

बच्चों के लिए
राज्य स्तरीय विज्ञान, गणित एवं पर्यावरण प्रदर्शनियाँ 2018 – 19
तथा
46वीं जवाहरलाल नेहरू राष्ट्रीय विज्ञान,
गणित एवं पर्यावरण प्रदर्शनी 2019
प्रदर्शों तथा मॉडलों को बनाने एवं प्रदर्शनियाँ आयोजित करने हेतु

दिशानिर्देश

STATE LEVEL SCIENCE, MATHEMATICS AND ENVIRONMENT
EXHIBITION FOR CHILDREN — 2018-19

AND

46TH JAWAHARLAL NEHRU NATIONAL SCIENCE, MATHEMATICS AND
ENVIRONMENT EXHIBITION FOR CHILDREN — 2019

GUIDELINES

FOR THE PREPARATION OF EXHIBITS AND MODELS AND
ORGANISING EXHIBITIONS



राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING



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 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, Central Tibetan Schools Administration 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 2018-19 too. These would form the first phase of preparation for the JNNSMEE to be organised in November 2019. 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;

The rising aspirations of human community for desire of more comfort and security has put tremendous pressure on the limited resources of the world leading to unequal access and unsustainable exploitation. Survival of mankind and its future will be in great danger if development is continued without caring about sustainable use of available resources. Development of any country or world at large can be sustainable only if it balances all the three dimensions: the economic, social and environmental. 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 and act as a major instrument for providing scientific solutions for different challenges in life. Children are naturally inquisitive and this inquisitiveness can be harnessed for finding new and innovative scientific solutions to solve different challenges in our lives. In order to provide an opportunity to our young innovators to show their talent and ideas for overcoming these challenges, the theme for the State Level Science, Mathematics and Environment Exhibition (SLSMEE) for Children–2018–19 has been chosen as **Scientific Solutions for Challenges in Life**.

Challenges are part of everyday life and we continuously try to solve them through innovative ways. Some of the major challenges we are facing today are hunger, poverty, health issues, depletion of resources, pollution, waste management, efficient transportation etc. Although our country has achieved significant outcomes in solving various problems like improvement in health care, poverty alleviation, development of new transportation system etc., yet more remains to be done.

In this context, it is envisaged that children and teachers would try to analyze all aspects of the role of science and mathematics for providing solutions

to challenges in lives. This will enable students and teachers to generate scientific and mathematical ideas and prepare models/exhibits for addressing various challenges in life. Scientific and mathematical ideas in this context may be regarding innovative ways of doing things, creating simple technologies/tools that meet new requirements; enabling the participation of the lower pyramid of the population in the development process through science and technology, creating an enabling innovation ecosystem in the country for enhancement of science, technology and mathematics. **However, there are instances when children and their teachers think of some ideas that are new and may be applicable in future. Often such ideas may not be possible to be presented in the form of model/exhibit. Organizers of exhibitions at all levels may provide opportunities to students and teachers to present such ideas in the form of presentations and discussions.**

Children and teachers should identify where and how new researches and innovations in science, technology and mathematics can help in providing solutions for challenges in life.

The theme for **SLSMEE–2018–19 and JNNSMEE–2019, “Scientific Solutions for Challenges in Life”** aims to cover sub-themes such as–

1. Agriculture and Organic Farming
2. Health and Cleanliness
3. Resource Management
4. Waste Management
5. Transport and Communication
6. Mathematical Modeling

(Sub-themes listed above are suggestive. Students are free to choose any other sub-themes and develop exhibits involving innovations in Science, Technology and Mathematics for meeting challenges in life)

A few exemplar ideas pertaining to the sub-themes listed in the context of the theme,

for the development of exhibits are given below.

THEME: SCIENTIFIC SOLUTIONS FOR CHALLENGES IN LIFE.

1. Agriculture and Organic Farming

The main objectives of this sub-theme are to make children and teachers aware of various ecofriendly techniques/ methods not only to enhance agricultural production but also for sustainable ecofriendly living. It is expected that children and teachers would explore various indigenous traditional practices and think of various ways and means towards organic agriculture to maintain sustainability.

