

बच्चों के लिए  
राज्य स्तरीय विज्ञान, गणित एवं पर्यावरण प्रदर्शनियाँ 2017-18  
तथा  
45वीं जवाहरलाल नेहरू राष्ट्रीय विज्ञान,  
गणित एवं पर्यावरण प्रदर्शनी 2018  
प्रदर्शों तथा मॉडलों को बनाने एवं प्रदर्शनियाँ आयोजित करने हेतु

## दिशानिर्देश

STATE LEVEL SCIENCE, MATHEMATICS AND ENVIRONMENT  
EXHIBITION FOR CHILDREN — 2017-18

AND

45TH JAWAHARLAL NEHRU NATIONAL SCIENCE, MATHEMATICS AND  
ENVIRONMENT EXHIBITION FOR CHILDREN — 2018

## GUIDELINES

FOR THE PREPARATION OF EXHIBITS AND MODELS AND  
ORGANISING EXHIBITIONS



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

# 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 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 2017-18 too. These would form the first phase of preparation for the JNNSMEE to be organised in November 2018. 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 confronting the nation

and the society. There is a need for us to continuously innovate to meet the challenges before us. 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 the 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 instruments for achieving sustainable goals. To recognize and encourage these powerful tools so that the problems confronting the society can be overcome and a better future for the country as well as the world can be built through science and mathematics led solutions, the theme for the State Level Science, Mathematics and Environment Exhibition (SLSMEE) for Children–2017–18 has been chosen as **Innovations for sustainable development.**

Widely accepted and well known definition of Sustainable development was coined in Brundtland report(1987) which defines Sustainable development, as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Growth with equity has been the focus of Indian Economic policy since 1960s. Though significant outcomes have been achieved in various areas such as poverty reduction, health and education, more remains to be done. The country as well as the world today faces multiple challenges. These challenges need to be addressed appropriately for a better future.

At the United Nations Sustainable Development Summit on 25 September 2015, all the member countries have adopted 2030 agenda for Sustainable Development which includes 17 different Sustainable Development Goals(SDGs) with 169 associated targets. **Much of India's undergoing development programmes mirrors in Sustainable Development Goals. Some of the recent initiatives of Government of India like Skill India, Smart City, Beti Bachao Beti Padhao, Digital India, Swachh Bharat etc. are some of the steps to achieve Sustainable Development Goals. The theme and sub-themes identified for SLSMEE–2017–18 are directly or indirectly focusing on the above mentioned initiatives of the government.** In this context, it is envisaged that children and teachers would try to analyze all aspects of the role of science and mathematics for achieving sustainable development goals. This will enable students and teachers to generate scientific and mathematical ideas and prepare models/exhibits for addressing various problems. 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 achieving sustainable development goals.

The theme for **SLSMEE-2017-18 and JNSMEE-2018, “Innovations for sustainable development”** aims to cover sub-themes such as-

1. Health and well-being;
2. Resource management and food security;
3. Waste management and water body conservation;
4. Transport and Communication;
5. Digital and Technological solutions;
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 sustainable development)***

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: INNOVATIONS FOR SUSTAINABLE DEVELOPMENT.**

**1. Health and well being**

The main objectives of this sub-theme are: to bring awareness among the children about the factors affecting our health and nutritional needs of the body; 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 requirement of human beings and innovative ideas for better management.

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;
- model to demonstrate importance of balanced diet and nutritional values of various food items;
- role of biotechnology to improve nutritional value of crops
- demonstration of models/ projects to show the effect of junk food items, adulterated food items on our body and its preventive measures;
- demonstration of models/ projects to create awareness among children about appropriate rules of safety in hazardous situations to avoid accidents and injuries;
- presenting medical assistance and facilities for rural/urban areas 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;
- 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;
- ideas for developing low-cost nutritious food;
- low cost medical diagnostic and therapeutic tools;
- models for sustainable agriculture and health;
- models to demonstrate the impact of chemical residues from fertilizers, pesticides, hormones and food dyes etc., on health;
- 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.
- 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;
- organic farming/organic fertilisers versus 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;
- innovative/inexpensive/improved/ indigenous technologies/methods of storage/preservation/conservation/ transport of agricultural products and foods materials;

## **2. Resource management and food security**

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. Also sub-theme is expected to make children and teachers aware of various techniques/methods to enhance agriculture production to achieve food security; to make children and teachers think of various ways and means to enhance knowledge on agriculture and food safety.

