

**STATE LEVEL SCIENCE, MATHEMATICS AND ENVIRONMENT EXHIBITION
FOR CHILDREN–2014–15**

and

**42ND JAWAHARLAL NEHRU NATIONAL SCIENCE, MATHEMATICS AND
ENVIRONMENT EXHIBITION FOR CHILDREN–2015**

GUIDELINES

**FOR THE PREPARATION OF EXHIBITS AND MODELS, AND
Organising Exhibitions**

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एन सी ई आर टी
NCERT

**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

All children are naturally motivated to learn and are capable of learning. The knowledge acquired by them is the outcome of their own activity. Children learn through interaction with nature, people and environment around. They construct knowledge by connecting new ideas to their existing ideas.

In order to stimulate creativity, inventiveness and the attitude for innovation in science and mathematics, National Curriculum Framework (NCF-2005) emphasizes on activities, experiments, technological modules, etc. It also encourages implementation of various activities through a massive expansion of channels such as organisation of science, mathematics and environment exhibition at the national level for school students, with feeder exhibitions at school/block/tehsil/district/region/state levels.

The National Council of Educational Research and Training (NCERT), New Delhi organises Jawaharlal Nehru National Science, Mathematics and Environment Exhibition (JNNSMEE) for Children every year for popularising science, mathematics and environmental education amongst children, teachers and public in general. 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 entries from all States and Union Territories, the Kendriya Vidyalaya Sangathan, the Navodaya Vidyalaya Samiti, Department of Atomic Energy Central Schools, Central Board of Secondary Education 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 2014 - 15 too. These would form the first phase of preparation for the JNNSMEE to be organised in November 2015.

The objectives of the exhibitions are:

- to provide a forum for children to pursue their natural curiosity, creativity, innovation and inventiveness;

- to make children feel that science and mathematics are all around us and we can gain knowledge as well as solve many problems by relating the learning process to the physical and social environment;
- to lay emphasis on the development of science and mathematics as a major instrument for achieving goals of self-reliance, socio-economic and socio-ecological development of the nation and the world;
- to analyse how science and mathematics have developed and are affected by many diverse individuals, cultures, societies and environment;
- to appreciate the role of science and mathematics in meeting the challenges of life such as climate change, opening new avenues in the areas of agriculture, fertiliser, food processing, biotechnology, green energy, disaster management, information and communication technology, astronomy, transport, games and sports etc.
- to create awareness about environmental issues and concerns and inspire children to devise innovative ideas towards their prevention and mitigation.

Children are naturally inquisitive and innovate in response to a variety of problems facing the society. The rapidly aspiring human community for want of more comfort has put tremendous pressure on the limited resources of the world leading to unsustainable exploitation which may result in threatening the very existence of human life. Science and Mathematics act as powerful tools for investigating and understanding the world. They also play a crucial role in solving problems confronting the society. To recognise and encourage these powerful tools so that the problems confronting the society can be overcome through science and mathematics led solutions for a sustainable World, the theme for the State Level Science, Mathematics and Environment Exhibition (SLSMEE) for Children – 2014-15 has

been chosen as **Science and Mathematics for a Sustainable World.**

It is envisaged that children and teachers would try to analyse all aspects of the role of science and mathematics for a sustainable world. This will enable students and teachers to generate scientific and mathematical ideas for addressing various problems of the society. Scientific and mathematical ideas in this context may be referred to as innovative ways of doing things or development of new values through solutions that meet new requirements leading to sustainable production and uses.

Children must be aware about how human society's unsustainable use of natural resources affects the quality of life and environment. Children and teachers should identify where and how new researches and developments in science, mathematics and technology can bring sustainable development of society.

The theme for SLSMEE-2014-15 and JNNSMEE-2015, **Science and Mathematics for a Sustainable World** aims to cover areas such as-

1. Community Health and Environment;
2. Landmarks in Science and Mathematics;
3. Information and Communication Technology;
4. Energy-Resources and Conservation;
5. Transport;
6. Waste Management.

(Areas listed above are suggestive. Students are free to choose any other area and develop exhibits involving Science and Mathematics for a Sustainable World)

A few exemplar ideas pertaining to the areas listed in the context of the theme for the development of exhibits are given below.

THEME: SCIENCE AND MATHEMATICS FOR A SUSTAINABLE WORLD.

