

**THEME : SCIENTIFIC SOLUTIONS FOR CHALLENGES IN LIFE**

**SUB – THEMES**

**1. Agriculture and Organic Farming**

The main objective of this sub-theme are to make children and teachers aware of 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 fertilizers;
- 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 cultivations;
- Identification of medicinal 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 objective 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 preventions and cure of diseases; to explore various scientific and technological interventions for meeting nutritional requirements of human beings and innovative ideas for better managements; 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 sensitive people to be careful in health matters explore the possibilities and make use of the facilities available;
- Innovative ideas for effective implementations of policies / programmes / schemes such as *Swachh Bharat Abhiyan*, National Leprosy Eradication Programme etc that have sufficient 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 exhibits / 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 minimized;
- 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 building, 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. Keeping in view the need of the hour, it is of utmost importance to stimulate children by involving them in bringing out most solution 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 / models 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 if 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 effecting methods / technique of waste handling and transportation.

**5. Transport and Communication**

The objective 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 innovation 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;

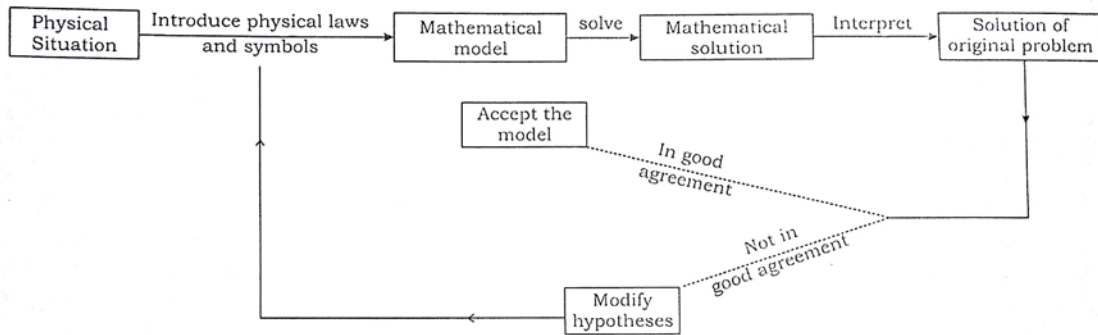
- Demonstrating the principle and functioning of modern devices of communication systems;
- Demonstrating the use of information technology in sharing improved designs / indigenous designs / devices;
- Developing innovating designs / models of equipments for children with special needs;
- Improvised / 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. Construction or selecting appropriate models, fighting out what data need to be collected, deciding number of variables and predictor 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 modeling, 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 are mathematical tools reveal the actual situations. The rapid development of high speed computers with the increasing desire for the answer's of everyday life problems have lead to enhance demands of modeling almost every area. The objective of this sub-theme is to help children to

analyse how mathematical modeling can be use to investigate objects, events, systems and processes. It can be visualized by figure-



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

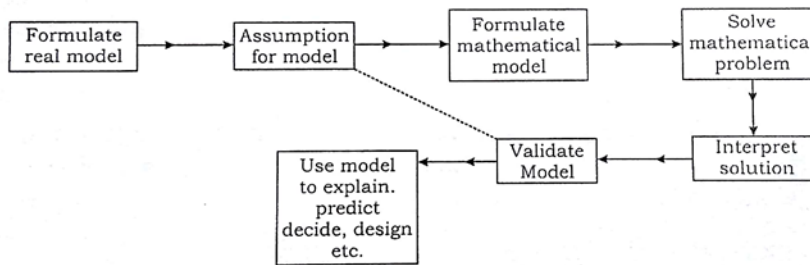


Fig. Mathematical Model

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, kidney, 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;
- Statistics and random number problems;
- Developing video games;
- Mathematical modeling for increasing production of crops;
- Mathematical modeling on balance of carbon cycle;
- 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 fiber optic links;
- Mathematical modeling of urban city planning;
- Mathematical modeling to prevent an unwanted future / to understand various natural and unnatural phenomena;
- 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.