paper in Science for the Summative Assessment II Term for Class IX which is going to be held in March 2010 has been modified. The modified design is as follows:

Modified Design of the Question Paper

Sl. No.	Type of questions	No. of questions	Marks allotted to each question	Total marks
1	Very Short Answer Type (VSA)	05	01	05
2	Short Answer Type-I (SA I)	09	02	18
3	Short Answer Type-II (SA II)	09	03	27
4	Long Answer type (LA)	03	05	15
5	MCQ(Practical Skills)	15	01	15
Total		**41**	**---**	**80**

The syllabus of Science and Mathematics and the design of the Mathematics question paper for Summative Assessment II of Class IX will remain same as per the Circular 42 dated 12.10.2009. The final syllabus and design of Science and Mathematics is placed at Annexure I and Annexure II respectively.

The details of the Formative Assessment to be followed in Science and Mathematics for Class IX in the IInd term is given in Annexure III (Science) and Annexure IV (Mathematics). This may be brought to the notice of all the teachers and the students involved in the teaching and learning for Class IX.

Yours faithfully,

(DR. SRIJATA DAS)
EDUCATION OFFICER(SD)

ANNEXURE I

EVALUATION SCHEME – II TERM
Oct to March 2009
Class-IX Science

There will be two formative tests and a yearend summative test. The weightages and time schedule will be as under:

Type of test	Weightage	Time schedule
Formative Assessment 3	10 %	Oct – Dec., 2009
Formative Assessment 4	10 %	Jan – Feb 2010
Summative Assessment 2	40 %	March 2010
Total	**60 %**	

Formative Assessment 3 and 4 will include the following:

I. Written Assessment based on Theory
II. Practical Assessment based on CBSE curriculum 2009-2011
III. Continuous Assessment in the following suggested areas:
   a) Home Assignments/Class Assignments
   b) Class Response/oral assessment/quiz
   c) Seminar
   d) Symposium
   e) Group Discussion
   f) Group Activity preferably in groups of 4-5 students. Suggested areas
      - Investigatory/Experimental Projects
      - Action Plan
      - Survey
      - Assessment on worksheets based on field trips

Summative test will be taken at the year end from the following chapters:

Sl. No.	Name of the chapter
1.	Is matter around us pure
2.	Atoms and molecules
3.	Structure of the atom
4.	The fundamental unit of life
5.	Tissues
6.	Gravitation
7.	Sound
8.	Work and Energy
9.	Why do we fall ill
10.	Improvement in Food Resources

Modified Design of the Question Paper

Sl. No.	Type of questions	No. of questions	Marks allotted to each question	Total marks
1	Very Short Answer Type (VSA)	05	01	05
2	Short answer Type-I (SA I)	09	02	18
3	Short answer Type-II (SA II)	09	03	27
4	Long answer type (LA)	03	05	15
5	MCQ(Practical Skills)	15	01	15
Total		**41**	**---**	**80**

ANNEXURE II

EVALUATION SCHEME – II TERM
Oct to March 2009
Class-Ix (Mathematics)

There will be two formative tests and a yearend summative test. The weightages and time schedule will be as under:

Type of test	Weightage	Time schedule
Formative Assessment 3	10 %	Oct – Dec., 2009
Formative Assessment 4	10 %	Jan – Feb 2010
Summative Assessment 2	40 %	March 2010
Total	**60 %**	

Formative tests may be of following forms:

I. Unit test based on the content taught during the respective periods.
II. Written test/oral test
III. H.W. /C.W.
IV. Worksheets/assignment
V. Quiz
VI. Group activity/discussion
VII. Mathematics projects in groups of 3 to 4 students. The projects can be chosen from the ones given in the Activity Book for class IX or any other topic selected students related to the subject using the taught concepts
VIII. Mathematics activities (Hands on) given in the Activity Book for Class IX or something which is related to concepts.

Summative test will be taken at the year end from the following chapters.

1. Number systems
2. Polynomials
3. Lines and angles
4. Triangles

5. Quadrilaterals
6. Areas of parallelograms and triangles
7. Circles
8. Surface areas and volumes
9. Statistics

Design of the Question Paper

Sl. No.	Type of question	No. of questions	Marks allotted to each question	Total marks
i)	M.C.Q	8 4	1 2	8 8 = 16
ii)	Short Answer Type-I	7	2	14
iii)	Short Answer Type-II	10	3	30
iv)	Long Answer Type	5	4	20
TOTAL		**34**	**---**	**80**

ANNEXURE-III

Formative Assessment in Science will include the following:

I. Assessment on Paper-pen test.

Due weightage to be given to different types of questions (short answer, long answer, MCQ etc.). The questions should include all difficulty levels (Easy, Average, Difficult and HOTS).

II. Practical assessment based on CBSE curriculum 2009-2010 would include the following:

The students should be asked to conduct experiments from all areas of curriculum. The assessments should be based on the following:

- Experimental Set up
- Observation
- Record of observation/data
- Analysis of observation/data
- Conclusions drawn by the student
- Practical Record File
- Viva

III. Continuous Assessment in the following suggested areas:

a. Home assignments / class assignments

Due weightage to be given to:

- Regularity
- Neatness
- Presentation
- Correctness

b. Class response may include:
- Oral Questioning
- Quiz
- Worksheets

Sl. No.	Assessment Method	Areas of Assessment
1.	**Oral Questioning** Oral Questions to assess the understanding of the topic	Listening Skills Clarity of expression Clarity of concepts Communication Skills
2.	**Quiz** The class students divided in groups and Questions pertaining to the topic asked to assess the students of a group	Thinking skills Alertness Time management Application of knowledge Reasoning skill Art of quizzing
3.	**Worksheets** Use of worksheets to assess the students in the class	Comprehension Regularity Application of knowledge Attentiveness

c) Seminar

A topic may be divided among eight to ten students for them to research/study and 'present' it to all students. e.g. Topic "Improvement in Crop Yields" can be divided into sub topics for presentation by the students:

i. Introduction
ii. Crop Variety Improvement
iii. Crop Production Management
iv. Crop Protection on Management

Areas of Assessment

Ability to research on the topic____

Acquisition of content knowledge______________________________________

Public speaking____

Verbal expression____

ICT skills____

Leadership quality____

Suggested topics based on the curriculum

Animal Husbandry

Diseases and their causes

Sources of energy & overcoming energy crisis

Application of Archimedes's Principle

Physical and Chemical changes in daily Life

Separation of mixtures -the techniques

d) Symposium

Students can be asked to 'present' papers on the topics of their choice.

Areas of Assessment

Depth of the content____

Presentation of the content____

Use of audio-visual aids____

Expression____

Comprehension of the topic____

Suggested topics based on the curriculum/related to the curriculum

Hygiene to ward off the diseases

Prevention is better than Cure

Application of ultrasound

'Pressure' – its application in daily life

Chemical classification of metals

Atomic models

e) Group Discussion

A group of ten students can be given a topic to discuss.

- Students to choose their group leader, a moderator and a recorder
- Their roles to be clarified
- The topic to be thrown open for discussion

Group leader to ensure all students participate in the group discussion
Moderator to ensure that there is no cross talk and no two students speak together and all listen to one speaker patiently. Recorder to record the observation made by all students in the group including his/her own.

Areas of Assessment

Courage to put forth views____

Team work____

Respect to peer____

Knowledge of content____

Appropriate body language____

Communication skills____

Listening skills____

Suggested topics -Based on curriculum OR Related to the curriculum

Global warming and its impact

Role of students in bringing awareness among community members on:

- Importance of hygiene
- Saving of power and water
- Importance of immunization

Displacement of an object in the absence of any force acting on it

Energy transformation in daily life situations
Laws of chemical combination
Application of Colloids

(f) Group Activity

Group Activity may include the following:

i) Projects

The students may be asked to do the investigatory/ experimental projects

- Investigatory Projects include:
  - Collection of data
  - Analysis & interpretation of data
  - Observation
  - Conclusion and Inference

Areas of Assessment

Inquisitiveness____
Observational skill____
Thinking skill (logical, rationale) ____________________________
Analytical____
Application of knowledge_____________________________________
Comprehension & understanding (viva-voce) ___________________
Computing skills____
Drawing conclusions____

Suggested topics related to the curriculum:

Conservation of resources
Factors affecting buoyant force
Application of reflection of sound
Spread of diseases caused by mosquito in the locality
Soil fertility

- Experimental Projects include:
  - Identifying problem
  - Making hypothesis
  - Testing/experimenting
  - Observation
  - Analysis & Interpretation
  - Conclusion & Inference
  - Making a theory

Areas of Assessment

Inquisitiveness____
Observational skill____
Thinking skill (logical, rationale) ____________________________
Analytical____
Application of knowledge_____________________________________
Comprehension & understanding (viva-voce) ___________________
Computing skills____

Drawing conclusions____

Experimental Skills____

Suggested topics related to the curriculum:

Floatation using vegetables

Density of immiscible liquids

Vibrating objects produce sound

Location of apical meristem

Determination of PH in different sample need in daily life (eg. soap, lotions, ford substances)

Separation of substance using paper chromatography

ii) Action Plan

Students of a class to be divided in 5-6 groups to make an action plan.

Action Plan includes identifying a problem and making a plan to find a solution. The students to

- Identify a problem
- Study the cause of the problem
- Interact with people (stake holders) associated with the problem.
- Categorize the problem in terms of
  - magnitude
  - effect on people
  - impact on community
- Make a plan to find the solution of the problem. The plan to include:
  - Meeting people
  - Counseling the people
  - Listing people/authorities who can help find solutions
  - Seeking appointments with the authorities to discuss the identified problem and seek their help
- A follow up action on the solution of the problem

The work to be divided among the students or all work in a group as a unit. Asessment may be done group-wise or student-wise

Areas of Assessment

Identification of a problem ______________________________________

Concern for the community_______________________________________

Team work____

Analysis of the problem ____

Strategy planned by the students__________________________________

Self confidence ____

Speaking skills____

Follow up action to see concern for people/environment__________________

Suggested topics related to the curriculum

Smoking among teenagers vis-à-vis health

Sale of cigarettes near schools

Hygiene in and around school
Seepage of water in buildings
Leaking of water pipes
Wastage of electricity
Stagnation of water in the coolers
Control of contagious/infectious diseases

iii) Survey – Collecting information on a relevant topic of study in a group Assessment may be done group-wise or student-wise.

Areas of Assessment

Inquisitiveness____
Conversational skills____
Public relations____
ICT skills____
Data collection____
Analytical skills____

Suggested topics as general awareness (related to science)

- Garbage collection in the locality
- Prevalence of diseases in a locality/community
- Contamination of water of different areas
- Consumption/misuse of electricity

ANNEXURE -IV

FORMATIVE ASSESSMENT in Mathematics will include the following:

i) Unit Tests

These may be tests based on a single unit or a group of units studied during a specified period. A test may contain (15-20) questions for duration of one or two periods. This may contain

a) multiple type questions
b) fill in the blanks type questions
c) short answer type questions which test the understanding of units
d) may contain one/two long answer type question which test the application of a number of concepts.

ii) Oral tests

Small questions testing the

a) knowledge of formulae involved in the units
b) numerical ability of problems involved in the topics
c) logical reasoning in the steps involved
d) Clarity of concepts

iii) Checking of Home Work

The student may be checked on the following:

a) regularity in doing the home work
b) getting it checked by the teacher and re-doing the parts which have not been done correctly(follow-up)
c) Neatness.

iv) Class Work

Whether the student is

a) attentive in the classroom
b) replying to questions raised by the teachers in the class
c) interaction in the class with fellow students and teachers
d) takes proper notes of concepts taught in the class and prepares according to the next-day's work.

v) Worksheets/Assignments

Worksheets/assignments on different topics may be given to the students related to the topics taught in the class to check the following:

- comprehension
- regularity
- understanding of concept
- application of knowledge

vi) Quizes

Quizes can be organized on the following:

a) Comprehension of concepts
b) Application of knowledge
c) Reasoning skills
d) Knowledge of historical events related to the subject

Some of the topics for quizzes can be

- Contribution of Indian Mathematician on various topics
- The knowledge on general topics like the number p, the golden triangle, the fourth dimension in the spatial concepts, etc.

vii) Group Activity

Activities given in the Activity books for classes IX and X can be done. Also teachers can think of other activities which help to clarify the concepts. Activities can be done in groups as well in individual capacity.

The student may be evaluated on the following:

(a) Performance of activity
(b) File record of the activities performed
(c) Viva

viii) Discussions/seminars, etc.

The group discussions/seminars may be organized on the general topics like

- The concepts of zero and infinity
- Contribution of Indian Mathematicians
- The history of p etc.

i) Project Work

It may be presented in any of the following forms:

a) Written project reports
b) Charts/Models
c) Power point presentations
d) Survey analysis

Projects can be evaluated on the following:

- Rationale of the project
- Inquisitiveness, observation skill, thinking skill, analytical ability
- Application of knowledge
- Drawing conclusion
- Presentation in style

Some suggested projects are as follows:

i) Observing interesting patters in a cricket match

This involves the performance of two teams involved in the following:

a) run-rate per over
b) runs scored in first 10,20,------50 over by two teams.
c) Wickets taken and runs per over given by bowlers.

Presenting the whole information in detail in

- Written form.
- Pictorial forms-bar charts
- Tabular form – comparisons on bowling pattern, batting pattern, etc.

ii) Designing a Cross Word Puzzle with Mathematics terms

iii) Contribution and life history of a selected Indian Mathematician like

- Aryabhatt
- Mahaviracharya
- Bhaskaracharya, etc.

iv) Number of different types of shop in a nearby shopping centre (A) --------
(B) ---------and its sufficiency

v) Survey type projects (involving field trips to different industries etc.)

APPENDIX F8

CBSE Circulars – 2010-11

CENTRAL BOARD OF SECONDARY EDUCATION
SHIKSHA SADAN, 17-ROUSE AVENUE, INSTITUTIONAL AREA,
NEW DELHI-110002

CBSE/Sc.Exh./cons./2010 Dated 21.04.2010

Circular No. 19

All Heads of Institutions
Affiliated to the Board

Subject: Organization of CBSE Science Exhibition 2010

Dear Principal

Besides creating scientific literacy, key expectations from teaching-learning of science at school stage include developing questioning and enquiring skills, acquiring process skills, developing problem-solving and decision-making skills and promoting scientific temper in the learners and helping them to understand and appreciate close inter-relationship between Science, Technology and society. This demands interactive, participator, hands-on, innovative and creative learning experiences to be provided to them.

The Board has initiated many steps in the recent past to provide such experiences. One such step refers to organization of Science Exhibitions at Regional and National levels. The event is aimed at providing a common platform to schools, teachers and students to given shape to their creative and innovative ideas. Based on the past experience of enthusiastic response from schools, it has again been decided to organize the Science exhibitions for the year 2010-2011. These exhibitions are likely to be organized at Regional level in the month of July/August and at National level in the month of September/October 2010.

The main theme and sub-themes for this year's Science Exhibition are:

Main theme: Science, Technology and Society

Sub-themes:

- Climate change-causes and consequences
- Green energy
- Biology in Human Welfare

- Information and Communication Technology
- Mathematics and Everyday life
- Science and Technology in Games and Sports

The following key aspects of the exhibition may be kept in mind for participation:

i. Any participating school can prepare a maximum of **two exhibits**/projects/models.

ii. The participating school/team will have to **bear all expenses** related to participation in the exhibition.

iii. The exhibit/model may be either
    1. A working model or
    2. An investigation-based project

iv. The school team may be represented by a maximum of two students per exhibit and one escort Science Teacher.

v. The exhibit/project may include
    - A working model to explain a concept, principle or a process
    - An indigenous design of a machine/device
    - An innovative/inexpensive design or technique
    - Application of basic principles of Science/technology
    - Scheme/design of a device or machine to reduce the production cost
    - Investigation-based study

vi. The request for participation along with the enclosed registration form and fee is to be sent directly to the respective Regional Officer.

vii. The schools in Delhi region may send it to Regional Officer, CBSE, PS 1-2, Institutional Area, I.P. Extension, Patparganj, Delhi-110 092.

viii. Irrespective of the number of exhibits, every participating school will pay a participation fee of Rs. 400/-. This payment should be made in the form of a Demand Draft in favor of Regional Officer, CBSE payable at respective regional office city.

ix. The last date for registration for participation in the event is June 15, 2010.

x. The first stage of exhibition will be held at two different venues in every region. However, if the number of participating schools from a particular region is very large, the number of venues may be increased to three.

xi. The selected best fifteen exhibits/schools at every regional level venue will be eligible to participate in the National level exhibition.

xii. The exhibits/projects will be evaluated by the experts as per the following criteria:

• Creativity and imagination	20%
• Originality and innovativeness	15%
• Scientific thought/principle/approach	15%
• Technical skill/workmanship	15%
• Utility/educational value	15%
• Economic aspect, portability, durability	10%
• Presentation-Explanation and demonstration	10%

xiii. The actual dates for the regional level exhibition will be communicated to every school individually as well as through CBSE website www.cbse,nic.in by July 10, 2010.

xiv. A brief write up about the main theme and sub-theme is enclosed for reference. The participating schools may prepare the exhibits/projects on any one of the sub-themes satisfying one or more of the stated parameters.

xv. Greater emphasis may be given to Investigation based innovative projects to kindle curiosity, originality and creativity in the students.

xvi. Attractive awards/cash prizes are given to exhibits/students who are among the best twenty models at the national level.

The above information may be brought to the notice of all concerned, particularly the science faculty in the school and the students. The request for participation along with enclosed registration form, registration fee and other details may be sent to respective Regional Officers before due date. For any other information in this regard, you may contact at science.cbse@gmail.com or eoscience@ive.com.

You may also send any specific suggestions or observations in this regard to the undersigned at the above e-mail address.

Thanking you,

Yours faithfully,

(R.P. Sharma)
Consultant, CBSE

APPENDIX F8

CBSE Circulars – 2010-11

Website: www.cbse.nic.in 23237779

CENTRAL BOARD OF SECONDARY EDUCATION
(An autonomous Organisation under the Union Ministry of Human Resource Development, Govt. of India)
'Shiksha Sadan', 17-Rouse Avenue, New Delhi – 110 002

CBSE/EO(SD)/IGNITE/2010/ July 23, 2010
Circular No. 35/10

All Heads of Independent Schools
Affiliated to the CBSE

Subject: IGNITE 2010: A Nationwide Campaign to harness the creative and innovative spirit of school children by National Innovation Foundation (NIF) and Central Board of Secondary Education (CBSE)

Dear Principal,

The CBSE has in the past years successfully launched IGNITE 2007, IGNITE 2008 and IGNITE 2009 in collaboration with National Innovation Foundation (NIF) and Honey Bee Network with an attempt to harness the creative and innovative talent of school children.

The main feature of the project has been one of promoting innovative thinking not confined to an isolated few but as a pervasive characteristic of all children. As a value addition the project has served as a stress reducing feature of regular curriculum transaction and an activity to promote original thinking and problem solving ability. This venture had a remarkable response from the students, teachers and the parents. While 961 entries were received during IGNITE 2008 the number rose to 1344 from 21 states in the IGNITE 2009 campaign. The awards for the original contributions and innovations submitted for the IGNITE 2009 competition were given away in an exhibition cum award function by Dr. APJ Abdul Kalam, Former President on 30th November, 2009 at the Indian Institute of Management, Ahmadabad.

Encouraged by such an overwhelming response the collaborative project "IGNITE 2010", is being taken forward by the Board in the new academic session 2010-11.

The schedule for the IGNITE 2010 is as per details given below:

a) Date of Announcement of the competition by July 23, 2010.
b) The last date for submission of entries directly to NIF at the following address or through email at ignite10@nifindia.org is September 15th, 2010

IGNITE 10
National Innovation Foundation, India
Bungalow 1, Satellite Complex,
Premchand Nagar Road, Vastrapur
Ahmadabad 380015, Gujarat

c) Call for entries from students as per the following categories:
   I. Technological ideas to solve any problem in day to day life
   II. Real life technological projects demonstrating innovative ways of solving problems or reducing drudgery or generating efficiency or conserving resources (projects demonstrating application of known scientific concepts or theories will not be accepted).
   III. Traditional knowledge practices documented from elders in and around one's family.
   IV. Information about some other innovators in the neighborhood
d) Each entry should be accompanied with a certificate from parents and teachers saying that the idea / innovation has been developed and documented by the student concerned entirely on his / her own without any guidance or support from them.
e) The awards will be announced on October 15, 2010, birthday of Hon'ble former President of India, Dr. A.P.J. Abdul Kalam celebrated as Children's Creativity and Innovation Day. The awards will be given away by Dr. Kalam at his convenience soon after.
f) NIF will provide support for patenting and incubating innovative projects into products in all deserving cases. NIF has already filed patents for first award winner in IGNITE'07, and selected winners of the IGNITE 08 and IGNITE 09 competitions. Many award winners have been interviewed at the national and international level also.