- Ideas for developing low-cost nutritious food; and
- 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;

- innovative/improved practices for reducing cost of cultivation;
- indigenous designs of farm machinery, agriculture implements and practices;
- impact of pollution on food and food safety;
- improved/improvised method of processing, preservation, storage and transport of food products;
- issues related with the animal health and food security;
- measures/methods for ensuring food safety;
- advantages and disadvantages of genetically modified (GM) food;

### **3. Waste Management and Water Body Conservation**

In the modern world the life style and development activities generates lot of biodegradable and non-biodegradable waste which are affecting water bodies as well. Both surface and groundwater is facing huge quantity and quality threat in the present time. Water bodies form a very important source of water and also helps in recharging groundwater. Lakes, ponds, tanks etc. which are built to hold water need to be protected. Keeping 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 water bodies.

The exhibit/models in this area 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 I 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-toxiology 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;
- traditional practices to be adapted for conservation of water;
- new technique/methods/practices for conservation of water bodies;
- cost effective and environmental friendly water bodies management;
- techniques/ways to create awareness for conservation of water;
- improvised/ improved devices for effective and efficient water management system;
- surveys/studies on the initiatives taken in the country in this direction.

### **4. 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 the 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;

### **5. Digital and Technological Solution**

Digital technologies have impacted almost every walk of our life. Be it education, research, business & commerce,

communication, safety & security, medicine or even socialization, countless observation of the shift to digitalization are seen. Digital technologies have made life much easier, by speeding up the pace and scale of doing such things. Through automation, it has saved time and human labour, and at the same time, it has created many job opportunities.

Under this sub theme, the participants are expected to come out with fresh ideas about solving daily-life problems with the help of digital technologies or proposing a tentative solution to critical issues that can be better addressed or managed digitally or with the help of and other technology. Technological solution can be a simple mobile application or a prototype of a software-based solution or a strong enough idea with a detailed solution plan. It is considered that digital technologies can help us achieve the sustainable development plan.

Therefore, children are encouraged to critically think about applications of sustainable digital and technological solutions of various important challenges faced by the human society.

The exhibits and models in this area may pertain to :

- Use of digital technology for improving quality of education.
- maintenance of learning performances over years and their analysis for career guidance and counseling.
- use of digital technology for prevention as well as mitigation of large scale disease out breaks, life-style related illness, etc.
- technology for effective monitoring and implementation of Swachh Bharat Schemes, as well as other cleanliness & hygiene efforts.
- safeguard against cyber attacks and online privacy.
- mass awareness for reach & access

of initiatives through Digital India Scheme & Other benefits. Use of technology to make easier digital transactions by less educated persons.

- technology for effective and efficient ways of communicating scientific and mathematical ideas and concepts.
- technology for better information and public address systems in the event of disaster to prevent chaos and confusion;
- applications of technology as an educational tool; simulations in science, mathematics, etc.;
- other emerging areas in information and communication technology.

## **6. Mathematical modeling**

Mathematical model is a representation in mathematical terms of the behavior of real devices and objects. The main aim of the sub-theme 'mathematical modeling' is to make our school children aware about how the problems and the situations around them could be framed in a mathematical setting and can be solved using the ideas and principles of mathematics. This will also make them realize the role of mathematics in understanding nature and natural phenomenon and help in finding solutions for societal challenges.