The exhibits/ models in this sub-theme may pertain to:

- effect of climatic change on agriculture and its mitigation and adaptive techniques/ methods;
- preservative and conservative methods for prevention of soil degradation and judicious use of water;
- technology packages in organic farming practices for improved yield.
- importance of organic fertilisers over chemical fertilisers;
- planning and managing energy crops (Salix, Poplar, Jatropha, Jajoba, etc.);
- use of biotechnology for economically and ecologically sustainable biofuels;
- various pest control and management measures through organic farming practices;
- 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;
- identification of medicinal plants and their applications;
- effect of electric and magnetic field on the growth of plants and protective measures;
- indigenous designs of farm machinery, agriculture implements and practices;
- improved/ improvised method of processing, preservation, storage and transport of food products;
- food production and demand of quality food and food security;
- advantages and disadvantages of genetically modified (GM) food;
- design and development of automatic weather recording device.
- ecologically sustainable methods of farming;
- schemes / designs to help reduce production cost and conservation of raw materials.

2. Health and Cleanliness

The main objectives of this sub-theme are: to bring awareness among the children about the factors affecting our health; to explore new scientific, technological and bio-medical inventions in prevention and cure of diseases; to explore various scientific and technological interventions for meeting nutritional requirements of human beings and innovative ideas for better management; awareness about the importance of cleanliness for our health etc.

The exhibits/models in this sub-theme may pertain to:

- factors affecting the health and resulting ailments in the body;
- infectious and non-infectious diseases, relationship with causative factors and their sources;

- innovative preventive measures to control diseases at different levels/ roles of various agencies;
- demonstration and use of traditional methods of medication;
- demonstration of known facts and findings, and health benefits of physical exercise and Yoga;
- demonstration of models/ projects to show the effect of junk food items, adulterated food items on our body and its preventive measures;
- ways to raise awareness and sensitise people to be careful in health matters, explore the possibilities and make use of the facilities available;
- innovative ideas for effective implementation of policies/ programmes/ schemes such as Swachh Bharat Abhiyan, National Leprosy Eradication Programme etc that have significant impact on health.
- development of knowledge-base and understanding new scientific, technological aids in bio-medical areas;
- presentation of known facts and research findings in different medical systems like Traditional, Modern, Homeopathy, Ayurvedic etc;
- lifestyle and its relationship with good and bad health based on known facts and researches;
- mechanisms/ways to control the spread of epidemics such as Dengue, Malaria etc;
- improved methods of sanitation and appropriate technology for waste disposal, both biodegradable and non-biodegradable;
- common prophylactic measures available for different diseases and advantages of inoculation and vaccination;
- appropriate measures for family planning and welfare;

- low cost medical diagnostic and therapeutic tools;

3. Resource Management

This sub-theme is expected to make children think of various ways and means for making efficient use of available resources and also new techniques/methods of conservation and management of resources.

The exhibit/models in this sub-theme may pertain to;

- innovative / improvised designs for efficient harnessing of solar energy
- plans for proper management of resources and its monitoring;
- recycling of water, materials, solid wastes, etc;
- devices/methods that control air/ water/land pollution and technologies to manage them;
- stopping depletion of essential micro nutrients in the soil;
- forest, river, mangrove, wetland conservation and management;
- desilting and renovation of ponds, tanks and reservoir;
- self regulating water harvesting system/rainwater harvesting and storage in a manner that evaporation and transportation losses are minimised;
- development of low cost technology for producing potable water;
- innovative/improvised designs for reducing waste in extraction and processing of minerals;
- innovative methods of exploration and preserving minerals and crude oil, etc;
- cost effective heating and cooling system of buildings, etc.;
- models to control loss of natural resources due to mismanagement/ disasters, etc;

4. Waste Management

In the modern world life style and development activities generates lot of biodegradable and non-biodegradable waste which are affecting our lives. Kepping in view the need of the hour, it is of utmost importance to stimulate children by involving them in bringing out some solutions for managing the waste and conservation of environment.

The exhibit/models in this sub-theme may pertain to;

- various way of waste disposal such as landfill, incineration, etc;
- new technique/methods for waste disposal;
- 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 nano-technology (nano-toxicology 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;
- techniques and processes for reduces waste generation;

- efficient and effective methods/ technique of waste handling and transportation.

5. Transport and Communication

The objectives of this sub-theme are:- to make general public and children understand different modes of transport and communication as well as the importance of transport and communication for Sustainable development; to make them aware about the issues and concerns of the present transport and communication systems and to promote innovations for efficient systems.