We request you to give wide publicity to this competition amongst students, teachers and parents so as to activate the creative instinct in children to find solutions to the day-to-day problems. We also request you to persuade every class teacher to motivate students to pursue innovative ideas and projects during summer vacation. Further schools are also requested to start the Honey Bee Creativity Clubs (Clubs in school that promote creativity and innovation among children, projects done/ideas and innovations conceived by student members of the club may be linked to NIF during the IGNITE campaign or otherwise) as part of their enrichment activities if they have not already initiated action in this regard.

With best wishes,

Yours sincerely,

(C. Gurumurthy)
Director (Academic)

APPENDIX F8

CBSE Circulars – 2010-11

Document No 1

Regional level CBSE Science Exhibition 2010
Region wise schedule

The Regional Level CBSE Science Exhibition, 2010 will be held in the month of August, 2010 as per the following schedule. Every participating school is also being informed individually. A copy of the letter being sent to every school is given below for complete information. Consultant CBSE, Mr. R.P. Sharma, may be contact at 011- 23211200 or science.cbse@gmail.com in case of any further clarification in this regard.

<u>COPY OF THE LETTER SENT TO EVERY PARTICIPATING SCHOOL</u>

CBSE/Cons/2010/ **29th July, 2010**

The Principal

<u>Subject: Participation in Regional Level CBSE Science Exhibition-2010</u>

Sir/Madam,

This has reference to your application for participation in Regional Level CBSE Science Exhibition 2010; it is to inform you that the said exhibition will be held on --------------------------------------- at the following venue in your region:

Travel schedule of the team may be planned accordingly. You are requested to note the following points in this regard.

a. The participating students must be accompanied by one escort teacher.
b. The participating teams will have to make their **own** travel and stay **arrangements** at venue city.
c. Travel and lodging/boarding **expenses will be borne by the participating** team/school.
d. Every team should report to the venue school Principal one day in advance (Morning) and ensure the space and other facilities required for the display of the exhibit. The model should be arranged and set in all respects well in time one day in advance. The school name and title of the exhibit should also be

displayed properly. The teams are advised to bring all necessary materials like bed-sheet, markers, cello-tape, all-pins, and drawing pins, gum stick etc. for proper display of the exhibit.

e. The timings of the exhibition will be from **9.00 a.m. to 5.00 p.m.** on both the days. No team will be allowed to leave before the timings. The travel plans may be made accordingly.

f. Your exhibit/model will be evaluated by a team of subject experts for selection for National Level Exhibition. Both or at least one of the members of the team should always be present at the exhibit for explanation to the visitors. The major parameters of evaluation of exhibits include originality, scientific principle, technical skill, utility, economic viability and presentation. The participating students should be well prepared for proper explanation and presentation.

g. As far as possible, one exhibit should not require more than 6'X3' (approx.) of space for display. The project/exhibit must be supported with Charts/Reports and other support materials.

h. You are required to submit a brief **write-up** of the model/exhibit displayed by the team. The write-up should include the **title, objective/aim, scientific principle involved, material used, figure, working investigation/findings, approx. cost, utility and further scope of the project etc., along with the name** of the participants and the school with complete address. The write-up is to be submitted to the Principal of Venue School or the organizers on the days of reporting at venue exhibition and should not exceed three typed pages.

i) The information/**confirmation about participation** of your school and your exact requirements for display of exhibit should be **sent to the venue Principal** well in advance under intimation to the Regional Officer.

In case of any further clarification in this regard, you may contact the undersigned at **science.cbse@gmail.com**, 011-23211200 or the Regional Officer. This information is also available on CBSE website **www.cbse.nic.in .**

Thanking you,

Yours faithfully,

R.P. Sharma
Consultant

APPENDIX F9

CBSE Circulars – 2011-12

Website: www.cbse.nic.in 23231667

CENTRALBOARDOFSECONDARYEDUCATION
(An Autonomous Organization under the Union Ministry of Human Resource Development, Govt. of India)
'ShikshaSadan', 17-Rouse Avenue, New Delhi – 110 002

CBSE/Sc.Exh.JS acad/2011 Dated: 18.04.2011
Circular No.31

All Heads of Institutions
Affiliated to the Board

Subject: Organization of CBSE Science Exhibition 2011

Dear Principal

The purpose of Science exhibitions is to develop scientific attitude in the young generation of our country to make them realize the interdependence of science, technology and society and the responsibility of the scientists of tomorrow. These objectives may be achieved by presenting the exhibits as an exciting experience of creativity of children, innovations through improvisations of science kits, and various devices and models for providing solutions to many present and future socio-economic problems particularly those confronted in the rural areas, using available materials and local resources.

The exhibitions will help children and teachers to learn from each other experiences and motivate them to design and develop something new and novel. It will also provide a medium for popularizing science and increasing awareness among the public towards it. The objectives of organizing science exhibitions may briefly be put as follows:

- stimulating interest in science and technology and inculcating scientific spirit in younger generations;
- exploring and encouraging scientific and technological talent among children;
- inculcating in them a sense of pride in their talent;
- providing exploratory experiences, encouraging creative thinking and promoting creative thinking and promoting psychomotor and manipulative skills among children through self devised exhibits or models or simple apparatus;
- encourage problem solving approach and developing the appropriate technologies, especially for rural areas and integrating scientific ideas with daily life situations;

- popularizing science among masses and creating an awareness regarding the role of science and technology in socio-economic and sustainable growth of the country.

The Board has initiated many steps in the recent past to provide such experiences. One such step refers to organization of Science Exhibitions at Regional and National levels. The event is aimed at providing a common platform to schools, teachers and students to given shape to their creative and innovative ideas. Based on the past experience of enthusiastic response from schools, it has again been decided to organize the Science exhibitions for the year 2011. These exhibitions are likely to be organized at Regional level in the month of July/August and at National level in the month of September/October, 2011.

The main theme and sub-themes for this year's Science Exhibition are:

Main Theme: Science and Technology for challenges in life.
Sub-Themes:

- Bio-diversity-Conservation and Sustenance
- Agriculture and technology
- Green Energy
- Transport and Communication
- Community health and Environment
- Mathematical modeling

The following Key aspects of the exhibition may be kept in mind for participation:

i Any participating school can prepare a maximum of two exhibits/projects/models.

ii The Participating school/team will have to bear all expenses related to participation in the exhibition.

iii The exhibit/model may be either
  a. A working model or
  b. An investigation-based project

iv The school team may be represented by a maximum of two students per exhibit and one escort Science Teacher.

v The exhibit/project may include
  a. A working model to explain a concept, principle or a process
  b. An indigenous design of a machine/device
  c. An innovative/inexpensive design or technique
  d. Application of basic principles of Science/technology
  e. Scheme/design of a device or machine to reduce the production cost
  f. Investigation-based study

vi The request for participation along with the enclosed registration form and fee is to be sent directly to the respective regional officer.

vii The schools in Delhi region may send it to Regional Officer, Central Board of Secondary Education, PS 1-2, Institutional Area, I.P. Extension, Patparganj, Delhi 110 092.

viii Irrespective of the number of exhibits, every participating school will pay a participation fee of Rs.400/-. This payment should be made in the form of a demand draft in favor of Regional Officer, CBSE payable at respective city where the Regional Office is situated.

ix The last date for registration for participation in the event is June 15, 2011.

x The first stage of exhibition will be held at two different venues in every region. However, if the number of participating schools from a particular region is very large, the number of venues may be increased to three.

xi The selected best fifteen exhibits/ schools at every regional level venue will be eligible to participate in the National level exhibition.

xii The exhibits/projects will be evaluated by the experts as per the following criteria:

a.	Involvement of children's own creativity and imagination	20%
b.	Originality and innovations in the exhibits	15%
c.	Scientific thought/principle/approach	15%
d.	Technical skill/workmanship and craftsmanship	15%
e.	Utility/educational value for layman, children	15%
f.	Economic aspect, portability, durability	10%
g.	Presentation-Explanation and demonstration	10%

The actual dates for the regional level exhibition will be communicated to every school individually as well as through CBSE website www.cbse.nic.in by July 10, 2011. A brief write-up about the main theme and sub-theme is enclosed for reference. The participating schools may prepare the exhibits/projects on any one of the subthemes satisfying one or more of the stated parameters.

Greater emphasis may be given to investigation based innovative projects to kindle curiosity, originality and creativity in the students. Attractive awards/cash prizes are given to exhibits/students who are among the best twenty models at the national level. The above information may be brought to the notice of all concerned, particularly the science faculty in the school and the students. The request for participation along with enclosed registration form, registration fee and other details may be sent to respective Regional Officers before due date. For any other information in this regard, you may contact at jsacad@yahoo.co.in You may also send any specific suggestions or observations in this regard to the undersigned at the above e-mail address.

Thanking you,

Yours faithfully,
(D.T.S.Rao)
JS(Acad.)

APPENDIX F9

CBSE Circulars – 2011-12

Website: www.cbse.nic.in

CENTRAL BOARD OF SECONDARY EDUCATION
(An autonomous Organisation under the Union Ministry of Human Resource Development, Govt. of India)
'Shiksha Sadan', 17-Rouse Avenue, New Delhi – 110 002

CBSE/ACADEMIC/CIRCULAR/2011/ 26.04.2011
Circular No. 34 /2011

All Heads of Institutions
Affiliated to the Board

Dear Principal,

The CBSE Sr. Secondary School Curriculum (Volume I) for 2013 Board examination is already available on CBSE website: www.cbse.nic.in. In the subject of Physics, the note under "Practicals" for Class XI and the note under "Practicals" for Class XII may respectively be read as follows:

Class XI
Practicals

Note: Every student will perform at least 15 experiments (8 from Section – A and 7 from Section B). The activities mentioned here should only be for the purpose of demonstration by the teachers. A total of at least 6 activities (3 each from each of the two sections) need to be demonstrated.

Evaluation scheme for Practical examination:

Two experiments (one from each section)	(8+8) marks
Practical Record (experiments)	6 marks
Record (of demonstrated activities)	3 marks
Viva on experiments of activities	5 marks
Total	**30 marks**

Class XII
Practicals

Note: Every student will perform at least 15 experiments (7 from Section – A and 8 from Section B). The activities mentioned here should only be for the purpose of demonstration by the teachers. A total of at least 6 activities (3 each from each of the two sections) need to be demonstrated. One project, of three marks, is to be carried out by the students.

Evaluation scheme for Practical examination:

Two experiments, one from each section	(8+8) marks
Practical Record (experiments & activities)	(4+2) marks
Project	3 marks
Viva on experiments of activities	5 marks
Total	**30 marks**

You are requested to disseminate the information to all concerned.

Yours faithfully,

(Dr. Srijata Das)
Education Officer

APPENDIX F9

CBSE Circulars – 2011-12

Website: www.cbse.nic.in Tel.: 23231667

e-mail Id: isacad@yahoo.co.in

CENTRAL BOARD OF SECONDARY EDUATION
(An Autonomous Organisation under the Union Ministry of Human Resource Development, Govt. of India)
"Shiksha Sadan", 17, Rouse Avenue, New Delhi-110 002

CBSE/JS (Acad.)/011 July 2011

The Principal

____

____

Subject: Participation in Regional Level CBSE Science Exhibition-2011

Sir/Madam,

This has reference to your application for participation in Regional Level CBSE Science Exhibition 2011; it is to inform you that the said exhibition will be held in your Region as per the details given in the CBSE website. Individual letters are also being sent to all the participants.

Travel schedule of the team may be planned accordingly. You are requested to note the following points in this regard.

a) The participating students must be accompanied by one escort teacher.
b) The teams will have to make their own travel and stay arrangements.
c) Travel and lodging/boarding expenses will be borne by the participating team/school.
d) Every team should report to the venue Principal one day in advance (Morning) and ensure the space and other facilities required for the display of the exhibits. The model should be arranged and set in all respects well in time the previous day itself. The school name and title of the exhibit should also be displayed properly. The teams are advised to bring all necessary materials like bed-sheet, markers, cello-tape, all-pins, drawing pins, gum stick etc. for proper display of the exhibit.

e) The timings of the exhibition will be from 9.00 am to 5.00pm on both the days. The students from other schools are also likely to visit the exhibition and get benefited.

f) Your exhibit/model will be evaluated by a team of subject experts for selection for National Level Exhibition. Both or at least one of the members of the team should always be present near the exhibit for explanation to the visitors. The major parameters of evaluation of exhibits include originality, scientific principle, technical skill, utility, economic viability and presentation. The participating students should be well prepared for proper explanation and presentation.

g) As far as possible, one exhibit should not occupy more than 6'x3' (approx.) of space for display. The project/exhibit must be supported with Charts/Reports and other support materials.

h) You are required to submit a brief write-up of the model/exhibit displayed by the team. The write-up should include the title, objective/aim, scientific principle involved, material used, figure, working investigation/findings, approx. cost, utility and further scope of the project etc. along with the name of the participants and the school with complete address. The write-up is to be submitted to Principal of /Venue School or the organizers on the days of exhibition and should not exceed three typed pages.

i) The confirmation about participation of your school and your exact requirements for display of exhibit should be sent to the venue of Principal well in advance under intimation to the Regional Officer. You are requested take with you a copy of this letter.

In case of any further clarification in this regard, you may contact the undersigned at D.T. Sudarshan, Joint Secretary (Academic), CBSE, Shiksha Sadan, 17,Rouse Avenue, New Delhi-110002, e-mail id: - jsacad@yahoo.co.in or the regional Officer. This information is also available on CBSE website www.cbse.nic.in.

Thanking you,

Yours faithfully,
D.T. Sudarshan
Joint Secretary (Academic)

APPENDIX F9

CBSE Circulars – 2011-12

CENTRAL BOARD OF SECONDARY EDUCATION
Shiksha Sadan, 17-Rouse Avenue, Institutional Area,
New Delhi-110002

CBSE/Sc.Exh/Cons/2012 25.04.2012
Circular No.Acad-5/2012

All Head of Institutions
Affiliated to the Board

Subject: Organization of CBSE Science Exhibition-2012

Dear Principal

The Central Board of Secondary Education has been taking many initiatives to provide interactive, participatory, hands-on, innovative and creative learning experiences to students studying in its affiliated schools. One such initiative refers to the organization of Science Exhibitions at Regional and National levels every year. The activity aims at providing a common platform to schools, teachers and students to give shape to their innovate ideas and learn from each other's experiences. These exhibitions also intend to provide a medium for popularizing Science and increase awareness among the stakeholders about close relationship between Science, Technology and Society. The main objectives of organizing Science exhibitions can be summarized as:

- promoting interest in Science and Technology among younger generation.
- encouraging scientific and technological creativity among students and inculcating a sense of pride in their talent
- providing exploratory experiences, encouraging creative thinking and promoting psychomotor skills among school students through self designed models or simple apparatus.
- encouraging problem solving approach and developing appropriate technologies, especially for rural areas and integrating scientific ideas with daily life situations.
- popularizing Science and technology among masses and creating an awareness regarding its impact on socio-economic and sustainable development of the country

Taking into consideration the enthusiastic response from participating schools in the past, it has again been decided to organize Science exhibitions for the year 2012. These exhibitions are likely to be organized in different parts of the country at

Regional level in the month of July/August and at National Level in the month of September/October, 2012.

The main theme and sub-themes for this year's exhibition are:

Main Theme: Science, Society and Environment

Sub-themes: The six sub-themes are:

- Agriculture and Food Security
- Energy-Resources and Conservation
- Health
- Environmental Issues and Concerns
- Mathematics and Everyday life
- Disaster Management

<u>Key aspects of the exhibition</u>

The following key aspects of the exhibition may be kept in mind for participation:

i. The participating school/team will have to bear all expenses related to participation in the event.
ii. The participating school can put up a maximum of two exhibits/projects/models
iii. A school team may be represented by a maximum of two students per exhibit and one escort Science Teacher.
iv. The participating teams will have to make their own lodging/boarding arrangements at the venue city of exhibition
v. The request for participation along with the enclosed registration form and fee is to be sent directly to the Respective Regional Officer and not to Headquarters Delhi.
vi. The schools in Delhi region may send it to the Regional officer, Central Board of Secondary Education, PS-1-2, Institutional Area, I.P. Extension, Patparganj, Delhi-110 092
vii. The exhibit/model may be either
    a. A working model
    b. An investigation-based project
viii. The exhibit/project may include
    - working model to explain a concept, principle or a process
    - an indigenous design of a machine/device
    - an innovative/inexpensive design or technique
    - application of basic principles of Science/Technology
    - Scheme/design of a device or machine to reduce production cost
    - Investigation based study

ix. Every participating school will pay a participation fee of Rs.400/- in the form of a demand draft in favor of Regional Officer, CBSE payable at respective regional office city.

x. The last date for registration for participation in the event is June 15, 2012.

xi. The first stage of exhibition will be held at two/three different venues in every region.

xii. The selected best fifteen exhibits/ schools at every regional level venue will be eligible to participate in the National level exhibition.

xiii. The exhibits/projects will be assessed by the experts as per the following criteria:

- Students' own creativity and imagination 20%
- Originality and innovativeness in design of the exhibit/project 15%
- Scientific thought/principle 15%
- Technical skill/workmanship/craftsmanship 15%
- Utility/educational value 15%
- Economic aspect, portability, durability 10%
- Presentation -Explanation and demonstration 10%

xiv. The actual dates for the regional level exhibition will be communicated through the Regional officers to every school as well as through CBSE website www.cbse.nic.in by July 15, 2012.

xv. Greater emphasis may be given to investigation-based innovative projects to kindle scientific method and scientific approach in the students.

xvi. A brief write-up about the main-theme and sub-themes is enclosed for reference. The participating teams may prepare the exhibits/projects on any one of the sub-themes satisfying one or more of the stated parameters.

xvii. Attractive awards/cash prizes are given to exhibits/students who present the best twenty models at the national level.

The above information may be brought to the notice of all concerned, particularly the science faculty in the school and the students. The request for participation along with the enclosed registration form, registration fee and other details may be sent to respective Regional Officer before due date. For any other information in this regard, you may contact the Consultant at science.cbse@gmail.com

You may also send any specific suggestions or observations in this regard to the undersigned at the above e-mail address.

Thanking you,

Yours faithfully
(R.P. Sharma)
Consultant

APPENDIX F9

CBSE Circulars – 2011-12

Website: www.cbse.nic.in Ph. No. 011-23237779

CENTRAL BOARD OF SECONDARY EDUCATION
(An autonomous Organisation under the Union Ministry of Human Resource Development, Govt. of India)
'Shiksha Sadan', 17-Rouse Avenue, New Delhi – 110 002

CBSE/EO (SD)/ 2012/ Dated: 27.04.2012
Circular No. Acad-6/2012

All the Heads of Institutions
Affiliated to the Board

Subject: Clarification in Evaluation Scheme for Class XI and XII Practical Examination in Physics (Code 042)

Dear Principal,

Please refer to the Evaluation Scheme for class XI and XII Physics Practical Examination for Session 2012-2013 on the CBSE website. The following clarification in this regard may be immediately brought to the notice of all concerned.

Class XII

The record, to be submitted by the students, at the time of their annual examination, has to include

- Record of at least 15 Experiments [with a minimum of 7 from section A and 8 from section B], to be performed by the students.
- Record of at least 6 Activities [with a minimum of 3 each from section A and section B], to be demonstrated by the teachers.
- The Report of the project, to be carried out by the students.

Evaluation Scheme

• Two experiments one from each section • Practical record [experiments & activities] • Project • Viva on experiments & project	8+8 Marks 6 Marks 3 Marks 5 Marks
	30 Marks

Class XI

The record, to be submitted by the students, at the time of their annual examination, has to include

- Record of at least 15 Experiments [with a minimum of 8 from section A and 7 from section B], to be performed by the students.
- Record of at least 5 Activities [with a minimum of 2 each from section A and section B], to be performed by the students.
- Report of at least two demonstration experiments, to be carried out by the teacher.

Evaluation Scheme

• Two experiments one from each section • Practical record [experiments & activities] • Record of demonstration experiments • Viva on experiments & activities	8+8 Marks 6 Marks 2 Marks 6 Marks
	30 Marks

Please also delete the words; (for the purpose of demonstration only) given along with the heading 'Activities' in each of the Section A and Section B of the class XI Physics Practical syllabus.