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

- mathematical applications that have a wide ranging impact on issues such as agriculture, space, energy, health, environment, space, industry, communication, education, etc.;
- effective and efficient ways of communicating an experiment that revolutionize mathematical ideas;

- cost effective demonstration of known facts and research in mathematics;
- impact of mathematical ideas on other subject areas such as science, medicine, psychology, social science, etc.;
- contribution of mathematics for economic growth, mass literacy, eradication of poverty and malnutrition, etc.;
- mathematical ideas to solve various problems of our everyday life, environment related problems;
- mathematical models to predict orbital path of comets, meteors and other minor planets;
- mathematical models to show how disease might spread in human in the event of epidemics bioterrorism;
- mathematical models to predict the devastating effects of wars/nuclear explosions;
- mathematical models to show spread of forest fire depending on the types of tree depending on the types of tree, weather and nature of the ground surface;
- using mathematical tools and computer simulation to improve cancer therapy/wound healing/tissues formation/corneal wound healing;
- mathematical tools to describe traffic flow/stock market option;
- mathematical tools for predicting future population and knowing the impact of population.
- mathematical tools to describe effect of climate change/global warming.





## GUIDELINES FOR ORGANISING ONE-DAY SEMINAR

### TOPIC: DIGITAL TRANSACTIONS: PROMISES AND CHALLENGES

*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 transactions which do not require exchange of any physical currency and can be done through electronic mode may be termed as digital transactions. Digital transactions form a subset of Digital India, a flagship programme of Government of India, which intends to transform India into a digitally empowered society. Digital transactions can convert cash-operational society to a cash-less society. Digital transactions are transparent.

Any financial transaction done by a person with his/her credit card, debit card, mobile wallet, net banking etc. comes under digital transaction. Further, accessing various services and facilities digitally can also be considered as digital transactions. Some examples include booking bus/train/air tickets using laptop/desktop/mobile with internet connectivity; booking online health test, accessing test report online or getting them in email, consulting doctors online either through chat or by uploading details of health reports. Like wise, getting to know about and availing the benefits of different government schemes like scholarships, financial aids etc, through online platforms can also be categorised as digital transactions.

According to some reports of the government of India, the number of internet users in India has crossed the figure of 50 crores, out of which around 4.5 crores people are using online banking facility. Having seen the ease and comfort of using digital transactions during the recent demonetisation activity, the number of people doing digital transactions is increasing day by day. Even the common people have started transacting digitally.

Nowadays many of the people living in Metro cities are performing most of the transactions through digital mode only.

To promote the digital transactions Government is giving incentives for transactions done through digital mode. Government has launched several awareness programmes for promoting digital transactions like DigiDhan Mela, DigiShala etc.

Government of India plans to connect 2.5 lakh Gram Panchayats by optical fiber network for providing high speed internet facility to villages also. More than 1 lakh Gram Panchayats have already been connected till date under this scheme.

Besides many advantages of digital transactions there are some limitations also. It is prone to theft of identity, fraudulent transactions etc. If the user is not cautious, alert and not maintaining secrecy of access credentials, he/she may be exploited by hackers or by phishing groups.

This one-day seminar is intended to create awareness about digital transactions, their benefits of being transparent, quick, time-saving, cost effective, thereby making life easier for the user.

Activities or major thrust areas may therefore focus on-

- Increasing the public appreciation & awareness about digital transactions;
- Awareness about different fields or areas in which transactions can be performed digitally.
- Awareness about the Digital India Initiative of the Government of India and how every citizen can participate in it.

- Precautions & Safety measures to be taken care of while performing digital transactions. This can include password safety, avoiding visiting harmful or unsafe websites, quick reporting in case of any trouble, etc.
- Encourage participants for out of the box thinking for popularising digital transactions by highlighting their immense benefits.
- About agencies working on cyber safety, security and how and where to report on any miss happenings due to digital transactions.
- How people from villages & rural areas can also get the benefit of different government schemes by knowing about them digitally & accessing them online.