The exhibits/models in this sub-theme may pertain to:

- improvised/indigenous models for efficient transport and communication;
- working models of fuel efficient/pollution-free designs of automobiles /ships, boats etc;
- innovative ideas for efficient management of road, rail, water and air transport systems, e.g. better safety measures, managing traffic jams, etc;
- demonstrating the principle and functioning of modern devices of communication systems;
- demonstrating the use of information technology in sharing improved designs/indigenous designs/devices;
- developing innovative designs/models of equipments for children with special needs;
- improvised/improved devices for effective transport and communication between various emergency services, namely medical, police, military and other administrative bodies/committees;
- use of geo-stationary satellites in providing information pertaining to vehicular movements and

transportation, disaster management, etc;

- designs for improving existing transport and communication systems;
- innovative ways of using modern communication technologies for connecting people.

6. Mathematical Modeling

Mathematical modeling is the process of transformation of a physical situation into mathematical analogies with appropriate conditions. Physical situations need some physical insight into the problem. Then it is solved by using various mathematical tools like percentage, area, surface area, volume, time and work, profit and loss, differential equations, probability, statistics, linear, nonlinear programming, etc. It is a multi-step process involving identifying the problem. Constructing or selecting appropriate models, finding out what data need to be collected, deciding number of variables and predictors to be chosen for greater accuracy, testing validity of models, calculating solution and implementing the models. It may be an iterative process where we start from a crude model and gradually refine it until it is suitable for solving the problem and enables us to gain insight and understanding of the original situation. It is an art, as there can be a variety of distinct approaches to the modelling, as well as science, for being tentative in nature.

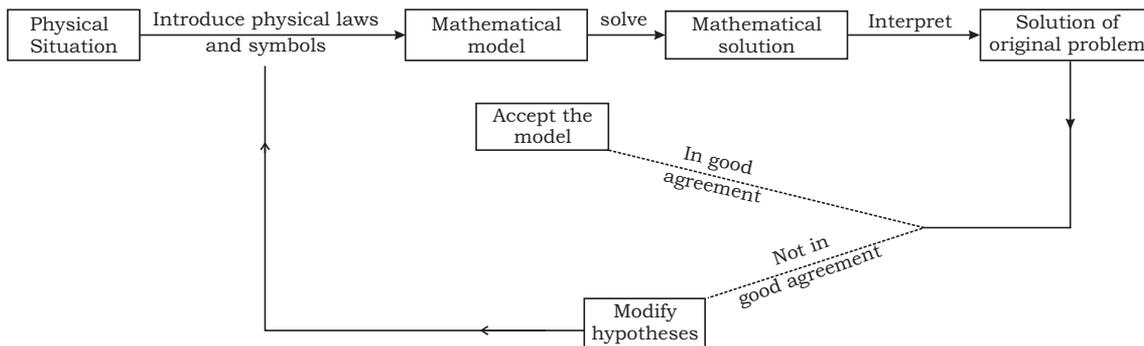
In mathematical modeling, we neither perform any practical activity nor interact with the situation directly, e.g. we do not take any sample of blood from the body to know the physiology, and still our mathematical tools reveal the actual situations. The rapid development of high speed computers with the increasing desire for the

answers of everyday life problems have led to enhanced demands of modeling almost every area. The objective of this sub-theme is to help children to analyse how mathematical modelling can be used to investigate objects, events, systems and processes. It can be visualised by Fig.1.

The exhibits/models in this sub-theme may pertain to:

- mathematical modeling to solve various problems of our everyday life/environment related problem;
- mathematical modeling and computer simulation of climate dynamics/prediction of weather phenomena based on a number of predictors;
- mathematical modeling in physical geography such as rotation and revolution of earth, precession and equinoxes etc.;
- mathematical modeling to predict orbital path of comets, meteors and other minor planets;
- mathematical modeling to show how disease might spread in human in the event of epidemics/bioterrorism;
- mathematical modeling to predict the devastating effects of wars/nuclear explosions;
- mathematical modeling to show spread of forest fire depending on the types of trees, weather and nature of the ground surface;
- mathematical modeling to demonstrate the action of medicines in human system;
- mathematical modeling of the working of heart, brain, lungs, kidneys, bones and endocrine system;
- computer diagnosis of human diseases;
- mathematical modeling of fluid flow in drain, spillways, rivers, etc;