Yours faithfully,

(Dr. SRIJATA DAS)
EDUCATION OFFICER

APPENDIX F9

CBSE Circulars – 2011-12

Website: www.cbse.nic.in Phone: 23220155
Email-id: sugandh.cbse@live.com

CENTRAL BOARD OF SECONDARY EDUCATION
(An Autonomous Organization under the Union Ministry of Human Resource Development, Govt. of India)
"Shiksha Sadan ", 17, Rouse Avenue, New Delhi-110 002

ACAD/CBSE/EO(C)/2012 Circular No. Acad-9/2012 2nd May, 2012

All the Heads of the
CBSE affiliated schools

Subject: Guidelines for Project Work in Business Studies for Classes XI and XII w.e.f. the academic session 2012-13 and the Board Examination 2013.

Dear Principal,

Kindly refer to the Business Studies syllabus for Classes XI and XII pertaining to the Board Examination year 2013 which provides for Project Work of 10 marks in both the classes at senior school level. The Board has brought out Guidelines for Project Work for perusal of the Business Studies teachers. Kindly bring these to the notice of concerned teachers and students.

The teachers are requested to ensure that the project work assigned to the students whether individually or in group are discussed at different stages right from assignment to drafts review and finalization. Students should be facilitated in terms of providing relevant materials or suggesting websites, or obtaining required permissions from business houses, malls etc for their project. The 16 periods assigned to the Project Work should be suitably spaced throughout the academic session. The teachers MUST ensure that the students actually go through the rigors and enjoy the process of doing the project rather than depending on any readymade material available outside.

The revised Sample Question Papers (Theory) in Business Studies for Class XII will soon be uploaded on the CBSE website.

Kindly bring these to the notice of concerned teachers and students.

Yours sincerely

N. Nagaraju Director (Academic)

Guidelines for Project work in Business Studies, Classes XI and XII

PROJECT WORK IN BUSINESS STUDIES FOR CLASS XI AND XII

(Effective from the Academic Session 2012-13 and Board Examination of Class XII, 2013.)

INTRODUCTION

The course in Business Studies is introduced at Senior School level to provide students with a sound understanding of the principles and practices bearing in business (trade and industry) as well as their relationship with the society. Business is a dynamic process that brings together technology, natural resources and human initiative in a constantly changing global environment. With the purpose to help them understand the framework within which a business operates, and its interaction with the social, economic, technological and legal environment, the CBSE has introduced Project Work in the Business Studies Syllabus for Classes XI and XII. The projects have been designed to allow students to appreciate that business is an integral component of society and help them develop an understanding of the social and ethical issues concerning them. The project work also aims to empower the teacher to relate all the concepts with what is happening around the world and the student's surroundings, making them appear more clear and contextual. This will enable the student to enjoy studies and use his free time effectively in observing what's happening around. By means of Project Work the students are exposed to life beyond textbooks giving them opportunities to refer materials, gather information, analyze it further to obtain relevant information and decide what matter to keep.

OBJECTIVES

After doing the Project Work in Business Studies, the students will be able to do the following:

- develop a practical approach by using modern technologies in the field of business and management;
- get an opportunity for exposure to the operational environment in the field of business management and related services;
- inculcate important skills of team work, problem solving, time management,
- information collection, processing, analyzing and synthesizing relevant information to derive meaningful conclusions;
- get involved in the process of research work;
- demonstrate his or her capabilities while working independently and
- make studies an enjoyable experience to cherish.

CLASS XI
GUIDELINES FOR TEACHERS

This section provides some basic guidelines for the teachers to launch the projects in Business Studies. It is very necessary to interact, support, guide, facilitate and encourage students while assigning projects to them. The teachers must ensure that the project work assigned to the students whether individually or in group are discussed at different stages right from assignment to drafts review and finalization. Students should be facilitated in terms of providing relevant materials or suggesting websites, or obtaining required permissions from business houses, malls etc for their project. The 16 periods assigned to the Project Work should be suitably spaced throughout the academic session. The teachers MUST ensure that the students actually go through the rigors and enjoy the process of doing the project rather than depending on any readymade material available commercially.

The following steps might be followed:

1. Students must take any one topic during the academic session of Class XI.
2. The project may be done in a group or individually.
3. The topic should be assigned after discussion with the students in the class and should then be discussed at every stage of submission of the draft/final project work.
4. The teacher should play the role of a facilitator and should closely supervise the process of project completion.
5. The teachers must ensure that the student's self esteem should go up, and he/she should be able to enjoy this process.
6. The project work for each term should culminate in the form of Power Point Presentation/Exhibition/Skit before the entire class. This will help in developing ICT and communication skills among them.

THE TEACHER SHOULD HELP STUDENTS TO IDENTIFY ANY ONE PROJECT FROM THE GIVEN TOPICS.

1. Project ONE: FIELD VISIT.

The objective of introducing this project among the students is to give a firsthand experience to them regarding the different types of business units operating in their surroundings, to observe their features and activities and relate them to the theoretical knowledge given in their text books.

The students should select a place of field visit from the following: –
(Add more as per local area availability.)

1. Visit to a Handicraft unit.
2. Visit to an Industry.

3. Visit to a Whole sale market. (vegetables, fruits, flowers, grains, garments.)
4. Visit to a Departmental store.
5. Visit to a Mall.

The following points should be kept in mind while preparing this visit.

1. Select a suitable day free from rush/crowd with lean business hours.
2. The teacher must visit the place first and check out on logistics. It's better to seek permission from the concerned business- in charge.
3. Visit to be discussed with the students in advance. They should be encouraged to prepare a worksheet containing points of observation and reporting.
4. Students may carry their cameras (at their own risk) with prior permission for collecting evidence of their observations.

1. Visit to a Handicraft Unit.

   The purpose of visiting a Handicraft unit is to understand nature and scope of its business, stake holders involved and other aspects as outlined below-

   a. The raw material and the processes used in the business: People /parties/firms from which they obtain their raw material.
   b. The market, the buyers, the middlemen, and the areas covered.
   c. The countries to which exports are made.
   d. Mode of payment to workers, purchasers etc.
   e. Working conditions.
   f. Modernization of the process over a period of time.
   g. Facilities, security and training for the staff and workers.
   h. Subsidies available/ availed.
   i. Any other aspect that the teachers deem fit.

2. Visit to an Industry.

   The students are required to observe the following:

   a. Nature of the business organisation.
   b. Determinants for location of business unit.
   c. Form of business enterprise: Sole Proprietorship, Partnership, Undivided Hindu Family, Joint Stock Company(a Multinational Company).
   d. Different stages of production/process
   e. Auxiliaries involved in the process.
   f. Workers employed, method of wage payment, training programmes and facilities available.
   g. Social responsibilities discharged towards workers, investors, society, environment and government.
   h. Levels of management.
   i. Code of conduct for employers and employees.

j. Capital structure employed- borrowed v/s owned.
k. Quality control, recycling of defective goods.
l. Subsidies available/availed.
m. Safety Measures employed..
n. Working conditions for labour in observation of Labour Laws.
o. Storage of raw material and finished goods.
p. Transport management for employees, raw material and finished goods.
q. Functioning of various departments and coordination among them (Production, Human Resource, Finance and Marketing)
r. Waste Management.
s. Any other observation.

3. Visit to a whole sale market: vegetables/fruits/flowers/grains/garmentsetc.

The students are required to observe the following:

a. Sources of merchandise.
b. Local market practices.
c. Any linked up businesses like transporters, packagers, money lenders, agents, etc.
d. Nature of the goods dealt in.
e. Types of buyers and sellers.
f. Mode of the goods dispersed, minimum quantity sold, types of packaging employed.
g. Factors determining the price fluctuations.
h. Seasonal factors (if any) affecting the business.
i. Weekly/ monthly non working days.
j. Strikes, if any- causes thereof.
k. Mode of payments.
l. Wastage and disposal of dead stock.
m. Nature of price fluctuations, reason thereof.
n. Warehousing facilities available\availed.
o. Any other aspect.

4. Visit to a Departmental store

The students are required to observe the following:

a) Different departments and their lay out.
b) Nature of products offered for sale.
c) Display of fresh arrivals.
d) Promotional campaigns.
e) Spaces and advertisements.
f) Assistance by Sales Personnel.

g) Billing counter at store – Cash, Credit Card/ Debit Card, swipe facility. Added attractions and facilities at the counter.
h) Additional facilities offered to customers
i) Any other relevant aspect.

5. Visit to a Mall.

The students are required to observe the following:

a. Number of floors, shops occupied and unoccupied.
b. Nature of shops, their ownership status
c. Nature of goods dealt in: local brands, international brands,
d. Service business shops- Spas, gym, saloons etc.
e. Rented spaces, owned spaces,
f. Different types of promotional schemes.
g. Most visited shops.
h. Special attractions of the Mall- Food court, Gaming zone or Cinema etc.
i. Innovative facilities.
j. Parking facilities.

Teachers may add more to the list.

II. Project TWO: CASE STUDY ON A PRODUCT

a) Take a product having seasonal growth and regular demand with which students can relate. For example,

- Apples from Himachal Pradesh, Kashmir.
- Oranges from Nagpur,
- Mangoes from Maharashtra/U.P./Bihar/Andhra Pradesh etc.
- Strawberries from Panchgani,
- Alivora from Rajasthan,
- Walnuts/almonds from Kashmir,
- Jackfruit from South,
- Guavas from Allahbad,
- Fishes from coastal areas.

Students may develop a Case Study on the following lines:

(i) Research for change in price of the product. For example, apples in Himachal Pradesh during plucking and non plucking season.
(ii) Effect on prices in the absence of effective transport system.
(iii) Effect on prices in the absence of suitable warehouse facilities.
(iv) Duties performed by the warehouses.

(v) Demand and supply situation of the product during harvesting season, prices near the place of origin and away.

Students may be motivated to find out the importance of producing and selling these products and their processed items along with the roles of Transport, Warehousing, Advertising, Banking, Insurance, Packaging, Wholesale selling, Retailing, Co-operative farming, Co-operative marketing etc. The teacher may develop the points for other projects on similar lines for students to work on.

The teacher may assign this project as ‘group’ project and may give different products to different groups. It could conclude in the form of an exhibition.

III. Project THREE: AIDS TO TRADE.

Taking any one AIDS TO TRADE, for example Insurance and gathering information on following aspects:

1. History of Insurance Lloyd’s contribution.
2. Development of regulatory Mechanism.
3. Insurance Companies in India
4. Principles of Insurance.
5. Types of Insurance. Importance of insurance to the businessmen.
6. Benefits of crop, orchards, animal and poultry insurance to the farmers.
7. Terminologies used (premium, face value, market value, maturity value, surrender value) and their meanings
8. Anecdotes and interesting cases of insurance. Reference of films depicting people committing fraudulent acts with insurance companies.
9. Careers in Insurance.

Teachers to develop such aspects for other aids to trade.

IV. Project FOUR: STOCK EXCHANGE

The students are already exposed to the Stock Exchange under Globalization in the Economics Unit of Social Science Syllabus of class X. The Project Work will enable them to understand the topics ‘Sources of Business Finance,’ Unit 7 of Class XI and ‘Capital Market,’ Unit 10 of Class XII.

The project work will enable the students to:

- understand the topics like sources of business finance and capital market
- understand the concepts used in stock exchange
- inculcate the habit of watching business channels, reading business journals/ news papers and seeking information from their elders.

On the basis of the knowledge of Sources of Business Finance in class XI, the students are expected to:

a) develop a brief report on History of Stock Exchanges in India.
b) prepare a list of at least 25 companies listed on a Stock Exchange.
c) make an imaginary port folio totalling a sum of Rs 50,000 equally in any of the 5 companies of their choice listed above.

The students may be required to report the prices of the stocks on daily basis and present it diagrammatically on the graph paper.

- They will understand the weekly holidays and the holidays under the Negotiable Instruments Act. They will also come across with terms like closing prices, opening prices,etc.
- During this period of recording students are supposed to distinctively record the weekly and other days under the negotiable instrument act so that they acquire knowledge about closing and opening prices.
- The students may conclude by identifying the causes in the fluctuations of prices. Normally it would be related to the front page news of the Economic Times, for example,
    - Change of seasons.
    - Festivals.
    - Spread of epidemic.
    - Strikes and accidents
    - Natural and human disasters.
    - Political environment.
    - Lack in faith in the government policies.
    - Impact of changes in government policies for specific industry.
    - International events.
    - Contract and treaties at the international scene.
    - Relations with the neighboring countries.
    - Crisis in developed countries, etc.

The students are expected to find the value of their investments and accordingly rearrange their portfolio. The project work should cover the following aspects;

1. Graphical presentation of the share prices of different companies on different dates.
2. Change in market value of shares due to change of seasons, festivals, natural and human disasters.
3. Change in market value of shares due to change in political environment / policies of various countries / crisis in developed countries or any other reasons
4. Identify the top ten companies out of the 25 selected on the basis of their market value of shares.

It does not matter if they have made profits or losses.

V. Project FIVE: IMPORT /EXPORT PROCEEDURE.

Any one from the following

I. IMPORT /EXPORTPROCEDURE.

The students should identify a product of their city/country which needs to be imported /exported. They are required to find the details of the actual import/export procedure. They may take help from the Chambers of Commerce, Banker, existing Importers/Exporters, etc. They should find details of the procedure and link it with their Text knowledge. The specimens of documents collected should be pasted in the Project file with brief description of each. They may also visit railway godowns/dockyards/ transport agencies and may collect pictures of the same.

PRESENTATION AND SUBMISSION OF PROJECT REPORT

At the end of the stipulated term, each student will prepare and submit his/her project report.

Following essentials are required to be fulfilled for its preparation and submission.

1. The total project will be in a file format, consisting of the recordings of the value of shares and the graphs.
2. The project will be handwritten.
3. The project will be presented in a neat folder.
4. The project report will be developed in the following sequence-
    - Cover page should project the title, student information, school and year.
    - List of contents.
    - Acknowledgements and preface (acknowledging the institution, the news papers read, T.V. channels viewed, places visited and persons who have helped).
    - Introduction.
    - Topic with suitable heading.
    - Planning and activities done during the project, if any.
    - Observations and findings while conducting the project.
    - News paper clippings to reflect the changes of share prices.
    - Conclusions (summarised suggestions or findings, future scope of study).
    - Appendix (if needed).
    - Teachers report.
    - Teachers will initial preface page.
    - At the completion of the evaluation of the project, it will be punched in the centre so that the report cannot be reused but is available for reference only.

- The projects will be returned after evaluation. The school may keep the best projects.

ASSESSMENT

The marks will be allocated on the following heads.

1.	Initiative, cooperativeness and participation	1 Mark
2.	Creativity in presentation	1 Mark
3.	Content, observation and research work	2 Mark
4.	Analysis of situations	2 Mark
5.	Viva	4 Mark
	Total	**10 Marks**

Class XII

Guidelines for Teachers

1. Help students to select any ONE Topic for the entire year.
2. The topic should be assigned after discussion with the students in the class and should then be discussed at every stage of the submission of the project. The teacher should play the role of a facilitator and should closely supervise the process of project completion. The teachers must ensure that the project work assigned to the students whether individually or in group are discussed at different stages right from assignment to drafts review and finalization. Students should be facilitated in terms of providing relevant materials or suggesting websites, or obtaining required permissions from business houses, malls etc for their project. The 16 periods assigned to the Project Work should be suitably spaced throughout the academic session. The teachers MUST ensure that the students actually go through the rigors and enjoy the process of doing the project rather than depending on any readymade material available outside.
3. The students must make a presentation of the project before the class.
4. The teachers must ensure that the student's self esteem and creativity is enhanced and both the teacher and the student enjoy this process.
5. The teachers should feel pride in the fact that they have explored the different dimensions of the project in an innovative way and their students have put in genuine work.

(I) Project ONE: ELEMENTS OF BUSINESS ENVIRONMENT

The teachers should help the students in selecting any one element of the following:

1. Changes witnessed over the last few years on mode of packaging and its economic impact. The teacher may guide the students to identify the following changes:

a) The changes in transportation of fruits and vegetables such as cardboard crates being used in place of wooden crates, etc. Reasons for above changes
b) Milk being supplied in glass bottles, later in plastic bags and now in tetra pack and through vending machines.
c) Plastic furniture [doors and stools] gaining preference over wooden furniture.
d) The origin of cardboard and the various stages of changes and growth.
e) Brown paper bags packing to recycled paper bags to plastic bags and cloth bags.
f) Re use of packaging [bottles, jars and tins] to attract customers for their products.
g) The concept of pyramid packaging for milk.
h) Cost being borne by the consumer/manufacturer.
i) Packaging used as means of advertisements.

2. The reasons behind changes in the following:
   Coca – Cola and Fanta in the seventies to Thums up and Campa Cola in the eighties to Pepsi and Coke in nineties. The teacher may guide the students to the times when India sold Coca Cola and Fanta were being manufactured in India by the foreign companies.
   The students may be asked to enquire about
   a) Reasons of stopping the manufacturing of the above mentioned drinks in India THEN.
   b) The introduction of Thums up and Campa cola range.
   c) Re entry of Coke and introduction of Pepsi in the Indian market.
   d) Factors responsible for the change.
   e) Other linkages with the above.
   f) Leading brands and the company having the highest market share.
   g) Different local brands venturing in the Indian market.
   h) The rating of the above brands in the market.
   i) The survival and reasons of failure in competition with the international brands.
   j) Other observations made by the students

   The teacher may develop the following on the above lines
3. Changing role of the women in the past 25 years relating to joint families, nuclear families, women as a bread earner of the family, changes in the requirement trend of mixers, washing machines, micro wave and standard of living.
4. The changes in the pattern of import and export of different Products.
5. The trend in the changing interest rates and their effect on savings.
6. A study on child labour laws, its implementation and consequences
7. The state of ‘anti plastic campaign,’ the law, its effects and implementation.

8. The laws of mining /setting up of industries, rules and regulations, licences required for running that business.
9. Social factors affecting acceptance and rejection of an identified product. (Dish washer, Atta maker, etc)
10. What has the effect been on the types of goods and services? The students can take examples like:
    a) Washing machines, micro waves, mixers and grinder.
    b) Need for crèche, day care centre for young and old.
    c) Ready to eat food, eating food outside, and tiffin centres.
11. Change in the man-machine ratio with technological advances resulting in change of cost structure.
12. Effect of changes in technological environment on the behaviour of employee.

(II) Project TWO: PRINCIPLES OF MANAGEMENT

The students are required to visit any one of the following:

1) A departmental store.
2) An Industrial unit.
3) A fast food outlet.
4) Any other organisation approved by the teacher.

They are required to observe the application of the general Principles of management advocated by Fayol.

Fayol's principles

1. Division of work.
2. Unity of command.
3. Unity of direction.
4. Scalar chain
5. Espirit de corpse
6. Fair remuneration to all.
7. Order.
8. Equity.
9. Discipline
10. Subordination of individual interest to general interest.
11. Initiative.
12. Centralisation and decentralisation.
13. Stability of tenure.

OR

They may enquire into the application of scientific management techniques by F. W. Taylor in the unit visited.

Scientific techniques of management

1. Functional foremanship.
2. Standardisation and simplification of work.
3. Method study.
4. Motion Study.
5. Time Study.
6. Fatigue Study
7. Differential piece rate plan.

Tips to teacher

i. The teacher may organize this visit.

ii. The teacher should facilitate the students to identify any unit of their choice and guide them to identify the principles that are being followed.

iii. Similarly they should guide the students to identify the techniques of scientific management implemented in the organisation.

iv. It may be done as a group activity.

v. The observations could be on the basis of
   - The different stages of division of work resulting to specialisation.
   - Following instructions and accountability of subordinates to higher authorities.
   - Visibility of order and equity in the unit.
   - Balance of authority and responsibility.
   - Communication levels and pattern in the organisation.
   - Methods and techniques followed by the organisation for unity of direction and coordination amongst all.
   - Methods of wage payments followed.
   - The arrangements of fatigue study.
   - Derivation of time study.
   - Derivation and advantages of method study.
   - Organisational chart of functional foremanship.
   - Any other identified in the organisation

vi. vi. It is advised that students should be motivated to pick up different areas of visit. As presentations of different areas in the class would help in better understanding to the other students.

vii. vii. The students may be encouraged to develop worksheets. Teachers should help students to prepare observation tools to be used for undertaking the project. Examples; worksheets, questionnaire, interviews and organisational chart etc.