1. Community Health and Environment

The main objectives of this area are: to bring awareness among the children about health

and factors affecting our health; to explore new scientific, technological and bio-medical inventions in prevention and cure; to analyse 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/models in this area may pertain to:

- various levels of good health and ill health;
- factors affecting the health and resulting ailments in the body;
- infectious and non-infectious diseases, relationship with causative factors and their sources;
- innovative control measures at different levels/roles of various agencies;
- presenting medical assistance and facilities of rural/urban and gender aspects;
- ways to raise awareness and sensitise 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;
- presentation of known facts and research findings in different medical systems like Indian, Modern, Homeopathy, Ayurvedic etc.;
- lifestyle and its 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 planning and welfare;
- ideas for developing low-cost nutritious food;
- occupational hazards to health and innovative techniques to overcome them;

- general awareness about community medicine;
- new medical diagnostic and therapeutic tools;
- improvised aids for visually impaired, hearing impaired, physically challenged persons, etc;
- need to curb menace of alcohol consumption, smoking, drug abuse etc.
- genetic studies;
- developing simple technologies for diagnostics and environmental problems monitoring; etc.

2. Landmarks in Science and Mathematics

The main aim of this area is to make our school children and teachers aware of the milestones in science and mathematics that have contributed for a sustainable world. The exhibits/models in this area may pertain to:

- developing innovative experiment or design of models/exhibits on the landmarks discovery and invention in science and mathematics;
- significant contributions to the advancement of science and technology;
- policies, programmes and schemes in science and mathematics that have a significant impact on human life;
- scientific and mathematical applications, that have a wide ranging impact on issues such as agriculture, energy, health, environment, space, industry, communication, education etc;
- effective and efficient ways of communicating an experiment that revolutionise scientific and mathematical ideas;
- cost effective demonstration of known facts and research in science and mathematics;
- impact of scientific and mathematical ideas on other subject areas such as medicine, psychology, social science etc;
- contribution of science and mathematics for economic growth, mass literacy, eradication of poverty and malnutrition; etc.

3. Information and Communication Technology

The main objectives of this area are: to promote innovations in knowledge networks involving information and communication technology in all segments of the society; to promote children to think, reason and communicate to solve problems; to understand effective use of information and communication technology for a variety of purposes.

The exhibits and models in this area may pertain to:

- developing innovation designs/models of multimedia equipments/materials and packages for children with special needs, especially visual and audio impairment;
- exploring uses/applications of information and communication technology in generating employment/eradicating illiteracy;
- technologies of emerging web designs;
- projects against attack aimed on information services/cyber security/cyber war;
- effective and efficient ways of communicating scientific and mathematical ideas and concepts;
- technologies in forecasting and warning of cyclones, floods and storms;
- better information and public address systems in the event of disaster to prevent chaos and confusion;
- improvised/improved devices for effective communication between various emergency services-medical, police, military and other agencies/bodies/committees;
- use of satellites in providing information pertaining to meteorology, communication, remote sensing, etc;
- applications in education using computer as an educational tool; simulations in science, mathematics, etc;
- other emerging areas in information and communication technology.

4. Energy- Resources and Conservation

This area is expected to make 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 area may pertain to:

- various ways of harnessing geothermal energy such as energy from hot springs/geothermal desalinisation/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;
- design 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;
- innovative designs of domestic hydroelectric generator;
- 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;
- 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;
- 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;
- 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;
- 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;
- 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/chemical/biological/nuclear resources;
- mechanism of extraction, storage and processing of fossil fuels;
- effects of landscaping and architecture on energy consumption etc.

5. Transport

The main objective of this area is to make general public and children in particular aware about the issues and concerns of the present transportation system and to promote innovations for an efficient transport system. The exhibits/models in this area may pertain to:

- improvised/indigenous technique for efficient transport in rural/urban areas;
- fuel efficient/pollution-free designs of automobiles/other vehicles;
- use of innovative/inexpensive/locally available materials/designs for construction/maintenance of roads/railway tracks;
- innovative ideas for efficient management of road, rail, water and air transport systems;
- preparedness for disaster management-both natural and man-made ;
- GPRS and satellites enabled vehicular movement and transportation;
- design and functioning of modern devices of transportation;
- designs for making existing operation of transportation more efficient;
- exploring uses/applications of transport in generating employment/eradicating illiteracy;
- improvised/improved devices for effective transport between various emergency services, namely medical, police, military and other administrative bodies/committees;