- using mathematical modeling and computer simulation to improve cancer therapy/wound healing/tissues formation/corneal wound healing;
- mathematical modeling of intracellular biochemical reactions and metabolism;
- mathematical modeling to describe traffic flow/stock market options;
- Studies of storage and retrieval techniques for computer systems;
- Data manipulation and information management techniques;
- mathematical modeling on social insects such as honeybees, termites, etc. to know how they use local information to generate complex and functional patterns of communication;
- mathematical modeling of maximum speed in fibre optic links;
- mathematical modeling of urban city planning;
- mathematical modeling to prevent an unwanted future/to understand various natural and unnatural phenomena;



More precisely the above diagram may be further explained as follows:

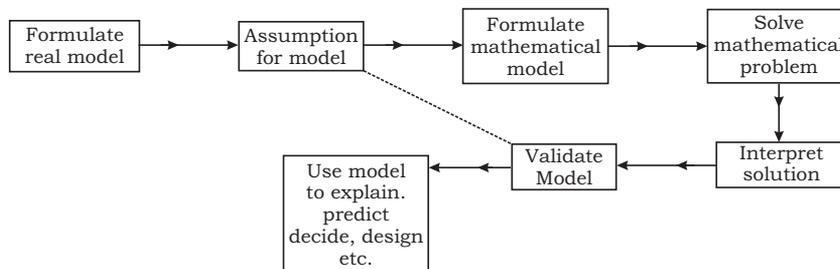


Fig 1: Mathematical Model

- Statistics and random number problems;
- Developing video games;
- mathematical modeling for increasing production of crops;
- mathematical modeling on balance of carbon cycle;
- mathematical modeling to show the effect of climate changes/global warming;
- mathematical modeling for predicting future population and knowing the impact of population;
- mathematical modeling for increasing production of crops etc.



GUIDELINES FOR ORGANISING ONE-DAY SEMINAR

TOPIC: WATER MANAGEMENT: POSSIBILITIES AND WAYS AHEAD

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.

Nature has gifted us with several essential things for our survival and water is one of the most important things among them. Water is vital for the survival of all living organisms and that is why water has got a central place in most of the practices and religions. Everyday water is needed for different purposes, such as cleaning, bathing, cooking, agriculture etc.

Nearly 70% of our earth is covered with water. Only 2.5% of all the water available on earth is fresh water and a very small percentage of this fresh water is easily accessible. With growing population, the demand for fresh water is increasing day by day. Although it should be noted that there is no scarcity of water at global level, rather it is available in plenty but it is not evenly distributed over the globe. Also due to the increasing population, mismanagement of water resources and wastage of water many sectors are facing water scarcity.

India has about 4 percent of the world's fresh water resources and it caters to 17 percent of total population of the world. Most of the fresh water used in India comes from groundwater and our country is the highest user of groundwater in the world. A major fraction of this groundwater is utilised for agricultural purposes and rest of it is used for drinking and other purposes. Due to uncontrolled exploitation of water the condition of number of aquifers is no more sustainable. According to a World Bank report, if current trends continue, in 20 years around 60% of India's aquifers

will be in a critical condition. One of the main causes for this is uncontrolled and unregulated extraction of ground water.

According to United Nations, an estimated 1.8 billion people will live in areas plagued by water scarcity by 2025, with two-thirds of the world's population living in water-stressed regions as a result of use, growth, and climate change. The challenge now in front of us is how effectively we can conserve, manage and distribute the fresh water that we have.

Looking at the immense need for accelerating the efforts towards meeting water related challenges, United Nations General Assembly has declared this decade (2018-2028) as "The Water Action Decade".

keeping these concerns in view one-day, seminar is to be organised to emphasize on this very important component for sustainable development. This seminar may help in creating awareness about the proper utilisation of water and different ways to manage water resources. It will also advocate the importance of promoting efficient water usage at all levels. Now the time has come to be aware about the concept of water foot print and modify our lifestyle in such a manner that we can contribute in decreasing water foot print.

Activities or major thrust areas may therefore focus on the following areas:

- increasing public awareness about the available fresh water resources.
- awareness about different ways for management of water resources.

- awareness about different schemes of government for management of water resources.
- awareness about the methods of conservations of water.
- awareness about the means by which every citizen can contribute in management of water resources.
- developing or finding new ways to solve the water management issue/problems.
- increasing public awareness about the concept of water footprint.