(III) Project THREE: MARKETING MANAGEMENT

It is advised that teachers should assign the students to do a simple market research with the objective of finding out a product /service whose marketing may be profitable like

i. Toothpaste
ii. Noodles
iii. Shampoo
iv. Bathing soap
v. Washing detergent
vi. Washing powder
vii. Lipstick
viii. Moisturiser
ix. Shoe polish
x. Pen
xi. Shoes
xii. Hair dye
xiii. Mobile
xiv. Chocolate
xv. Sauces/ketchup
xvi. Ready soups
xvii. Body spray
xviii. Fairness cream
xix. Hair oil
xx. Roasted Snacks
xxi. Jeans
xxii. Pickles
xxiii. Squashes
xxiv. Jams
xxv. Salt
xxvi. Bread
xxvii. Butter
xxviii. Shaving cream
xxix. Razor
xxx. Cheese spreads
xxxi. e -Wash
xxxii. Tiffin wallah

Any more as suggested by the teacher.

The teacher must ensure that the identified product should not be items whose consumption /use is discouraged by the society and government like alcohol products/pan masala and tobacco products, etc.

Identify one product/service from the above which the students may like to manufacture/provide [pre assumption].

Now the students are required to make a project on the identified product/ service keeping in mind the following

1. Why have they selected this product/service?
2. Find out '5' competitive brands that exist in the market.
3. What permission and licenses would be required to make the product?
4. What are your competitors Unique Selling Proposition.[U.S.P.]?
5. Does your product have any range give details?
6. What is the name of your product?
7. Enlist its features.
8. Draw the 'Label' of your product.
9. Draw a logo for your product.
10. Draft a tag line.
11. What is the selling price of your competitor's product?
    i. Selling price to consumer
    ii. Selling price to retailer
    iii. Selling price to wholesaler

    What is the profit margin in percentage to the
    - Manufacturer.
    - Wholesaler.
    - Retailer.
12. How will your product be packed?
13. Which channel of distribution are you going to use? Give reasons for selection?
14. Decisions related to warehousing, state reasons.
15. What is going to be your selling price?
    iv. To consumer
    v. To retailer
    vi. To wholesaler
16. List 5 ways of promoting your product.
17. Any schemes for
    (i) The wholesaler
    (ii) The retailer
    (iii)The consumer
18. What is going to be your 'U.S.P?
19. What means of transport you will use and why?
20. Draft a social message for your label.
21. What cost effective techniques will you follow for your product.
22. What cost effective techniques will you follow for your promotion plan.

At this stage the students will realize the importance of the concept of marketing mix and the necessary decision regarding the four P's of marketing.

- PRODUCT
- PRODUCT
- PLACE
- PRICE
- PROMOTION

On the basis of the work done by the students the project report should include the following:

1. Type of product /service identified and the (consumer/industries) process involve there in.
2. Brand name and the product.
3. Range of the product.
4. Identification mark or logo.
5. Tagline.
6. Labeling and packaging.
7. Price of the product and basis of price fixation.
8. Selected channels of distribution and reasons thereof.
9. Decisions related to transportation and warehousing. State reasons.
10. Promotional techniques used and starting reasons for deciding the particular technique.
11. Grading and standardization.

PRESENTATION AND SUBMISSION OF PROJECT REPORT

At the end of the stipulated term, each student will prepare and submit his/her project report.

Following essentials are required to be fulfilled for its preparation and submission.

1. The total length of the project will be of 25 to 30 pages.
2. The project should be handwritten.
3. The project should be presented in a neat folder.
4. The project report should be developed in the following sequence-
    - Cover page should include the title of the Project, student information, school and year.
    - List of contents.
    - Acknowledgements and preface (acknowledging the institution, the places visited and the persons who have helped).
    - Introduction.
    - Topic with suitable heading.
    - Planning and activities done during the project, if any.
    - Observations and findings of the visit.
    - Conclusions (summarized suggestions or findings, future scope of study).
    - Photographs (if any).
    - Appendix.
    - Teacher's observation.
    - Signatures of the teachers.

- At the completion of the evaluation of the project, it should be punched in the centre so that the report may not be reused but is available for reference only.
- The projects will be returned after evaluation. The school may keep the best projects.

ASSESSMENT

Allocation of Marks (TEN)

The marks will be allocated under the following heads:

1.	Initiative, cooperativeness and participation	1 Mark
2.	Creativity in presentation	1 Mark
3.	Content, observation and research work	2 Mark
4.	Analysis of situations	2 Mark
5.	Viva	4 Mark
	Total	**10 Marks**

APPENDIX G

KVS Dispatches

Kendriya Vidyalaya Sangathan
Govt. of India
Ministry of Human Resource Development
18, Institutional Area,
Shaheed Jeet Singh Marg,
New Delhi 110 602
Ph No. 011-26858570
e-mail acacadl@rediffmail.com
www.kvsanqathan.nic.in

F 59-1/07-KVS(Acad) Dated 20.07.2007

KVS has been regularly participating in the Jawaharlal Nehru Science Exhibition for children, organized by NCERT. This year the theme of the exhibition is "Science & Technology and Planet Earth". The identified six sub themes are as follows:

1. Water Management
2. Agriculture and food
3. Energy Resources
4. Disaster Management
5. Mathematical Modeling
6. Educational Technology

In addition to the preparation of exhibits on the sub-themes, there will be Science Quiz competition for the participants, in the following manner:-

- On the first day there will be a written test on General topics of Science consisting of 50 objective type questions in different branches of Science and the time given will be 40 minutes. Two students deputed by each region will participate in the written test.
- Based on the performance of the test, four regional teams will be selected for Quiz Competition.
- In the Quiz Competition there will be ten rounds of questions on different themes and live demonstration with one separate round of rapid fire questions.
- In this competition 1^{st}, 2^{nd} and 3^{rd} position holders will be awarded prizes/certificates.

This year a new component for the science Exhibition has been included for encouraging the teachers to develop teaching and technological aids/models in various subjects' areas including mathematics. For this each region will send 03 (three) best teaching and technological aids/models developed by teachers to the Assistant Commissioner-cum-coordinator to the national Science Exhibition at the venue Vidyalaya. These teaching aids/models will be sent along with the escort teachers coming with the students for the national science exhibition. It should be ensured that the teachers bringing the teaching aids/models should be able to demonstrate and explain the teaching aids/models during the science exhibition. To ensure this preference should be given to those teachers for escorting the students who have developed these teaching aids/models.

The following time schedule has been drawn for organizing the exhibition at various levels:

a) Vidyalaya level exhibition should be completed by 20.8.2007. One exhibit under each sub-theme may be selected for the Regional exhibition.
b) Regional level exhibition should be completed at least by 30.8.2007. each region will select 03 Science exhibits for each sub theme and sent their write-ups to the venue Assistant commissioner-cum-coordinator of KVS level Science exhibition.
c) KVS National level exhibition will be held as per details given below:

Date:	20th to 21st September, 2007
Venue:	Kendriya vidyalaya IIT Kharagput No. 1, Dist. Midnapore, 721302 Phone 03222-277223
Co-coordinators:	Assistant Commissioner KVS, RO, Kolkata Ph. No. 033-23376998

The total number of participants from each KVS Region for "KVS National Level Science Exhibition" should not exceed 20 (Twenty).

Instructions for Write-ups:

1. All write-ups are to be prepared in the prescribed forms (Copy enclosed).
2. The diagrams, photographs and write-ups should be neat, clean and sufficiently detailed.

The coordinator of KVS level exhibition will select only 3 exhibits for each of the six sub-themes and forward their write-ups totaling 18 (3x6=18) to the undersigned on or before 31.10.2007 for their onward transmission to NCERT. Jawaharlal Nehru Science Exhibition will be organized by NCERT sometime in 2008. A copy of the detailed guidelines received from NCERT is attached herewith. Kindly send a copy of the guidelines to each Kendriya Vidyalaya functioning under your jurisdiction.

Yours faithfullyijk,

(M.M.Joshi)
Assistant Commissioner(Acad-1)

APPENDIX G

KVS Dispatches

Kendriya Vidyalaya Sangathan
(Ahmadabad Region)
"Gyandeep"
Sector 30, Gandhinagar 382030

F 62-2/Sci Exh/07/KVS(AR)/Acad Dated 03.08.2007

The Principal
Kendriya Vidyalaya
Ahmadabad Region

Sub: State Level Science Exhibition for children 2007-08

Sir/Madam,

Kindly find enclosed the letter received from Sh. MM Joshi, Asst. Commissioner (Acad I), KVS(HQ) on the subject cited above.

1. The theme of the exhibition is "Science and Technology and Planet earth". There are 06 sub themes:
    1. Water Management
    2. Agriculture and food
    3. Energy Resources
    4. Disaster Management
    5. Mathematical Modeling
    6. Educational Technology
2. Science Quiz competition—two students are to be sent at every level.
3. Three best teaching and technological aids/models developed by teachers. The escort teachers will demonstrate and explain the teaching aids/models during Science Exhibition.

    The schedule of the Science Exhibition is enclosed.

Vidyalaya Level Science Exhibition

Each Vidyalaya will conduct Science Exhibition on or before 20.08.2007 as detailed in the above referred KVS HQ letter.

The Principal after the completion of the competition will arrange the following:

1. Will select one exhibit under each sub theme
2. Will select two students for quiz
3. Will select 03 best teaching and technological aids/models developed by teachers.

The students will be escorted preferably by two Science Teachers. The girls are to be escorted by lady escort. The students should not be escorted by contractual Teachers, Group Ds, Lab Attendant and Lab Assistant.

Number of participants = 06+02=08 (01 student per exhibit, 02 for quiz)
Number of escort teachers = 02

Proforma III and IV are to be duly filled and to be kept at the venue Vidyalaya. Proforma V in triplicate and write-ups in duplicate are to be submitted to the Venue of the cluster level competition. The list of participants duly signed by the Principal is to be submitted at the time of registration or as per the instruction of the coordinator. Each Vidyalaya will send a report on Vidyalaya Level Science Exhibition to the RO.

Cluster Level Competition

The cluster level competition will be conducted on 27-08-2007 in four clusters as given in the schedule. Each Cluster In charge after the exhibition will arrange for the following

1. Will select two exhibits under each sub-theme
2. Will select two students for quiz
3. Will select three best teaching and technological aids/models developed by teachers.

The cluster in charge will inform the result to all the participating Vidyalayas and RO. A report will also make the arrangement for escorting the students to the venue of the Regional Level Science Exhibition and back.

No. of participants = 12+2 = 14 (01 student per exhibit and 02 for quiz)
No. of escort teachers = 02

Regional Level Competition

The regional level competition will be held on 30th Aug, 2007 at KV EME, Baroda. The teams will report on 9.08.07 (AN) and will arrange the exhibits in the rooms allotted to them the same day. The Principal, KV EME, Baroda will arrange the following after the conduct of the exhibition:

1. Will select three exhibits under each sub-theme and will send their write ups to the asst. commissioner cum coordinator of National Science Exhibition with a copy marked to the venue Principal and KVS RO (Ahmadabad)
2. Will select two students for quiz
3. Will select three best teaching and technological aids/models developed by teachers.

The write up should be prepared only in the prescribed Proforma.

The Principal will send the result of the competition to all the KVs and to the RO. A report will also be sent to the RO.

The Principal, KV EME, Baroda will arrange for the reservation and will also make necessary arrangements for sending the participants duly escorted by the teachers to take part in the National Science Exhibition to be held at KV Kharagpur, Kolkatta on 20th or 21st Sept., 2007 and back.

No. of participants from the region should not exceed 20, i.e. 18+2 = 20
No of escort teachers = 02

Principals are requested to go through the KVS (HQ) letter and follow the instructions strictly.

The Venue Principal of the cluster and regional level shall make proper board and lodging arrangements and detailed letter may be sent to all the KVs well in advance highlighting the location of the Vidyalaya and distance from the railway station and bus stand and other details required. It is mandatory for all the Vidyalayas to participate. I request all the Principals to encourage students and teachers to take part in science exhibition to promote their creativity and scientific skills.

Certificate will also be distributed at cluster and regional level.

TA/DA will be paid as per KVS rules.

Yours faithfully,

(Smt. Rema Rajan)
Offg. Asst. Commissioner

APPENDIX G

KVS Dispatches

Kendriya Vidyalaya Sangathan
(Ahmadabad Region)
"Gyandeep"
Sector 30, Gandhinagar 382030 (Gujarat)
Phone-079-2326071/23261360, Fax-079 23260109
e-mail: acahmadabad@yahoo.com

F.64-1/2007-08/KVS(AR) Dated 04.02.2008

The Principal
Kendriya Vidyalayas
Ahmadabad Region

Sub: Amendment in Article 106(A) & (C) of KVS Education Code

Sir/Madam,

A copy each of KVS (HQ) letters No. F.28-66/2005-KVS (Acad) dated 7.1.2008 and of even number dated 24.1.2008 is forwarded herewith for your information.

The Article 106(A) & (C) in its amended form as mentioned below may please be noted carefully for further necessary action:-

Article 106(A) – the final assessment of a pupil will be based on his total achievement of a maximum of 100 marks in each subject which would be distributed as under:

i.	Class work and homework assignment: (session ending only)	-05 marks
ii.	Projects/Practical (session ending only)	-05 marks
iii.	Unit Test (5x3)	-15 marks
iv.	Half Yearly examination	-25 marks
v.	Session Ending Exams	- 50 marks
	Total	**- 100 marks**

(Only grades will be awarded for (i) & (ii) above in the first two terms and quantified evaluation will be done for (i) & (ii) in the final term only based on the work of the student during the whole year)

Grades will be awarded to students in non-scholastic subjects like Work Experience, Physical Education, Music, Yoga, etc. on the basis of their performance in the particular activity throughout the session.

Article 106 (C) – A student will have to secure overall 33% to be promoted. Thus each student shall need to obtain at least 33 marks out of 100 in continuous and comprehensive examination and session ending examination taken together. There will be no awarding of comparative position/rank in section/class based on aggregate marks. However, for making any subject wise/class, analysis of the achievement/performance of the teachers, marks obtained at the half yearly/session ending examination only will be considered.

It is further clarified that it is mandatory for every student to appear at all the examinations, unit test, half yearly and session ending examination in order to be eligible for promotion in addition to his/her obtaining marks of 33% as aggregate percentage in all subjects separately.

Yours faithfully,
(R Kalavathi)Assistant commissioner

APPENDIX G

KVS Dispatches

Kendriya Vidyalaya Sangathan
18, Institutional Area,
Shaheed Jeet Singh Marg,
New Delhi 110 602
Ph No. 011-26532643
Fax 011-26514175
www.kvsanqathan.nic.in
e-mail acacadl@rediffmail.com

F.110365-01/2008-KVSHQ/Acad (Science Exhibition) Dated 11.08.2008

The Assisstant Commissioner
Kendriya Vidyalaya Sangathan
All Regional Offices

Madam/Sir,

Sub: State Level Science Exhibition for children 2008-09-reg

Kendriya Vidyalaya Sangathan has been regularly participating in the Jawaharlal Nehru Science Exhibition for children, organized by NCERT. This year, the theme of the exhibition is SCIENCE AND TECHNOLOGY FOR GLOBAL SUSTAINABILITY. The identified six sub themes are as follows:

i. Agriculture and Food Security
ii. Harnessing energy
iii. Conservation of Natural Resources
iv. Combating Climate changes
v. Disaster Management
vi. Mathematical Modeling

In addition to the preparation of exhibits on the sub-themes, there will be Science Quiz competition for the participants in the following manner:

- On the first day there will be a written test on General topics of Science consisting of 50 objective type questions in different branches of Science and the time given will be 40 minutes. Two students deputed by each region will participate in the written test.
- Based on the performance of the test, four regional teams will be selected for Quiz Competition.
- In the Quiz Competition there will be ten rounds of questions on different themes and live demonstration with one separate found of rapid fire questions.

- In this competition 1st, 2nd and 3rd position holders will be awarded prizes/certificates.

For encouraging the teachers to develop teaching and technological aids and models in various subject areas including Mathematics, this year also the component of teaching aid in the Science Exhibition will continue. For this, each region will send 03 (three) best teaching and technological aids/models developed by teachers to the venue Vidyalaya. These teaching aids/models will be sent along with the escort teachers coming with the students for the national science exhibition. It should be ensured that the teachers bringing the teaching aids/models should be able to demonstrate and explain the teaching/models during the Science Exhibition. To ensure this, preference should be given to those teachers for escorting the students who have developed these teaching aids/models.

The following time schedule has been drawn for organizing the exhibition at various levels:

- Vidyalaya level exhibition should be completed by 30.8.2008. one exhibit under each sub-theme may be selected for the Regional exhibition.
- Regional level exhibition should be completed latest by 15.9.2008. each region will select 03 science Exhibits for each sub-theme and send their write-ups to the venue Assistant commissioner-cum-coordinator of KVS level Science Exhibition.
- KVS National level exhibition will be held as per details given below:

Date:	22/23.9/2008
Venue:	Kendriya Vidyalaya Sector J. Aliganj Lucknow 226024
Coordinator:	PRL Gupta

- The total number of participants from each KVS Region for "KVS National Level Science Exhibition" should not exceed 20 (twenty).

Instructions for write-ups:

1. All write-ups are to be prepared in the prescribed forms (copy enclosed).
2. The diagrams, photographs and write-ups should be neat, clean and sufficient detailed.
3. The coordinator of KVS level exhibition will select only 3 exhibits for each of the six sub themes and forward their write ups totaling 18 (3x6 = 18) to the undersigned on or before 31.10.2008 for their onward transmission to NCERT. Jawaharlal Nehru Science Exhibition will be organized by NCERT sometimes in 2009. A copy of the detailed guidelines is attached herewith for distribution among KVs under your jurisdiction. The same can also be downloaded from NCERT sebsite (www.ncert.nic.in).

Yours faithfully

(M.M. Joshi)
Assistant Commissioner (Acad)

APPENDIX G

KVS Dispatches

Kendriya vidyalaya Sangathan
(Ahmadabad Region)
"Gyandeep"
Sector 30, Gandhinagar 382030

F.120361/1/2008/KVS RO AHMD Dated19.08.2008

Sub: State Level Science Exhibition for children 2008-09-reg

Ref: KVS (HQ) letter 110365-01/2008/KVS (HQ)/Acad dated 11.08.2008

Sir,

As you are already aware, KVS has been regularly participating in the Jawaharlal Nehru Science Exhibition for children organized by NCERT. This year the theme of the exhibition is Science and Technology for Global Sustainability. For knowing sub themes, guidelines to preparation of exhibits and other related things, you are requested to log on to the NCERT website www.ncert.nic.in to collect all the details. All the details of Science Exhibition 2009 are available on website of NCERT. Kindly download the text of the Science Exhibition 2009. In case of any difficulty to get the details, approach nearby KV or RO.

The following is the time schedule for conducting in-house science exhibition:

1. Vidyalaya level	Vidyalaya Level Exhibition should be completed by 30.08.008
2. Regional level	Regional Level Science Exhibition will be conducted at K.V. No II, Ahmadabad
3. National level	National Level Science exhibition will be organized at KV sector J., Aliganj, Lucknow on 22/23.09.2008

Other points to be noted are:

1. Every vidyalaya will prepare a model/exhibit strictly as per the guidelines given in the booklet of NCERT
2. Participant from each school will report at KV II Ahmadabad Cantt on the evening of 10.09.2008 and arrange exhibits in the rooms allotted to them by KV Ahmadabad Cantt
3. Exhibits selected for participation at national level in KV Aliganj, Lucknow will be handed over the Principal, KV Ahmadabad Cantt after the declaration of the result.

4. Principal, KV Ahmadabad Cantt will make necessary arrangements for the smooth conduct of the exhibition and also boarding and lodging arrangements for the students for the two days 11th and 12th September, 2008.
5. KV Ahmadabad Cantt will make necessary arrangements for sending the contingent from Ahmadabad to Lucknow duly escorted by responsible officials along with exhibits.
6. Models/exhibits should be handed over to Principal, KV, Aliganj (i.e. after selection at KVS National level).
7. Every vidyalaya will sent its participants with exhibits duly escorted by responsible officials as per KVS norms.
8. Vidyalayas should submit write ups for all models/exhibits prepared by them. They should carry with them basic requirements like electric switch boards.
9. All the students/teachers concerned with exhibits are requested to study the material of the circular before the models are categorized under different heads.
10. Principal, KV Ahmadabad Cantt will arrange for judges/other for selection of exhibits and conducting quiz.
11. Certificates will be printed and distributed by the Vidyalayas (KV Ahmadabad Cantt
12. List of exhibits selected for participation at KVS Nationals along with the names of the children who prepared the model, class, section and Vidyalaya may be sent to Regional Office immediately after the event is over.
13. One of the escorts may be made the team leader, to take care of the full affairs of the team, including to and fro reservations to Lucknow.
14. Principals of the Vidyalayas, whose students represent KVS National Science Exhibition, are requested to make arrangements to collect the students at Ahmadabad from KV Ahmadabad Cantt on return from Lucknow.