6. Waste Management

The main aim of this area is to make our school children and teachers realise the need for managing the unsustainable disposal system of waste material generated from industry and domestic household and also new technique/methods for waste disposal. The exhibits/models in this area may pertain to;

- various ways of waste disposal such as landfill, incineration etc;
- cost effective and environmental friendly waste management;
- various ways/methods/techniques of recycling waste materials;
- various ways/methods/techniques of extracting useful resources from waste materials;
- low cost waste management system;
- improvised/improved devices for effective and efficient waste management system;
- issues involved in nuclear, biological, medical and chemical waste management;
- Issues related to management of marine pollution, ocean dumping, eutrophication, marine debris, thermal pollution, algal boom, micro-plastic etc
- implication of nanotechnology (nanotoxicology and nano-pollution);
- improvised and innovative techniques / methods of harnessing energy from waste material.
- technique of separating/extracting harmful biological/chemical/nuclear waste and their storage;
- technique and processes for reducing waste generation;
- efficient and effective methods/technique of waste handling and transportation;

Note:- The exemplar points listed so far are to trigger ideas and give directions for preparing exhibits and are not exhaustive. Further we would once again reiterate that, students and teachers are free to choose any area, even areas not listed in this guidelines. However the chosen area and the exhibits/models developed should be in the context of the theme: **Science and Mathematics for a Sustainable World**. Examples of write-ups of exhibits from the previous JNNSMEE are also given at the end of this booklet for facilitating the preparation of exhibits and models for students and teachers.

2 GUIDELINES FOR ORGANISING ONE-DAY SEMINAR

Topic: Indigenous Technology for Inclusive Growth

NOTE: *The One-Day Seminar should preferably be organised one day before the organisation of State Level Science, Mathematics and Environment Exhibition (SLSMEE) for Children.*

The importance of Indigenous Technology has been realised since ancient time. In day to day human endeavours, indigenous technology encompasses all spheres of activities, right from agriculture to transport and from simple tools to sophisticated machines. Indigenous technology holds the key to a nation's development objectives. It is also seen as the driver for inclusive growth for a country.

Government of India has declared the decade 2010-2020 as the Decade of Innovations with a Focus on Indigenous Technology for achieving Inclusive growth. Having realised this, Science, Technology and Innovation Policy-2013 of the Department of Science and Technology, Government of India emphasises the importance of indigenous technology for the country's technological competence and self reliance. Indigenous technology in this context need not necessarily be on the technological invention through high input R&D but on indigenous innovation and other simple tools and processes that create new values for the development and participation of the lower pyramid of the population. The diversity of the country has served as a breeding ground for indigenous innovation for the country.

We intend to create awareness among teachers, teacher educators, researchers and students about looking for indigenous innovation in all possible situations that can bring inclusive growth of the nation. The general public and community may be motivated to appreciate and recognise the role played by indigenous technology for the development and progress of the nation.

Activities to be performed during this Seminar should be planned to (i) increase the public appreciation and understanding of Indigenous Technology; (ii) motivate people to think about using indigenous technology for solving challenging problems surrounding them; (iii) encourage out of the box thinking and lateral thinking among the

children; (iv) make people aware of the role of indigenous technology in achieving inclusive growth; and (v) make people aware about the need for collaborative arrangement among holders of indigenous knowledge.

As a part of this endeavour, to reach out to the public through children and teachers, a one day seminar may be organised in the SLSMEE for children. During this One-Day Seminar on '**Indigenous Technology for Inclusive Growth**', children, teachers, parents and all concerned may be invited to generate ideas. The activities in this seminar may include:

- Making people aware of contributions of Indigenous technology in the development of the nation;
- Publicising the usefulness of indigenous technology in the development process for achieving inclusive growth;
- Organising poster exhibition-cum-competitions highlighting usefulness of indigenous technology especially for inclusive growth and in solving the problems of the society;
- Organising invited talks by experts in Indigenous Technology, particularly motivating the audience to look for its role in creating inclusive growth
- Making students find solution to specific problems existing in their immediate environment.
- Arranging a Quiz competition in which questions may be based on the Indigenous innovation and technology;
- Arranging a group discussion among different groups, to create awareness about the usefulness of Indigenous Technology in different spheres of life.