Participants and escorts are eligible for TA/DA as per KVS rules. Letter of KVS (HQ) is enclosed for your ready reference.

This issue with the approval of the assistant commissioner

Yours faithfully

(B.A. Rangasri)
Education Officer

APPENDIX G

KVS Dispatches

Kendriya Vidyalaya Sangathan, Regional Office, Lucknow

Ref. No. date: 08.09.2008

To

The Assistant Commissioner
Kendriya Vidyalaya Sangathan
Regional Office
Sub: 36th Jawaharlal Nehru KVS Stat Level Science Exhibition – 2008
Sir/Madam,

It gives me immense pleasure and a sense of pride that KVS (Lucknow Region) has been entrusted with the responsisbility of hosting the 36th Jawaharlal Nehru KVS Stat Level Science Exhibition-2008 on 22nd and 23rd September, 2008 and this great event will be held at Kendriya Vidyalaya aliganj, Lucknow. The detailed information regarding this Exhibition is as follows –

1. **Reporting:** all the Regional contingents are requested to report at the venue latest by 1st Sept, 2008 (FN).
2. **Location**: KV Aliganj, Lucknow is about 12 kilometers from Lucknow Junction Railway Station. It is located in sector 'J' in Aliganj adjacent to 'Q' sector crossing.
3. **Season, climate and temperature:** Lucknow is pleasant after 15th September 2008 with a slight warm weather on sunny days. The maximum temperature is 38^{o}C and minimum 24^{o}C. Chances of rain cannot be over ruled. Summer clothes will suffice for the purpose.
4. **Exhibition:**
    1. Each region is required to come with three models/exhibits from each sub theme i.e. eighteen models/exhibits
    2. Each contingent will comprise of twenty participants inclusive of two participants for the quiz competitions.
    3. Each region will be provided with sufficient bed sheets. Concerned contingent must bring necessary materials for display on bed sheets. **Nailing on the walls will not be allowed under any circumstances.**
    4. The requisition of electrical points and size of the table for the display may be sent in advance so as to enable us to provide the materials required on time.

5. **Quiz:**
    1. There will be a written test on general topics of science consisting of 50 objective type questions to be answered in 40 minutes on first day i.e. 22nd September, 2008.

2. On the second day, six best teams (performance wise in the test) will be participating in a stage quiz of ten rounds inclusive of audio/visual rounds and rapid fire rounds.

6. **Reception at Railway Station:** A team of teachers/students with KVS placards/banners will be available at both the railway stations of Lucknow junction on 20th September, 008 evening and on 21st sept2008 since morning to assist and guide the contingents to te venue.
7. **Contanct numbers:**
8. Teacher's activity: teachers of each participating region have to develop teaching and technological aids and models in various subject areas including Mathematics. The teacher himself/herself has to report for the demonstration of the techno aids/models. He/she has to submit the write-up prepared strictly in accordance with the prescribed performa A and B induplicate
9. Identity card: each participant and escort will be provided on identity card at the venue. Hence every contingent is required to bring one passport size photograph for the purpose.
10. DA charges: no DA will be charged on 21st and 2nd September, 2008. If any contingent is arriving before and staying afterward, Rs. 100 + 20 per head/day will be charged towards boarding and lodging.

Looking forward for your warm welcome and pleasant stay at Lucknow.

With regards,

Yours faithfully

(P.R.L.Gupta)
Assistant Commissioner

APPENDIX G

KVS Dispatches

KENDRIYA VIDYALAYA SANGATHAN
Regional Office, Guwahati
Jawaharnagar, Khanapara,
Phone: 2360105/2360106/2360108(FAX)/2360107(AC)
Web site: www.kvsroguwahati.org Email: kvsroguwahati@rediffmail.com

No.F. 1-13/2008-KVS (GR)/ Dated: -13th August, 09

To
The Principal,
Kendriya Vidyalayas,
Guwahati Region

Sub:-State Level Science Exhibition for children 2009-2010.

Madam/Sir,

You are aware that KVS has been regularly participating in the Jawaharlal Nehru Science Exhibition for children organized by NCERT. In order to ensure our meaningful and effective participation, it has been decided to organize exhibition at Vidyalaya and Regional level.

The following time schedule has been drawn for organizing the exhibition:

SN	Level of exhibition	Venue	Date
01	Vidyalaya level	Every KV	To be completed by 31st August, 09
02	Regional level	KV, IIT Guwahati	14th & 15th Sept, 09
03	KVS National Level	KV, AFS Avadi, Chennai	13th & 14th October, 09

02. Selection of Exhibits for participation at each level:

(a) One exhibit under each sub-theme may be selected by every KV for participation in the Regional Exhibition. However only the potentially good exhibits should be sent for Regional Level participation.

Name of the venue Principal: Mr. P.S. Raju,
Principal, Kendriya Vidyalaya,
IIT Guwahati, PO: IIT Guwahati,
Dist. Kamrup (Assam)
E-mail kviitg@gmail.com
Website: http// www.kviitguwahati.or
Phone: 0361- 2582105, 2692329
Mobile: 9207172193

(b) 03 Exhibits for each sub theme will be selected from the Regional level and sent for participation in the Kendriya Vidyalaya Sangathan level Science Exhibition. Their Write-ups are to be sent to the venue Assistant Commissioner-cum-Coordinator of KVS National level exhibition at the address given below:

Co-ordinator: Dr. E. Prabhakar
Assistant Commissioner

Kendriya Vidyalaya Sangathan, Regional Office,
IIT Campus, Chennai – 600036
Tel. No. 040-22570484, 22570159 (Fax)
Mobile: 09444400944

(c) The total number of participants from each KVS Region for “KVS National Level Science Exhibition” should not exceed 20 (Twenty).

This year, the theme of the exhibition is SCIENCE, TECHONOGY AND SOCIETY, The identified six sub themes are as follows:

(i) Climate Change-Causes and Consequences:
(ii) Green Energy;
(iii) Biology in Human Welfare;
(iv) Information and Communication Technology;
(v) Mathematics and Everyday life;
(vi) Science and Technology in Games and Sports.

In addition to the preparation of exhibits on the sub-themes, there will be Science Quiz Competition for the participants in the following manner:

- On the first day there will be a written test on General Topics of Science consisting of 50 objective type questions in different branches of Science and the time given will be 40 minutes. Two students deputed by each region will participate in the written test.
- Based on the performance of the test, four regional teams will be selected for Quiz Competition.
- In the Quiz Competition there will be ten rounds of questions on different themes and live demonstration with one separate found of rapid-fire questions.
- In this competition 1st, 2nd and 3rd position holders will be awarded prizes/ certificates.

03. For encouraging the teachers to develop teaching and technological aids and models in various subject areas including Mathematics, this year also the component of teaching aid in the Science Exhibition will continue. For this, each region will send 03 (three) best teaching & technological aids/ models developed by teachers to the venue Vidyalaya. These teaching aids in the Science Exhibition will continue. For this, each region will send 03 (three) best teaching & technological aids/ models developed by teachers to the venue Vidyalaya. These teaching aids/ models will be sent along with the escort teachers coming with the students for the national science exhibition. It should be ensured that the teachers bringing the teaching aids/ models should be able to demonstrate and explain the teaching aids/ models during the Science Exhibition. To ensure this, preference should be given to those teachers for escorting the students who have developed these teaching aids/ models.

A copy of details guidelines received from NCERT is enclosed for your perusal and necessary action.

Hindi version follows. Yours faithfully,

(A. K. Vajpayee) Assistant Commissioner

APPENDIX G
KVS Dispatches

Kendriya Vidyalaya Sangathan
18, Institutional Area,
Shaheed Jeet Singh Marg,
New Delhi 110 602
Ph No. 011-26532643(0), 9873195140(M),
011-26533749 (Fax)
e-mail acacadl@rediffmail.com

F.ll016/1/2009/KVSHQ/ Acad 20.10.2009

The Assistant Commissioner
Kendriya Vidyalaya Sangathan
All Regional Offices

Sub: Examination Reforms and Continuous& Comprehensive Evaluation (CCE) in KVS in Class IX for the Academic Session 2009-2010 -reg

Madam/Sir,

CBSE has circulated instructions vide circular No.CBSE/ ACAD/2009 (39) dated 20th September 2009, CBSE/ ACAD/2009 (40) dated 29th September 2009 & CBSE/ ACAD/2009 (42) dated 12th October 2009 (http://cbse.nic.in/circulars/cir42-2009.pdf) on the subject cited above. KVS has decided to introduce continuous and comprehensive evaluation (CCE)) from the Academic Session 2009-2010 in Class IX as per the guidelines issued by CBSE vide aforesaid circulars.

As per circular No. CBSE/ACAD/2009 (42) dated 12.10.2009; the scheme of the examination for the session 2009-2010 is as follows:

<table>
<tr><td rowspan="3">First Term (April-Sept)</td><td>Formative Assessment 1</td><td>10%</td><td colspan="3">Unit Test</td></tr>
<tr><td>Formative Assessment 2</td><td>10%</td><td colspan="3">Project/Assessment</td></tr>
<tr><td>Formative Assessment 3</td><td>10%</td><td colspan="3">(Half yearly examination)</td></tr>
<tr><td rowspan="5">Second Term (Oct-March)</td><td>Formative Assessment 3</td><td>10%</td><td colspan="3">Pen paper Test (Unit Test)</td></tr>
<tr><td rowspan="4">Formative Assessment 4</td><td rowspan="4">10%</td><td colspan="3">This will include testing items such as assignments/projects/practicals/oral testing/interview/quiz/conservation etc. weightage for various items included in this assessment test will be as under:</td></tr>
<tr><td>1</td><td>Assignment</td><td>30%</td></tr>
<tr><td>2</td><td>Projects, practicals, presentation, tour reports</td><td>30% (in case subjects involving practicals, only practicals will be considered)</td></tr>
<tr><td>3</td><td>Oral testing, interview, quiz, conversation, public speaking</td><td>40%</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td colspan="2">100% reduced to 10%</td></tr>
<tr><td></td><td>Summative Assessment 2</td><td>40%</td><td colspan="3">Summative assessment test (Session ending examination)</td></tr>
</table>

The format of the Report card is available at CBSE website (http://www.cbse.nic.in/cce/index.html) titled Teachers' Manual on School Based Assessment for Classes IX & X, which has already been sent to you bye-mail along with this office letter No.F.11024/0l/2009/KVSHQ/ Acad dated 1.10.2009.

Yours faithfully,

(M.M. Joshi)Deputy Commissioner (Acad)

APPENDIX G

KVS Dispatches

F.110365/1/2010-KVS(HQ)/Acad 9.7.2010

The Assistant Commissioner
Kendriya Vidyalaya Sangathan
All Regional Offices

Sub: KVS State Level Science Exhibition for children 2010-2011 - reg

Madam / Sir,

Kendriya Vidyalaya Sangathan has been regularly participating in the Jawaharlal Nehru Science Exhibition for children, organized by NCERT. This year, the theme of the exhibition is SCIENCE AND TECHNOLOGY FOR CHALLENGES IN LIFE. The identified six sub themes are as follows

(i) Biodiversity: Conservation and Sustenance;
(ii) Agriculture and Technology;
(iii) Green Energy;
(iv) Transport and Communication;
(v) Community Health and Environment; and
(vi) Mathematical Modeling

In addition to the preparation of exhibits on the sub-themes, there will be Science Quiz Competition for the participants in the following manner:

- On the first day there will be a written test on General Topics of Science consisting of 50objective type questions in different branches of Science and the time given will be 40minutes. Two students deputed by each region will participate in the written test.
- Based on the performance of the test, four regional teams will be selected for Quiz Competition.
- In the Quiz Competition there will be ten rounds of questions on different themes and live demonstration with one separate round of rapid-fire questions.
- In this competition 1', 2"d and 3rd position holders will be awarded prizes / certificates.

The following time schedule has been drawn for organizing the exhibition at various levels:

- Vidyalaya level exhibition should be completed by 30.8.2010. One exhibit under each subtheme may be selected for the Regional level exhibition.
- Regional level exhibition should be completed latest by 30.9.2010. Each Region will select 03 Science Exhibits for each sub-theme and send their write-ups to the venue Assistant Commissioner-cum-Coordinator of KVS level Science Exhibition.

- KVS National level exhibition will be held as per details given below:

Date	25" to 26th October 2010
Venue	Kendriya Vidyalaya AFS Picket, Hyderabad
Co-ordinator	Shri S. Selvaraj (M-09490450432) Assistant Commissioner Kendriya Vidyalaya Sangathan Regional Office, Picket Hyderabad Telephone Nos. 040-27845649, 27897571, 27847249

- The total number of participants from each RO KVS for "KVS National Level Science Exhibition" should not exceed 20(Twenty).

Instructions for write-ups:

- All write-ups are to be prepared in the prescribed forms (as given in NCERT guidelines).
- The diagrams, photographs and write-ups should be neat, clean and sufficiently detailed.

The Coordinator of KVS level exhibition will select only 3 exhibits for each of the six subthemes and forward their write ups totaling 18 (3x6=18) to the undersigned on or before 30.11.2010 for their onward transmission to NCERT, Jawaharlal Nehru Science Exhibition will be organized by NCERT sometimes in 2011. A copy of the detailed guidelines is attached herewith for distribution among KVs under your jurisdiction. The same can also be downloaded from NCERT website (www.ncert .nic.in)

Yours faithfully,

(M.M.Joshi)
Deputy Commissioner (Acad)

बच्चों के लिए
राज्य स्तरीय विज्ञान प्रदर्शनियाँ–2011-2012
तथा
39वीं जवाहरलाल नेहरू राष्ट्रीय विज्ञान एवं पर्यावरणीय शिक्षा प्रदर्शनी–2012

प्रदर्शों तथा मॉडलों को बनाने के लिए
एवं
प्रदर्शनियाँ आयोजित करने हेतु

दिशानिर्देश

STATE LEVEL SCIENCE EXHIBITIONS FOR CHILDREN–2011-2011

AND

39th JAWAHARLAL NEHRU NATIONAL EXHIBITION FOR SCIENCE AND ENVIRONMENTAL EDUCATION FOR CHILDREN–2012

GUIDELINES

For the Preparation of Exhibits and Models
and
Organising Exhibitions

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

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1 GUIDELINES FOR THE PREPARATION OF EXHIBITS AND MODELS

INTRODUCTION

All children are naturally motivated to learn and are capable of learning. They are natural learners and knowledge is the outcome of their own activity.

Children learn through interactions with the environment around, nature, things and people–both through actions and through languages. They construct knowledge by connecting new ideas to their existing ideas based on materials/activities presented to them. The structuring and restructuring of ideas are essential features as children progress in learning. They actively engage with the world around them, exploring, responding, inventing, working things out, and interpreting. In order to stimulate creativity and inventiveness in science, National Curriculum Framework (NCF) 2005 emphasises on activities, experiments, technological modules etc. NCF–2005 also encourages implementation of various curricular activities (even if these are not part of the examination) through a massive expansion of non-formal channels such as organisation of science exhibition at the national level for school students, with feeder events at school/block/tehsil/district/region/state levels. The objective must be to search and nurture inventive/creative talent among students. NCF – 2005 further envisages the upgradation of current activity in this regard by many orders of magnitude, through co-ordination of state and central agencies, NGOs, teacher associations etc., financial support and mobilisation of experts in the country. Such a movement should gradually spread to every corner of India and even across South Asia, unleashing a wave of creativity and scientific temper among young students and their teachers.

Science is a powerful way of investigating and understanding the world. Therefore, the teaching of science must enable children to examine and analyse their everyday experiences. Every resource must be explored to enable children to express themselves and to handle objects. Concerns and issues pertaining to the environment should be given importance on all possible occasions through a wide range of activities involving outdoor project works. Some of the information and understanding, flowing from such activities and projects could contribute to the elaboration of a publicly accessible database, which would in turn become a valuable educational resource. Well-planned student projects may lead to knowledge generation. Such projects may then get a place for display in various science exhibitions.

The National Council of Educational Research and Training (NCERT), New Delhi organises Jawaharlal Nehru National Science Exhibition for Children (JNNSEC) every year for popularising science amongst children, teachers and public in general. This exhibition is now renamed as Jawaharlal Nehru National Exhibition for Science and Environmental Education for Children (JNNESEC). This exhibition is a culmination of various exhibitions organised in the previous year by the States, UTs and other organisations at district, zonal, regional and finally at the state level. Selected schools from all States and Union Territories, the Kendriya Vidyalaya Sangathan, the Navodaya Vidyalaya Samiti, Department of Atomic Energy Central Schools, CBSE affiliated public (independent) Schools and Demonstration Multipurpose Schools of Regional Institutes of Education participate in this national level exhibition. Like in the past several years such exhibitions are to be organised from district to state level during 2011 - 12 too. These would form the first phase of preparation for the Jawaharlal Nehru National Exhibition for Science and Environmental Education for Children (JNNESEC) to be organised in November 2012. To create a caring community in a well developed society, the main theme for the State Level Science Exhibitions for Children (SLSEC)– 2011-12 would be '**Science, Society and Environment**'.

We confront many crucial issues as a rapidly progressing society, which are directly or indirectly related to science. Among these issues, there are a number of daily and real life situations. There are various problems related to agriculture, global warming, resource depletion, pollution, health, nutrition, disaster management, environment etc. Children need to be aware of such situations, issues and problems that the society is facing. It is aimed to empower them to apply their scientific knowledge and their mathematical understanding to solve them in order to sustain well being of people of modern society. Children should understand how human societies unlimited use of natural resources affects the quality of life and environment. Children need to be encouraged to appreciate and participate in the responsible use of science for the benefit of the society and environment. They should also have a scientific vision about different issues and the ability to acquire and process information about scientific developments and their long term implications on society and environment.

The main objectives of the exhibitions are:

- to provide a forum for children to pursue their natural curiosity and inventiveness to quench their thirst for creativity;
- to make children feel that science is all around us and we can gain knowledge as well as solve many problems also by relating the learning process to the physical and social environment;
- to lay emphasis on the development of science and technology as a major instrument for achieving goals of self-reliance and socio-economic and socio-ecological development;
- to highlight the role of science and technology for producing good quality and environmental friendly materials for the use of society;
- to encourage children to visualise future of the nation and help them become sensitive and responsible citizens;
- to analyse how science has developed and is affected by many diverse individuals, cultures, societies and environment;
- to develop critical thinking about global issues to maintain healthy and sustainable societies in today's environment;
- to apply mathematics to visualise and solve problems pertaining to everyday life etc.
- to appreciate the role of science in meeting the challenges of life such as climate change, opening new avenues in the area of agriculture, fertiliser, food processing, biotechnology, green energy, disaster management, information and communication technology, astronomy, transport, games and sports etc.

It is envisaged that children and teachers would try to analyse all aspects of human endeavor with a view to identify where and how the new researches and developments in science and technology can bring and sustain progress of society leading to improvement for the challenges of life. The organisation of science exhibitions would also provide opportunities to all participating students, teachers and visitors to get acquainted with different kind of equipments, devices and techniques. This exercise would enable the students and teachers to generate scientific ideas for addressing various problems of the society and environment.

In order to facilitate the preparation of exhibits and models for display and the organisation of State Level Science Exhibitions during 2011 -12, six sub-themes have been identified. These are:

1. Agriculture and Food Security;
2. Energy - Resources and Conservation;
3. Health;
4. Environmental Issues and Concerns;
5. Mathematics and Everyday Life; and
6. Disaster Management.

The importance of each sub-theme in the context of the main theme and a number of ideas for development of exhibits are given below. However, these ideas are only suggestive.* Participants are free to develop exhibits based on other related ideas of their choice.

THEME: SCIENCE, SOCIETY AND ENVIRONMENT

1. Agriculture and Food Security

Agriculture, directly or indirectly has been the main source of livelihood for the majority of Indian population. Initiatives started for an overall agricultural development in the country include the improvement in science and technology capabilities, production and supply of agricultural inputs like seeds and fertilizers, public policy measures like land reforms etc. One of the greatest assets in rural areas could be an intelligent and effective use of emerging technologies such as biotechnology, microbiology, genetic engineering, etc. It is important to emphasize on all fronts like research, education, training and extension to fully realize the agricultural potential of the country by integrating agriculture with other allied areas like horticulture, cash crops and energy crops production, fisheries, agro-forestry etc.

In view of the above, the agricultural activities that lead to food production are no longer a subject of classical farming only. The modern agriculture cannot sustain itself without the support of research work done by scientists in the field of plant breeding; improved variety of seeds; genetic engineering; biotechnology etc.; industries (chemical fertilisers and pasticides, tractors, farming machines and materials); transports (road, rail, waterways); energy (electricity, diesel, petrol, gasoline etc.) ; management (storage, processing, preserving, quality control and maintenance) and many other sectors.

The main aim of this sub-theme is to make our school children and teachers realize the need of studying and removing the constraints responsible for knowledge gap on rural professions and building capacity in food security.

Food resources development is one of the most important areas of human activity. Application of the knowledge of various scientific principles has played as important role in providing new technologies for improving food production. Now, the world is able to grow sufficient food for its 6.6 billion inhabitants. But it is also a reality that many people still do not have enough food to eat and many are malnourished. It is ironical that quite a large number amount of food is grossly wasted by some sections of our global society. Recently our country too is facing this problem related with the food security. This problem needs immediate and appropriate attention. About 15,000 children of the world die daily as a direct or indirect consequence of inadequate nutrition. People can reach their full intellectual and physical potential to contribute to social and econmoical development of a country only when they are well fed and well nourished. Therefore, it is important to achieve food security for all. Food security exists when all people at all times have physical, social and economic access to safe and nutritious food to meet their dietary needs for a productive and healthy life.

With the help of science and terchnology, we can enhance our agricultural knowledge to achieve food security to reduce hunger, malnutrition and poverty, and facilitate equitable, environmentally, socially and economically sustainable development.

The exhibits / models in this sub-theme may pertain to:

****Exhibits that involve curricular areas and low-cost technologies are also welcome to participate.***

- Studies of climatic change on the agriculture;
- Managing crop yield due to climatic change arising from global warming;
- Eco-forestry to protect and restore ecosystem for sustainable forest practices / preserving and enhancing forest biodiversity;
- Preservation and conservation of soil and judicious use of water;
- Conventional biotechnology practices e.g., application of biotechnology, microbiology, genetic engineering and genomics to agriculture for improved and high yielding varities;
- Organic farming / organic fertilisers versus chemical fertilisers; biodynamic liquid manure / green manure;
- Planning and managing energy crops (Salix, poplar, Jatropha, Jojoba etc.);
- Use of biotechnology for economically and ecologically sustainable biofuels;
- Environmental friendly measures of pest control;
- Application of biotechnology and genetic engineering in improving animal breeds and production of animal products that are used as food;
- Growing fodders in hydro-ponic environment;
- Innovative / inexpensive / improved / indigenous technologies / methods of storage / preservation / conservation / transport of agricultural products and food materials;
- Innovative / improved practices for reducing cost of cultivation;
- Growing plants without seeds;
- Identification of medicinal plants and their applications;
- Effect of electric and magnetic fields on the growth of plants and protective measures;
- Sugar levels in plant sep at different times and dates;
- Gentic variations among plants;
- Factors affecting seed germination;
- Best conditions for mushroom production and growth of ferns;
- Tropisms in plants and growth hormones etc.;
- Indigenous designs of farm machinery, agriculture implements and practices;
- Impact of pollution on food;
- Application of biotechnology and genetic engineering to agriculture for improved and high yielding varieties;
- Improved / improvised method of processing, preservation, storage and transport of animal products;
- Organic fertilizers versus chemical fertilizers;
- Ecologically sustainable farming methods;
- Environment friendly measures of pest control;
- Harnessing of animal products keeping environmental concerns;
- Identification of medicinal plants and their applications;
- Schemes / designs to help reduce production cost and conservation of raw materials;
- Plans for proper management of natural resources and environment;
- Strategies to eliminate food insecurity;
- Issues related with the animal helath and food security;
- Food production and demand of qulaity food and food security;
- Advantages and disadvantages of genetically modified (GM) food;
- Nutrition education / healthy eating habits and food utilisation by body;
- Pepping / mulching for weed management and root development in soil; etc.
- Devices to control and measurement of the noise, air, soil, water pollution;
- Preservation, conservation and management of soil;
- Analysis of soil samples for their components;
- Ecological studies of plants and animals;
- Experiments with biodegradability;
- Study and record varying water levels, over the year, in the water body, surrounding environment;
- Design and development of an automatic weather recording device;
- Ozone destruction experiments; etc.

2. Energy - Resources and Conservation

After food and water; energy is our most basic need. All activities require energy to perform. The social and economic development of a country and living standard of its inhabitants depends on the availability and proper utilization of energy resources of that country. Energy is an important concern that differentiates the global rich and the global poor and the social and economic inequalities that result.

All conventional sources of energy are exhaustible. Development of conventional forms of energy for meeting the growing needs is the main task. Fossil fuels supply nearly 75 per cent of the world's energy. But fossil fuels are being depleted hundred thousand times faster than they are being formed. At the current rate of consumption, known reserves of petroleum will be exhausted in about 35 years, natural gases in about 50 years and coal some time within 200 years.

In the context of global sustainability, the great concern about energy is not about diminishing supplies. It is rather than our current models of harnessing energy are unsustainable because of environmental, economic, geographical and equity issues. Our current energy models rely on (i) fossil fuels that cause smog and acid rain and are linked with global warming; (ii) traditional biomass fuels that provide about 10 per cent of world energy, but contribute to deforestation, desertification and air pollution; (iii) hydroelectric power stations that provide about 05.5 per cent of energy consumed but linked with environmental refugee; (iv) Nuclear power stations that provide just over 6 per cent of world energy but generated radioactive wastes that require long term safe disposal. Redesigning system of utilization and conservation of energy could not only minimize environmental impacts but also provide tremendous economic opportunities to fast developing country like India.

One of the important and obvious way of redesigning system for harnessing energy is to develop and shift to clean and non-conventional energy resources which are either non exhaustible or renewable as solar energy, wind energy, hydroelectric power, geo-thermal energy, energy from biomass and biogas, ocean thermal energy, wave energy and energy from other emerging technologies. This energy is also called Green Energy. Our country is making efforts in this direction. The technology to exploit such non-conventional sources of energy must have to be efficient and capable of being operation. Another important point is to make efficient use of existing energy resources and their more equitable distribution. As per the data available, two third of energy is currently wasted worldwide.

Our country is endowed with enormous solar energy. It can generate up to 20 MW solar powers per square kilometer land area that can be used for variety of applications. The gross wind power is estimated to be about 45,000 MW, but presently our country is producing only about 15,000 MW wind power. The demand of electric energy is growing at a rate faster than any other form of energy. Its requirement in India is primarily met through a network of thermal (about 70 per cent) hydroelectric (about 14 per cent) and nuclear (about 4 per cent) power station and remaining from other resources. Nuclear electricity holds much greater potential of power supply in future. But the safety and environmental concerns with the nuclear resources are also important.

In this scenario, we need to design, develop and innovate new and economically viable technologies to harness and conserve energy from alternative resources. This sub-theme is expected to make the children think of various ways and means for making efficient use of available energy resources and also new techniques / methods of using and conserving energy from both conventional and non-conventional sources. The exhibits / models in this sub-theme may pertain to:

- Various ways of harnessing geothermal energy such as energy from hot springs / geothermal desalinization / geothermal heating – controlling heating and cooling of a building using underground heat by vertical / horizontal loops / geothermal power / electricity generated from naturally occurring geological heat sources;

- Models of green building/environment building which harvest energy, water and materials;
- Green roof technologies/roof mounted solar technologies such as solar water heater, solar lighting system;
- Heating system of a building by solar heater;
- Models/innovative designs of domestic hydroelectric generator;
- Devices to make breeze funneling towards your home;
- Methods of heat retention in materials/ heat control in the design of house;
- Solar cooker/solar distiller/solar dryer for food processing/solar heated houses;
- Solar thermal electricity/community solar project;
- Innovative designs and installation of solar tower;
- Hybrid solar lighting (solar illumination by routing daylight into the interior part of the building by reflecting a focused beam of sunlight on the end of optical fiber cables);
- Studies of variation in sunshine intensity at a given place for developing indigenous method of its usage etc;
- Projects for measuring availability of solar/wind energy in a given area;
- Model of wind turbine for domestic use with vertical/horizontal axis;
- Designs of low noise wind farm;
- Wind mill/water mill for grinding grains/ drawing water from the well and to generate electricity;
- Water sensitive urban design to mitigate water shortage;
- Water crisis management;
- Use of tidal waves/ocean currents/salinity gradient for generating electricity;
- Wave energy from oscillating water conversion/tidal barrage generator etc;
- Energy from biomass such as seaweeds, human/animal wastes, keeping in view environmental concerns;
- Improvised technologies for effective usage of bio-fuels;
- Innovative designs of bio gas/bio mass plant;
- Bio diesel from plant oils (obtained from canola, palm oil, micro algae oil, waste vegetable oil etc);
- Low cost liquid fuel (bio-ethanol, bio-methanol from cellulose biomass by improvising conversion techniques);
- Bio energy for poverty alleviation;
- Impact of bio-energy on food security;
- Models/designs of fuel-efficient automobiles/machines;
- Innovative designs of internal combustion engine which can function on various bio fuels;
- Production of electrical energy from mechanical energy/nuclear resources;
- Mechanism of extraction, storage and processing of fossil fuels,
- Study of air tides;
- Effects of landscaping and architecture on energy consumption etc.

3. Health

Health is an overall state of body, mind and social well being that implies to an individual and people. Our health is continuously under the influence of both endogenous (within) and exogenous (around) environment and therefore a matter of great concern especially in the rapidly growing society to cope up with newer scientific and technological inventions. When people are healthy, they are more efficient at work. This increases productivity and bring economic prosperity. Health also increases longevity of the people and reduces infant and maternal mortality. When the functioning of one or more organs or systems of the body is adversely affected, characterized by various sign and symptoms, a state of disease is reflected.

The health is broadly affected by genetic disorders, infections and lifestyle but multi-factorial causes are more prevalent in case of many diseases. In case of genetic disorders, deficiencies/defects are inherited from parents and the best examples are hemophilia and colour blindness, however, diseases like cancer and diabetes mellitus are also known to have genetic basis, these are non-infectious.

Further, many diseases last for short period of time called acute diseases like common cold but many other ailments last for longer duration and even as much as life time like tuberculosis, they are chronic diseases. The cancer is one of the most dreaded chronic diseases of human beings and is a major cause of death all over the globe. Transformation of normal cells into cancerous neo-plastic cells may be induced by physical, chemical or biological agents. Ionizing radiations like X-rays, gamma rays and non ionizing radiations UV causes DNA damage leading to neo-plastic transformation. Chemical carcinogens present in tobacco smoke have been identified as a major cause of lung cancer. Cancer causing viruses are also known, they possess genes called viral oncogenes.

Infectious agents comprises of a wide group of organisms called pathogens, they are viruses, bacteria, fungi, protozoan and multicellular worms, insects etc. The diseases caused by these organisms include influenza, dengue fever, AIDS, typhoid, cholera, malaria, ringworms, filariasis etc. The pathogens live under different environmental conditions and have great potential to adapt to the environment within the host. For example, the pathogens that enter the gut know the way of surviving in the stomach at low pH and resistance to various digestive enzymes. Pathogenic attack to an individual and spread to someone else takes place through air, water, soil, physical contact and also through other animals. Such animals are thus the intermediaries and are called vectors. In many instances the body is able to defend itself from most of these infectious agents through the immune system. Acquired immunity is pathogen specific; however, we also possess innate immunity from birth.

Our health is adversely affected due to many environmental hazards that lead to several kinds of infection in the body. With increasing population, demand for food, water, home, transport, energy etc are increasing causing tremendous pressure on our natural resources and thereby contributing to pollution of air, water and soil. The lifestyle including food and water we take, tendency for junk/fast food, rest and exercise, habits and drugs and alcohol abuse is another challenge to our health. Increasing level of obesity, early detection of hyperglycemia and hypertension is a great cause of worry from the health point of view. Continuous efforts of scientists, technologists, doctors and naturalist have brought many new ways of safety and security to our life. Major inventions in bio-medical diagnostics, new vaccines and antibiotics, surgical methods and genetic engineering have given relief to the mankind. These efforts are responsible for raising the standard of the personal health and hygiene and in providing both preventive and curative facilities to the community. Mortality age has gone up, infant and maternal mortality gone down and epidemics are much under control. Awareness towards meditation and traditional knowledge of herbal medicines has influenced community health.

The present sub-theme is proposed with the objectives: to bring awareness among the youth about health and factors affecting our health, to explore new scientific, technological and biomedical interventions in prevention and cure, to analyze the role of self and society in keeping our environment healthy in order to maintain good health and promote innovative ideas for better management.

The exhibits and models in this sub-theme may pertain to:

- Demonstration of health and differentiation from the state of ill health;
- Demonstration of factors affecting the health, different ailments in the body;
- Showing and designing activities on infectious and non-infectious diseases, relationship with causative factors and their sources;
- Innovation to develop control measures at different levels, role various agencies;
- Presenting medical assistance and facilities, rural/urban and gender aspects;
- Sensitising people to be careful in health matters, explore the possibilities and make use of the facilities available;

- Development of knowledge-base and understand new scientific, technological aids in bio-medical area;
- Demonstration of means and ways to adopt methods for self concentration and meditation and their uses;
- Demonstration of known facts and research findings in different medical systems like Indian, Modern, Homeopath etc.;
- Demonstration of lifestyle and relationship with good and bad health based on known facts and researches;
- Demonstration of the role of traditional knowledge of herbal products for community health; etc.
- Improved methods of sanitation and appropriate technology for waste disposal, both biodegradable and non-biodegradable;
- Common prophylactic measures available and advantages of inoculation and vaccination;
- Need for appropriate measures for family welfare;
- Need for developing low-cost nutritious food;
- General awareness about occupational hazards and innovative techniques to overcome them;
- General awareness about community medicine;
- New medical diagnostic and therapeutic tools;
- Improved aids to visually impaired and physically handicapped persons;
- Need to curb menace of alcohol consumption, drug addiction and smoking;
- Genetic studies;
- Studies of memory span and memory retention; and
- Factors affecting the enzymes' reaction rates etc.
- Simple technologies for developing diagnostics and environmental monitoring.

4. ENVIRONMENTAL ISSUES AND CONCERNS

The spectacular industrial and economical development over the past few decades has led to the replacement of the communities of nature by man-made communities. However, the principles that govern the life of natural communities have to be observed if these man-made communities are to flourish. Deforestation, overgrazing, indiscriminate mining, and tree-felling, faulty tillage practices etc. have led to severe soil erosion. Over irrigation and river-harvesting of agricultural lands has resulted into salinity of water, water-logging and degradation. Over-use of tube-wells has substantially lowered down the underground water table. Destruction of lush tree covers has occurred due to the need of more agricultural and residual lands to meet the challenges due to over-population. Industrial effluents, forest fire and unplanned growth have led to severe water and air pollution. Major current environmental issues include climate change, species extinction, pollution, environmental degradation, and resource depletion etc. Human living has now become unsustainable. However there is an understanding that the sustainability is the key to preventing or reducing the effect of environmental issues. This needs to practice the human use of natural resources to within sustainable limits. Therefore for humans to live sustainably, the Earth's resources must be used at a rate at which they can be replenished.

The biophysical environment that comprises the Earth's biosphere is the symbiosis between the physical environment and the biological life. The biophysical environment can be divided into two categories: the natural environment and the man-madeenvironment. The industrial revolutionhas mad the man-made environment an increasingly significant part of the Earth's environment. The scope of the biophysical environment is all that contained in the biosphere, which is that part of the Earth in which all life occurs. A biophysical environment is the complex of biotic, climatic, and edaphic factors that act upon an organism and determine its form and survival, and morphs itself in the process. Ecosystems, of which there are numerous types and are a defined part of the biosphere, collectively make up the whole of the biosphere. Within an ecosystem there are habitats in which an organism (including human beings) exists. At its most natural state, an environment would lack any effects of human activity, although the scale of this activity is such that all areas of the Earth have had at least some influence by humans. At the other end of the scale is the man-made environment and in some cases it has the biotic component that is virtually absent. Emphasis is now for protection of endangered species and protection of any ecologically valuable natural areas.

The understanding of Earth has remarkably increased in recent times through *Environmental Science* which is a basis for addressing environmental issues. It is now a multi-disciplinary academic study taught and studied at all stages of education including the school education. environmental Science is the study of the interactions within the biophysical environment. Part of this scientific discipline is the investigation of the effect of human activity on the environment. Ecology, a sub-discipline of biology and a part of environmental sciences, is often mistaken as a study of human induced effects on the environment. *Environmental Studies* is a broader academic discipline that is the systematic study of interaction of humans with their environment. It is a broad field of study that includes the natural environment, man-made environments and social environments. Environmentalism is a broad social and philosophical movement that, in a large part, seeks to minimize or eliminate the effect of human activity on the biophysical environment.

Environmental issues and concerns are addressed at a regional, nation or international level by several government and non-government organizations. Ministry of Environment and Forest, Government of India, has established National Green Corps to set up and run eco-clubs in school education. Through the eco-clubs different environment related activities such as greening of school campus, collection of wastes, waste management, water conservation practices etc., and other activities related to spread awareness about the environment such as organizing rallies, painting competition etc. are undertaken. With such initiatives of National Green Corps and school systems, Indian children have finalized Indian Children's Charter of Responsibilities. This Charter "Let's Take Care of India" says: *We, the children of India, resolve to work together to take care of our environment Air, Water, Fire (Energy) and Earth by assuming the Indian Children's Charter of Responsibilities.*

The main objective of this sub-theme is to make general public and children in particular aware with the current environmental issues and concerns for achieving sustainability to prevent the effect of environmental issues. The models and exhibits in this sub-theme may pertain to:

- Evironmental issues related with human activities such as agriculture, energy, fishing, foorests, mining, shipping, paper, war, occean deoxygenation, dead zone, paint etc.;
- Environmental issues with conservation — species extinction, pollinator decline, coral bleaching, Holocene extinction, invasive species, poaching, endangered species etc. ean deoxygenation, dead zone, paint etc.;
- Environmental issues with energy conservation, renewable energy, efficient energy use, renewable energy commercialization etc;
- Environmental controversies such as dam controversies, genetically modified organisms/food controversy, sealing, dioxin controversy, water fluoridation controversy etc.;
- Environmental disasters such as Bhopal disaster, oil spills, nuclear accidents etc.
- Endocrine disruptors;
- Climate change — global warming, greenhouse gases, fossil fuels, sea level rise, ocean acidification etc.;
- Issues related with environmental health such as air quality, asthma, electromag-

netic radiations and fields, lead poisoning, indoor air quality, sick building syndrome etc;

- Ozone depletion – CFC;
- Environmental effects of intensive farming such as overgrazing, irrigation, plasticulture, pesticides etc.;
- Water pollution — acid rain, marine pollution, Ocean dumping, eutrophication, marine debris, thermal pollution, algal boom, micro-plastics, etc;
- Air pollution — smog, ozone, particulate matter, sulphur oxide etc;
- Light, noise, visual, point source and extended source pollution;
- Urban sprawl, habitat fragmentation, habitat destruction;
- Soil erosion, soil contamination and salination, and Waste;
- Aviation and environment;
- Environmental impacts of irrigation, dams and reservoirs;
- GAIA hypothesis and environment protection;
- Environmental implications of nanotechnology (nano-toxiology and nano-pollution).

5. Mathematics and Everyday Life

The fascinating world of mathematics provides us with an unlimited scope to perceive problems pertaining to three situations visualized in the form of concrete, abstraction and intuition. The important segment of mathematics—the ability to reason and think clearly is extremely useful in our everyday life. Proofs and deductions are hallmarks of mathematics. Much more than arithmetic and geometry, mathematics today is a diverse discipline. It also deals with data, measurements and observations from science, mathematical models of natural phenomenon including human behavior and social systems. Its domain is not molecules or cells but numbers, chance, forms, pattern and order, algorithms, and change. As a science of abstract objects, mathematics relies on logic rather than on observation, as its standard of truth, yet employs observation, simulation, and even experimentation as means of discovering truth. Mathematics offers distinctive mode of thoughts which are versatile and powerful, including mathematical modeling, optimization, logical analysis, inference from data and use of symbols. Experience with mathematical modes of thought builds mathematical power—a capacity of mind of increasing value in this technological age that enables one of read critically, to identify fallacies, to detect bias, to assess risk, and to suggest alternatives.

From medical technology to economic planning (input/output models of economic behavior), from genetics to geology, mathematics has made an indelible imprint on every part of modern science, even as science itself has stimulated for growth of many branches of mathematics. Applications of one part of mathematics to another-of geometry to analysis, of probability to number theory-unity of mathematics. Despite frequent connections among problems in science and mathematics, the constant discovery of new alliances retains a surprising degree of unpredictability. Whether planned or unplanned, the intimacy between science and mathematics in problem solving, understanding theories and concepts has rarely been greater than it is now, in the last quarter of twentieth century.

Mathematics gives an exactness in thinking and provides a quantitative approach. The special role of mathematics in education is a consequence of its universal applicability. In general, to solve practical problems we follow a set procedure invoving steps related with defining variables; writing equations or inequalities; collecting data and organize into tables; making graphs and illustrations; and calctaulating probabilities.

With the above fragrance of mathematics, let us observe a situation and examine how mathematics is involved in it.

Situation: Suppose our problem is to estimate the number of fish/fishes in a pond. It is not possible to capture each of those fish/fishes and count them. We may capture a sample from the pond and estimate the total number of fish/fishes in it. How can we do this?

For the above situation, let us first take a sample of fishes. Now, how do we estimate the entire population? We would have to then mark the sampled fishes, allow them to mix with the remaining ones in the pond, again draw a sample from the pond, and see how many of the previously marked ones are present in the new sample. Then, using ratio and proportion, we can come up with an estimate of the total population. For instance, let us take a sample of 20 fishes from the pond and mark them, and then release them in the same pond, so as to mix with the remaining fishes.

We then take another sample (say 50), from the mixed population and see how many are marked. We collect data and analyze it.

One major assumption we are making is that the marked fishes mix uniformly with the remaining fishes, and the sample we take is a good representative of the entire population.

The simplified mathematical problem developed here is then solved using various *mathematical techniques*.

For instance, suppose in the second sample 5 marked fishes are present. So, 5/50, *i.e.* 1/10, of the population is marked. If this is typical of the whole population, then $1/10^{th}$ of the population is equal to 20. So, the whole population = 20 x 10 = 200.

Now, let us go back to the original situation and see if the results of the mathematical work make sense. If not so, we use the model until new information becomes available or assumptions change.

Sometimes, because of the simplification of assumptions we make, we may loose essential aspects of the real problem while giving its mathematics description. In such cases, the solution could very often be off the mark, and not make sense in the real situation. If this happens, we reconsider the assumptions in first step and revise them to be more realistic, possibly by including some factors which were not considered earlier.

For instance, the number may not be the actual number of fishes in the pond. We next see whether this is a good estimate of the population by repeating the above steps a few more times, and taking the mean of the results obtained. This would give a closer estimate of the population.

The importance of mathematics lies in exploring its applications in three different dimensions attributed to its fundamental aspects, *viz*, cultural value, disciplinary value, and utilitarian value.

To encourage and stimulate students' interest in Mathematics, some of the mathematical principles being transacted at school stages with their applications have been indicated below.

The exhibits/models in this sub-themes may pertain to:

- Principles of sequence and series in several spheres of human activities viz, calculating the amount of money over certain period of time under given rate of simple interest or compound interest/ finding depreciated or increased value of a certain commodity over a period of time;
- Determining expenditures needed for manufacturing water tank/rectangular box/cylindrical/cone- shaped objects of a certain material provided cost of material per square/cube/unit are known;
- Using principles of permutations and combinations to count the number of arrangements and selections (for example, determining how many routes are there from City A to City C via City B provided there are five routes from City A to City B and seven routes from City B to City C);
- Determining perimeter, area of a region bounded by polygons/the circumference and area of a circular region/surface area and volume of cube/cuboid/cylinder/ cone/sphere/hemisphere of solid when two basic solids are joined together;
- Construction of sphere by revolving circle about its diameter/right circular cylinder by revolving rectangle/right circular cone by revolving right angled triangle/ construction of conics, parabola, ellipse and hyperbola by cutting double napped cones by planes;
- Analytical tools such as conics used in designing parabolic reflectors in automobile head light/suspension of cable bridges/loud speakers in radio;
- Principles of symmetry for indirect mea-

surement for the height of certain object;

- Finding the ratio of area of quantities of substances in the formation of compounds or mixtures;
- Application of semi-elliptic springs and elliptic shaped gears in engineering and industry;
- Constructing an open water tank of maximum capacity by cutting squares of same size at each corner of the sheet and folding up the sides by using given rectangular sheet of metal/finding when the reservoir will overflow by knowing the depth of water at various instants of time;
- Designs of parking area for maximum utilization of space;
- Predicting the changes in value of a particular stock by knowing its present value through financial institutions;
- Predicting the population of species over certain period of time under given constraints;
- Estimating/calculating size of windows/doors/rooms in our school or home/estimating number of plants lying in a particular flower bed/calculating height of a building or a tree;
- Estimating the degree of uncertainty regarding the happening of a given phenomenon such as a candidate appearing for an interview for a post may be selected or may not be selected/it may or may not rain today;
- Applications of linear programming in solving problems pertaining to manufacturing of goods/transport/diet issues;
- Study of rotational symmetry in plants and animals/role of repeated symmetrical patterns in making fabric designs, wallpaper etc.;
- Applications of mathematics in decorating home e.g. how many rolls of wallpaper/number of tiles are needed to cover the wall;
- Use of triangles/making geometrical designs on a table of certain radius, a design is formed leaving an equilateral triangle in the middle and finding the area of the design);
- Using mathematics in cooking and nutrition/estimating number of calories and quantity of nutrients (carbohydrates, proteins, fats, minerals etc.) in a sample portion of various food items;
- Estimating quantity of seeds needed for a crop/estimating crop yields in a particular field without cutting or weighing/estimating/calculating length of wire needed to fence our field/estimating life span of an electric bulb/estimating the volume of blood inside the body of a person/estimating amount of water needed to fill a swimming pool;
- Establishing a mathematical relation by considering all possible parameters to have maximum profit in producing certain items by a factory;
- Helping to decide/determine premium on insurance policies/to make important decisions in business;
- Finding instantaneous speed of a piston in a cylinder of an automobile engine;
- Application of mathematical tools and computer techniques in biology. For example, naration of story of evolution through computer mediated assembly of phylogenic trees and dendograms; etc.

6. Disaster Management

Disasters have significant relationship with natural resource management, poverty allevaiation and sustainable development. Various disasters can cause damage to human life, environment, infrastructure, lowering the quality of life, loss of different bio-organisms, political instability and conflicts, demographic imbalance, unemployment etc.

There is chaos and disorganisation in the event of any natural or manmade disaster. People are affected and disturbed. The issue of disaster can be managed by making all possible preparedness to facilitate proper coordination among different components of the system such as communication, medical, fire fighting agencies, police, social workers, media, electric supply agencies, armed forces, scientists, engineers and technologists, and other agencies. The whole system including the general public altogether must know what to do and at what time to do. Preparedness, coordination anongst different agencies including the government agencies, planning and clear vision of action to be taken are the keys to any disaster management.

Geoclimatic conditions of our country are prone to certain natural disasters like drought, flood, cyclone and earthquake. Around 60 % of Indian landmass is prone to earthquake of varying degree; 8 per cent of total area to cyclone; 68 per cent to drought; 0.5 million hectare to flood. Seventy five per cent of the annual rainfall occurs during monsoon months. As a result, almost all the rivers carry heavy discharge with them during those months. In the current decade, the damage in terms of human sufferings, loss of life, agricultural productivity and economic losses have been astronomical. Forecasting, warning and communicating using advanced technologies: setting up, maintaining reviewing and upgrading of preparedness measures: sensitization: training: exercise and behavioral change programmes of the community; effective enforcement of building safety codes and information management are some of the issues related with disaster management.

In our country, the issue is also about the need for effective resource mobilization and speedy action. What should we do when faced with a flood, cyclone, quake or any other disaster when we are at home, school or at work? Trained local teams should be equipped to deal swiftly and efficiently in any emergency. Science and technology can be of great help as in most disasters response time is crucial to prevent further loss.

The objective of this sub-theme is to increase awareness of the dangers posed by disasters and to help children find measures for effective mitigation of those dangers. The exhibits/ models in this sub-theme may pertain to:

- Better information and public address systems in the event of disaster to prevent chaos and confusion;
- Access of clean and safe drinking water in the event of disaster;
- Extending logistic supports during various calamities, undertaking rescue and rehabilitation measures during calamities;
- Improvised/improved devices for effective communication between various emergency services-medical, police, military and other administrative bodies/committees;
- Various measures/models for planning, preparedness and coordination of different agencies in the even of disaster/community level preparedness for the various man-made disasters such as gas leakage, nuclear accidents, battery/bomb explosions, etc.;
- Use of geo-stationary satellites in providing information pertaining to meteorological processes;
- Technologies in forecasting and warning of cyclones, floods and storms;
- Innovative designs of flood alarm/flood forecasting and cyclone warning networks;
- Information management from ships and oceans buoys- use of radars in cyclone detection;
- Various flood preventing measures such as construction of raised platforms, embankment of rivers, maintenance of mangroves and other mitigation measures;
- To ensure the effectiveness of drainage system for clearance of sewage before monsoon season/to carry off storm water;
- Emergency mechanisms and mobilization centers/improvement in communication and transportation system;
- Information management and early warning systems for flash floods;
- Studies of the impact of global warming on human health (spread of epidemic like dengue, malaria, yellow fever etc.;
- Reconstruction of riverbanks in flood affected areas for agricultural and rehabilitation of landless people;
- Studies of the changes in animal behavior as a warming to natural disaster;
- Designs and development of automatic weather recording devices etc.

2 GUIDELINES FOR ORGANISING ONE-DAY SEMINAR ON POPULARISATION OF SCIENCE

INTERNATIONAL YEAR OF CHEMISTRY – 2011

NOTE: *The One-Day Seminar on Popularisation of Science should preferably be organised one day before the organisation of State Level Science Exhibition for Children.*

The United Nations declared year 2011 as the International Year of Chemistry (IYC). The activities to be carried out internationally and nationally in this year 2011 will emphasize on the importance of chemistry in sustaining natural resources. In addition, the year will also draw attention to the UN decade of Education for Sustainable Development 2005 – 2014.

The year 2011 is the 100th anniversary of the award of Nobel Prize in Chemistry to Mme Maria Sklodowske Curie. Thus IYC – 2011 also provide an opportunity to celebrate the contribution of women to science. This year is also the 100th anniversary of the foundation of the International Association of Chemical Sciences (IACS) to address the needs for international scientific communication and cooperation among chemists by standardizing nomenclature and terminology (together with the International Union of Pure and Applied Chemistry which was established in 1919 by chemists and academia).

Chemistry is fundamental to our understanding of the world and the cosmos. All known matter is composed of the chemical elements. This is the knowledge of chemistry that makes us to understand the material nature. The molecular transformations are central to the production of food, medicines, fuel, and countless manufactured and extracted products. Indeed all living processes are controlled by chemical reactions. It is also certain that chemistry will play a major role in developing alternative energy sources and in feeding the world's growing population. During IYC – 2011, the achievements of chemistry and its contributions to the well-being of humanity will be celebrated. Through the Year, the world will celebrate the art and science of chemistry, and its essential contributions to knowledge, to environmental protection and to economic development. The IYC will give a global boost to chemical science in which our life and our future are grounded. During the IYC, activities woiuld be planned to (i) Increase the public appreciation of chemistry in meeting world needs; (ii) Increase interest of young people in chemistry; (iii) Increase the public appreciation and understanding of chemistry; (iv) Generate enthusiasm for the creative future of chemistry; (v) Raising public awareness about chemistry is all the more important in view of the challenges of sustainable development; (vi) Promote the role of chemistry in contributing to solutions to global challenges; and (vii) Celebrate the 100the anniversary of the Mme Curie Nobel Prize and the 100th anniversary of the founding of the International Association of Chemical Socities (IACS).

During this One-Day Seminar on Popularization of Science, children, teachers, parents and all concerned are invited to generate ideas. The activities in this seminar may include:

- Organising hands-on activities and demonstrations to help children in understanding working in chemistry-related areas, such as periodic table, molecules that have led to revolution in human life, atomic models, use of mathematical modelling etc.
- Promoting designing projects to promote and stimulate modern developments in chemistry and chemical research at all levels of school education.
- Organization of visits to industrial sites including manufactures, chemical producers, plants, metal and petroleum refineries,. science express train etc.
- Publicizing the contributions that chemistry makes to human kind by arranging lectures or by publications etc.
- Organizing poster exhibition-cum-competitions highlighting usefulness and wonders of chemistry.
- Inviting professionals to schools to show how chemistry is applied and used in their jobs.
- Dispaly of low-cost exhibits and models conveying curricular topics.
- Screening of slide shows, demonstrations experiments etc.

3 Guidelines for Organising the State Level Science Exhibitions for Children – 2011-2012

Objectives

The purpose of science exhibitions is to develop scientific attitude in the young generation of our country to make them realise the interdependence of science, technology and society and the responsibility of the scientists of tomorrow. These objectives may be achieved by presenting the exhibits as an exciting experience of creativity of children, innovations through improvisations of science kits, and various devices and models for providing solutions to many present and future socio-economic problems particularly those confronted in the rural areas, using available materials and local resources.

The exhibition will help children and teachers to learn from each other experiences and motivate them to design and develop something new and novel. It will also provide a medium for popularising science and increasing awareness among the public towards it. The objectives of organising science exhibitions may briefly be put as follows:

- stimulating interest in science and technology and inculcating scientific spirit in younger generation;
- exploring and encouraging scientific and technological talent among children;
- inculcating in them a sense of pride in their talent;
- making children realise the relationship between science and technology and society;
- understanding the need for proper management for the optimum utilisation of resources and prevailing technologies;
- providing exploratory experiences, encouraging creative thinking and promoting psychomotor and manipulative skills among children through self devised exhibits or models or simple apparatus;
- encouraging problem solving approach and developing the appropriate technologies, especially for rural areas and integrating scientific ideas with daily life situations;
- inculcating intellectual honesty, team spirit and aesthetic sense among the participants;
- popularising science among masses and creating an awareness regarding the role of science and technology in socio-economic and sustainable growth of the country;
- developing appropriate techniques for communication of science, technology and its management.

Call for Entries

The main theme for the State Level Science Exhibitions for Children – 2011-2012 and for the 39th Jawaharlal Nehru National Exhibition for Science and Environmental Education for Children (JNNESEC – 2012) would be '**Science, Society and Environment**'. The identified six sub-themes are:

1. Agriculture and Food Security;
2. Energy – Resources and Conservation;
3. Health;
4. Environmental Issues and Concerns
5. Mathematics and Everyday Life; and
6. Disaster Management

In order to facilitate the preparation of exhibits and models for display in district to state level science exhibitions during 2011-2012, *Guidelines for the Preparation of Exhibits and Models* are also being communicated.

i. Children from all schools [including government, government-aided, public and private, catholic, mission, armed-forces (Army, Air Force, Navy, Sainik, BSF, ITBP, Assam-Rifles, CRPF, Police etc.), DAV management, Maharshi Vidya Mandir, Saraswati Vidya Mandir, Navyug, Municipality, Bhartiya Vidya Bhavan, Science Clubs etc.] are eligible to participate in State Level Science Exhibitions. Preference may be given for students in senior classes (i.e. in secondary and higher secondary stages).

Note for all State Level Science Exhibitions coordinators belonging to state/UT governments:

Following organisations conduct their own science exhibitions separately:

- Kendriya Vidyalaya Sangathan;
- Navodaya Vidyalaya Samiti;
- Department of Atomic Energy Central Schools;
- CBSE affiliated Public Schools (independent schools); and
- Demonstration Multipurpose Schools of Regional Institutes of Education.

These organisations send their selected entries for consideration for participation in Jawaharlal Nehru National Exhibition for Science and Environmental Education for Children (JNNESEC) - 2012 to the NCERT directly. Therefore, it may please be ensured that entries belonging to these organisations are not forwarded to NCERT.

ii. Wide publicity should be given for inviting entries. *Guidelines for the Preparation of Exhibits and Models for display in district to state level science exhibitions during 2011-2012 should be provided to all schools*. These guidelines may also be translated in local languages, if possible, and be given wide publicity. This may also be given on the Internet website(s) of the respective states/ union territories and other participating organisations. It is also envisaged that guidelines be printed in local language(s), Hindi, and English in the form of a booklet for their dissemination among all the schools for generating the ideas for developing the exhibits and models. These guidelines can also be viewed on NCERT website (*www.ncert.nic.in*).

iii. Public Sector Undertakings, Industries, and other Non-government Organisations working in the areas (where these science exhibitions are organised) may also be invited to participate as the exhibits displayed by them would be of instructional value for the children and teachers.

Screening, Evaluation and Monitoring of Entries

1. A screening committee should be set up to finalise the selection of entries from the various institutions for participation in the State Level Science Exhibition for Children in case Districts/Regional Level Science Exhibitions are not being organised by the state/UT.
2. The Screening Committee may consist of representatives of SISE/SIE and some selected representative institution(s). All records about the meeting of the committee should be maintained. The selection procedure adopted should lay more emphasis on the quality of the exhibits rather than quantity. *It should be ensured that the exhibits are not crude and hazardous* and have good finish and are presentable.
3. The above mentioned Screening Committee or a separate panel of judges should evaluate the exhibits according to the criteria of evaluation attached herewith. Best three exhibits in each sub-theme from each category, viz., higher secondary and others must also be selected by the said panel of judges.
4. A separate list of the selected entries of the exhibits and models under each sub-theme (to be displayed in the state level science exhibition) must be prepared. This must contain the name of the exhibit/model, names of the student(s) and guiding teacher(s), name of the school and a brief information about the exhibit (may be in two sentences only). This list may also be distributed among all participating children and teachers. A copy of this list should be forwarded to NCERT together with the formal report of the exhibition.

   Such a list may be prepared in accordance with the NCERT un-priced publication on "List of Exhibits", to be displayed in Jawaharlal Nehru National Science Exhibition for Children (now renamed as Jawaharlal Nehru National Exhibition for Science and Environmental Education for Children). It is published every year and distributed to all participating children, teachers, and visitors during the exhibition. *A copy of this may be obtained from the Head, Department of Education in Science and Mathematics, National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi 110 016.*
5. A formal report of the State Level Science Exhibition and Seminar on Popularisation of Science should reach NCERT **within one month** after the conclusion of the exhibition. It should include the following:
   - i Dates and venue of exhibition.
   - ii Proformas I - V duly filled up.
   - iii List of schools participating and the number of students/teachers participating as per the proforma attached. Break-up of the male and female participants should also be given. It should also reflect on the number of rural and urban schools, that participated in the exhibition.
   - iv List of entries of the exhibits and models being displayed in the state level science exhibition, as explained in paragraph-4 above. Number of exhibits displayed under each sub-theme should also be mentioned separately.
   - v Highlights of the exhibition including other activities such as lectures, film shows, book exhibition etc. and participation of other scientific/ industrial organisations.

vi Panel of judges for evaluating the exhibits/models displayed in the exhibition (in accordance with the Criteria for Evaluation of Exhibits).

vii List of selected exhibits being sent for consideration for display in 39th JNNESEC - 2012 bearing the name of student, teacher, school, etc. and their write ups for consideration for participation in JNNESEC -2012.

(A proforma for information about the exhibit/model is also attached for this purpose).

viii Number of visitors to the exhibition.

The Report

and

Proformas I-V

Should strictly follow the above format and be forwarded

within one month

after the conclusion of the exhibition to :

Dr. Gagan Gupta
Co-ordinator

State Level Science Exhibitions for Children - 2011-12
and
Jawaharlal Nehru National Exhibition for Science and Environmental Education for Children - 2011

Department of Education in Science and Mathematics
National Council of Educational Research and Training
Sri Aurobindo Marg, New Delhi 110 016

Telefax: 011-26561742

e-mail: *desm.ncert@nic.in*; *jnnesec2011@yahoo.com*

Website: www.ncert.nic.in

Criteria for Evaluation of Exhibits

The Jawaharlal Nehru National Exhibition for Science and Environmental Education for Children - JNNESEC (earlier called Jawaharlal Nehru National Science Exhibition for Children - JNNSEC) is organised every year by the NCERT. It receives entries for consideration for participation from States/UTs selected from the State Level Science Exhibitions held in the preceding year. In order to keep a uniform criteria for evaluating the exhibits in all States/UTs and on the basis of the feedback received from different agencies, the following criteria for judging the exhibits is suggested (the percentage given in bracket are suggestive weightages):

1. Involvement of children's own creativity and imagination (20 per cent);
2. Originality and innovations in the exhibit/model (15 per cent);
3. Scientific thought/ principle/ approach (15 per cent);
4. Technical skill, workmanship and craftsmanship (15 per cent);
5. Utility/educational value for layman, children, etc.; (15 per cent)
6. Economic (low cost), portability, durability, etc. (10 per cent); and
7. Presentation - aspects like demonstration, explanation, and display (10 per cent).

It is further advised to divide the entries into two categories, viz., (i) upto secondary level; and (ii) higher secondary level. On the basis of the criteria suggested above, three entries from each sub-theme may be selected and forwarded to NCERT for consideration for participation in JNNESEC-2012. Besides the popularisation of science, the objective of this activity is to search and nurture inventive or creative talent among children. Judges are requested to evaluate the entries on the basis of pupils' involvement. Imagination and innovations made by the child in designing the exhibit/model should be assessed. They should also judge whether the model is traditional or an improvement over the traditional model or it is innovative. Various skills involved in constructing the exhibit and model, the degree of neatness and craftsmanship may also be taken into account. *Every effort must be made to rule out the tendency of procuring the ready-made exhibits/models.*

General layout of the exhibit, relevance, clarity of charts accompanying the exhibit and overall attractiveness to the layman and children should also be assessed. Working models should be encouraged.

State ___________ Duration___________

STATE LEVEL SCIENCE EXHIBITIONS FOR CHILDRE - 2011-2012

THEME: SCIENCE, SOCIETY AND ENVIRONMENT

VENUE: ....

JUDGES' PROFORMA FOR EVALUATION OF PARTICIPATING ENTRIES–SUB-THEME-WISE

Sub-theme

(Please tick mark on the sub-theme being evaluated)

Agriculture and Food Security / Energy – Resources and Conservation / Health / Environmental Issues and Concerns / Mathematics and Everyday Life / Disaster Mangamnet

Sl. No.	Code of the Exhibit	Involvement of Children's Own Creativity and Imagination 20 %	Originality / Innovations in the Exhibit / Model 15 %	Scientific Thought / Principle / Approach 15 %	Technical Skills / Workmanship / Craftsmanship 15 %	Utility / Education Values for Layman and Children 15 %	Economic (low cost) / Portability / Durability 10 %	Presentation 10%	Total 100 %
1.	...	...	...	...	...	...	...	...	...
2.	...	...	...	...	...	...	...	...	...
3.	...	...	...	...	...	...	...	...	...
4.	...	...	...	...	...	...	...	...	...
5.	...	...	...	...	...	...	...	...	...
6.	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...

Date: _________________

Signature ....

Name :

Designation and Affiliation:

Expenditure Norms

The 'Grant-in-Aid' provided by the NCERT to respective states/UTs is a **catalytic grant** for organising the State Level Science Exhibitions and Seminar on 'Popularisation of Science'. States and UTs are expected to spend the additional expenditure, if any, from the state funds. The funds given to the States/UTs are to be utilised *exclusively for meeting the travel and boarding costs of participating students and their teachers and experts*. It is suggested that the following norms of payment may be followed:

1. For Organising the Seminar on Popularisation of Science

(i) The seminar should be organised during the days of exhibition in morning/evening hours.

(ii) Honorarium to **four** (**two** outstation and two local) experts/scientists may be disbursed at the rate of Rs 500.00 each.

Note : The expert/scientist should be preferably from a research institute/ laboratory/ university.

(iii) Travelling allowance to two outstation experts/scientists from a maximum distance of 500 km may be disbursed as per the state/central government rules.

(iv) Daily allowance and incidental charges to **two** outstation experts/scientists for a maximum of three days may be disbursed as per state/central government rules.

(v) Conveyance charges to **two** local experts/scientists may be disbursed as per state/central government rules.

(vi) Contingency grant for tea/coffee with light snacks: typing/photocopying/ cost of transparencies/transparency pens/CDs etc: Rs. 2,500.00.

1. For Organising the State Level Science Exhibitions

(i) Honorarium to **four** (local) judges may be disbursed at the rate of Rs. 500.00 each. **NCERT faculty members should not be provided any Honorarium from this head, if invited as a judge in the exhibition.**

(ii) Only one student and one teacher may be permitted to participate with each exhibit. However, for more than one teacher may be permitted to participate.

(iii) Travelling allowance: actual second class sleeper rail/bus (non-AC) fare.

(iv) Incidental charges: Rs. 50.00 each way for outward and inward journeys subject to a maximum of Rs. 100.00 provided the journey time by rail or bus is more than 6 hours. For journeys less than 6 hours no incidental charges should be paid.

(v) Boarding expenses: Rs.80.00 per head per day for each participant for a maximum of 4 days. *In case if the boarding facilities are not provided by the organisers then a sum of Rs.120.00 per person may be provided as daily allowance (DA).*

(vi) Local conveyance charges may be disbursed as per state/central government rules.

(vii) contingency grant for typing/ photocopying etc. Rs. 2,500/-

It is necessary to **maintain a separate account** for the expenditure of the grants-in-aid provided by the NCERT and the same should be forwarded to the NCERT, along with all relevant vouchers and receipts, in original **WITHIN ONE MONTH OF THE CLOSE OF THE EXHIBITION** for adjustment in the NCERT account. Proforma I is given for convenience. All vouchers may be signed by the Coordinator/In-charge of the exhibition. All those vouchers/receipts that are in regional language should accompany with a translated copy in English certified by the Coordinator/In-charge of the State Level Science Exhibition to facilitate audit and settlement of accounts. Only those Vouchers/Receipts against such items of expenditure, which are covered under the expenditure norms, may please be sent to this department for adjustment/settlement of accounts. All payments exceeding Rs 5000/- should be supported by payee's receipt with a revenue stamp.

It may please be ensured that each Voucher/Receipt against the expenditure is duly verified for the amount and then passed for payment. The specimen of this certificate is indicated below for convenience:

Verified and passed for payment of Rs ....

(Rupees .... only).

Signature of the Co-ordinator/In-charge
STATE LEVEL SCIENCE EXHIBITION

4 PROFORMAS

STATE LEVEL SCIENCE EXHIBITION FOR CHILDREN - 2011-2012

Proforma I

MAINTENANCE OF ACCOUNTS

State/Union Territory: ______________________________

Dates of Exhibition: ______________________________

Venue of Exhibition: ______________________________

Voucher No.	Receipt			Expenditure				Signature of Coordinating Officer
	Date of Receipt	Particulars of Grant	Amount Received	Voucher No.	Date of Expenditure	Particulars (Head-wise)	Amount Spent	
		Draft No. Date						
		Other income, if any						
					Balance Refunded to NCERT, if any, vide			
		Total				**Total**		

Certified that the expenditures have been made in accordance with the norms and Guidelines as given by the NCERT for organising the State Level Science Exhibition for Children. It is also certified that no other voucher is included.

Date

Signature of the In-Charge (Controlling Officer)
Official Seal

STATE LEVEL SCIENCE EXHIBITIONS FOR CHILDREN - 2011-2012

Proforma II

INFORMATION ABOUT PARTICIPATING SCHOOLS

State/Union Territory: ______________________________

Dates of Exhibition: ______________________________

Venue of Exhibition: ______________________________

Type of School*	No. of Schools	Tribal/ Rural/ Urban	Number of Exhibits/ Models	Participants from the School						
				Teachers			Students			
				Male	Female	Total	Boys	Girls	Total	SC/ST
G	T									
	R									
	U									
LB	T									
	R									
	U									
PA	T									
	R									
	U									
PU	T									
	R									
	U									
Total										

* **G. Government**: A Government School is that which is run by the State Government or Central Government or Public Sector Undertaking or an Autonomous Organisation completely financed by the Government;

L.B. Local Body: A Local Body School is that which is run by Panchayati Raj and Local Body Institutions such as Zila Parishad, Municipal Corporation, Municipal Committee or Cantonment Board;

P.A. Private Aided: A Private Aided School is that which is run by an individual or a private organisation and receives grants from the Government or Local Body;

P.U. Private Unaided: A Private Unaided School is that which is managed by an individual or a private organisation and does not receive any grant from the Government or Local Body.

State Level Science Exhibitions For Children—2011-2012

Proforma III

Information about Nature and Number of Exhibits Displayed

Theme: Science, Society and Environment

State/Union Territory: ______________________________

Dates of Exhibition: ______________________________

Venue of Exhibition: ______________________________

Sub-themes	Natural and Number of Exhibits Displayed				Total No. of Exhibits
	Innovative/Improvised Apparatus/Working Model	Static Model	Study/Survey Report	Any other	
Agriculture and Food Security					
Energy – Resources and Conservation					
Health					
Environmental Issues and Concerns					
Mathematics and Everyday Life					
Disaster Management					
Grand Total					

State __________ Duration __________

STATE LEVEL SCIENCE EXHIBITIONS FOR CHILDREN - 2011 - 2012

Proforma IV

PANEL OF JUDGES - SUB-THEME-WISE*

VENUE ....

THEME : SCIENCE, SOCIETY AND ENIRONMENT

Sub-theme:
(Please tick mark on the sub-theme being evaluated)

Agriculture and Food Security / Energy – Resources and Conservation /Health/ Environmental Issues and Concerns / Mathematics and Everyday Life / Disaster Management

Sl. No.	Name(s) of the Judge(s)	Designation	Official Address, Phone Fax, e-mail	Residential Address Phone, Mobile
1.				
2.				
3.				
4.				

* Respective judges may have their opinions, suggestions and comments about the organisation of science exhibition. NCERT welcomes all such opinions. Kindly enclose them on separate sheets.

39TH JAWAHARLAL NEHRU NATIONAL EXHIBITION FOR SCIENCE AND ENVIRONMENTAL EDUCATION FOR CHILDREN (JNNESEC) - 2012

Theme : Science, Society and Environment

Proforma V

INFORMATION ABOUT THE EXHIBIT / MODEL

1. Title of the Exhibit / model (in block letters) ______________________________ ______________________________
2. Sub-theme: (Tick only one or strike out all others) Agriculture and Food Security / Energy – Resources and Conservation / Health / Environmental Issues and Concerns / Mathematics and Everyday Life / Disaster Management
3. Name(s) of the Student(s) (in block letters)
   ______________________________ (M / F)
   ______________________________ (M / F)
   ______________________________ (M / F)
   ______________________________ (M / F)
4. Name(s) of the Teacher(s) (in block letters)
   ______________________________ (M / F)
   ______________________________ (M / F)
5. Name and complete address of the school (in block letters) :

   ....

   ....Pin ....
6. Type of school* Government / Local Body / Private Aided / Private Unaided / Any other (Please Specify) ________________ ______________
7. Affiliation of the School State Board / ICSE / CBSE Any other (Please Specify) ______________
8. Location of the School Tribal / Rural / Urban
9. Nature of the Exhibit / Model Innovative / Improvised Apparatus / Working / Static Model / Study Report Any Other (Please Specify) ______________
10. Approximate Cost of the Exhibit / Model Rs ___________
11. Requirement for Display
    (i) Shamiana / Open Space / Dark room ________________________
    (ii) Table Size Length: _____ m; width: ______ m.
    (iii) Water Supply Yes / No
    (iv) Number of Electrical Points No.: _____ (5 A); No.: _______ (15 A)

* **G.** **Government:** A Government School is that which is run by the State Government or Central Government or Public Sector Undertaking or an Autonomous Organisation completely financed by the Government;

L.B. **Local Body:** A Local Body School is that which is run by Panchayati Raj and Local Body Institutions such as Zila Parishad, Municipal Corporation, Municipal Committee or Cantonment Board;

P.A. **Private Aided:** A Private Aided School is that which is run by an individual or a private organisation and receives grants from the Government or Local Body;

P.U. **Private Unaided:** Private Unaided School is that which is managed by an individual or a private organisation and does not receive any grant from the Government or Local Body.

12. Source of inspiration / help for preparing the exhibit / model:
(Please explain briefly about the nature and form of help received from the following):

(i) From Teachers / School
____
____

(ii) From Parents
____
____

(iii) From Peer Group
____
____

(iv) Any other
____
____

13. Brief Summary (Please explain the purpose and the scientific principle involved in the exhibit / model in not more than three lines).
____
____

14. Write-up of the Exhibit / Model **(not more than 1,000 words) in the following format.** (Note: *Proper submission of the write-up will ensure that if selected for participation in the 39^h Jawaharlal Nehru National Exhibition for Science and Environmental Exhibition for Children (JNNESEC) – 2012, it will be considered for publication in* the booklet *entitled: Structure and Working of Science Models*. For convenience an exemplary write-up is also given here.):

I. *Introduction*
(i) Rationale behind construction of the exhibit; and
(ii) The scientific principle involved.

II. *Description*
(i) Materials used for the construction;
(ii) Construction and working of the exhibit / model; and
(iii) Applications, if any.

III. *References*
Books, journals or magazines referred for preparation of the exhibit / model.

IV. *Illustrations*
(i) Black and white line diagram of the model, illustrating the working of the exhibit.
(ii) Close-up photographs of the exhibit.

Note: (i) Please neither pin nor paste the photographs of the exhibits. Enclose them in a separate envelope. Description of the photograph may be written on its back.
(ii) Please do not enclose the photographs of participating student(s) and their guide teacher(s).

(Signatures of all students and teachers)

5 An Exemplary Write-up of an Exhibit "Toilet Modification in Indian Trains" Displayed in the 35th Jawaharlal Nehru National Science Exhibition for Children—2008 (Solan)

Students
Shameer S. Hameed
Shahid S. Hameed
Nitesh Prabhu
Deepthi Murali

Kendriya Vidyalaya
Port Trust
Kochi
Kerala

Teacher
Ajith S.R.

Introduction

When it comes to disposal of human excreta and other wastes the country's largest public sector undertaking, the Indian Railways, has been groping in the dark for many years. Untreated excreta and sewerage are discharged into the open, leaving railway tracks a repulsive sight.

Most of the passenger coaches have four toilets, two on both ends of each coach. The human waste from these toilets is directly discharged onto the open tracks. Unhindered dumping of such waste is resulting in unhygienic conditions that may also cause spread of diseases.

Human waste, especially of sick passengers, may contain a large number of germs of many diseases like diarrhoea, cholera, typhoid, hepatitis, other water-borne diseases besides parasitic infections. Parasites like hookworm, roundworm and pinworm are spread mainly through human waste that results in the spread of communicable diseases. The seemingly innocent action of the railways contaminates the environment and promotes unsanitary conditions, negating the very small strides made in sanitation and community health.

Toilet discharge is another major source of corrosion of rails and fastenings. Large amount of water used in the toilets at present needs to be minimised in order to conserve water. Waste water can be treated and recycled so that the problems of corrosion of the tracks as well as spread of diseases can be checked.

Rationale behind Construction of the Exhibit

This project is an attempt to solve the problems arising due to the present mode of disposal of human waste in Indian trains with additional benefit of recycling the water after proper treatment. In the present model the water used in the toilet is filtered and chemically treated and recirculated so that water usage can be minimised as well as the release of untreated water into the tracks can be avoided. After separating water the human excreta is stored separately and can be used to produce biogas

Scientific Principle Involved

Collection: Human waste flushed from toilets is collected in a tank.

Filtration: Filters used in the proposed system filters water from the human wastes flushed from the toilet. The filtered water is collected in a separate tank.

Disinfection: The filtered water is treated chemically using chlorine solution and 1per cent phenol.

Recirculation of Water Using Sensor Controlled Pump: The pump automatically switches ON to pump up water to the overhead tank. This pump is auto controlled with an IC and sensor circuit and switches ON when the water has been treated and switches OFF when water has been pumped up to an overhead tank.

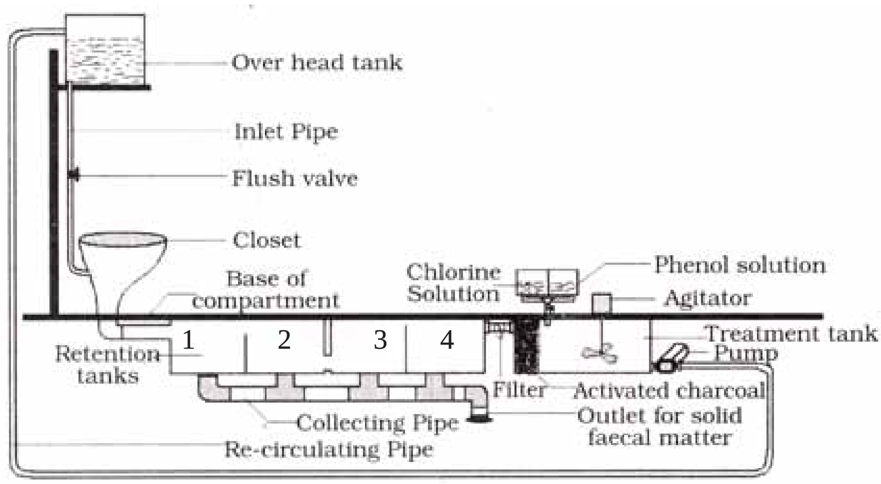
MATERIALS REQUIRED FOR THE CONSTRUCTION

Plywood, transparent plastic boxes, transparent pipes, water pump (washing machine), fevibond, phenol, bleaching powder, metal clamps, screws and nails, wooden stand and activated charcoal.

CONSTRUCTION AND WORKING

The present working model consists of the following major components in the given figure.

(i) Toilet and overhead tank;
(ii) Faecal storing tanks;
(iii) Chemical treatment tank;
(iv) Pipes for water circulation; and
(v) Pump with sensor.



Water from the overhead tank flushes into the toilet after use and the human waste with water gets collected in tank 1 after passing through a tube bent in U-shape. This U-bent tube always holds some water which acts as a seal (to prevent spread of odour). In tank 1 the heavy matter of the excreta is allowed to settle. A pipe has been attached to this tank in order to prevent air blockage. This tank has another pipe near its top through which, water and the light weight matter overflows to tank 2. Tank 2 is connected to tank 3 through a pipe fixed near its base. Water reaching tank 3 may contain some particles, which may settle down after some time.

When tank 3 gets filled up, water from it overflows to tank 4 where it gets filtered. Filters remove tiny particles and the water is then transferred to the treatment tank. Chemical treatment is done with the help of two chemicals, 10 per cent bleaching powder solution and 1 per cent phenol solution. Both chemicals are kept in two separate tanks, fixed over the treatment tank, and are connected to the treatment tank through pipes, with valves to control the flow of chemicals.

An agitator is provided in the treatment tank, for the proper mixing of chemicals with the water. The treated water is then sent to the adsorption tank where unwanted chemicals get adsorbed by activated charcoal. Charcoal removes foul odour as well as chemicals such as phenol by the process of adsorption and makes the water clean. The treated water is then pumped into the overhead tank with the help of a sensor-operated pump. Whenever the water level reaches a particular level (maximum), through a relay system and IC, the pump gets switched ON and water is pumped to the overhead tank. The same process is repeated again and again.

The water in the overhead tank is only meant for use in toilets for flushing, not for washing and other purposes. For this, another tank has to be provided adjacent to the overhead tank.

The solid component of human excreta stored in the retention tanks is sucked out by a motor when the train reaches the destination station. This can then be transferred to the digester tank of biogas plant which are to be installed in the yard near the main stations.

APPLICATIONS

1. The present model ensures safe disposal of human waste in running trains and helps in minimising use of water by recycling it.
2. The suggested system would also help in preventing spread of diseases causing germs and parasitic infections.
3. Anaerobic fermentation of human waste produces biogas. Hence, the biogas plant set up in the railway yards could meet some of the energy needs of the railway station.
4. This model ensures that railway stations and tracks are kept clean besides, preventing corrosion of rails and fastenings.
5. The biogas produced can minimise energy consumption of the railways. Besides, slurry can be used as manure for plants along the railway lines and at railway stations.

REFERENCES

1. ACCIDENTS civilaviation.nic.in/ccrs/accidents
2. PIB Press Release: pib.nic.in/archive/lreleng/lyr2003
3. Indian Railways:www.indianrailways.gov.in/deptts/safety
4. Department of Transport, www.dft.gov.uk/transportforyou/access/rail/