Extract from the *Draft* Activity Guide Book *for* National Children's Science Congress 2022-23

The ongoing pandemic has created a 'disjuncture' in our existence. 'Disjuncture' is a concept discussed in learning theory to interpret a phenomenon when people are confronted with an experience that conflicts with an individual's previous own understanding about the world[1]. The process compels us to find different information, acquire new knowledge and learn new ways of doing things[2]. This new learning tells us that "**we must learn to listen to science**"[3]. In this perspective, global focus on public health, scientific inquiry and education emphasizes developing linkages to promote necessary collaboration, solidarity and collective action for common good to encompass fluidity as well as capillarity in the changing context[4]. The experience of pandemic and understanding about the origin of such a crisis with loss of human life, livelihood and biodiversity[5], emerging barriers to '**old normal**' and evolving fresh norms for a '**new normal**'[6] focusing more on ecological security[7] . But to relook and reconnect with nature[9] for health security[10] and well-being[11] nurturing eco- literacy[8] is very much essential. Considering its commitment to human well-being, biodiversity conservation and achieving Sustainable Development Goals, the UNO has declared 2021- 2030 as the UN Decade on '*Ecosystem Restoration'* within existing structures and available resources. This is done with the aim of supporting and scaling up efforts to prevent, halt and reverse the degradation of ecosystems worldwide and raise awareness on the importance of ecosystem restoration[12]. With these perspectives, 'Ecosystem', 'Health' and 'Well-being' are considered as the primary focus to develop focal theme of National Children's Science Congress (NCSC), 2022-23. It is admitted on all hands that the mentioned issues (health and wellbeing) cannot be addressed properly unless 'ecosystem' is conceptualized properly in one's own local context. Hence, **"Understanding Ecosystem for Health and Well-being"** has been chosen as the focal theme for NCSC 2022-2023**.**

Focal Theme: Understanding Ecosystem for Health and Well-being

Ecosystems are the planet's life-support systems; not only for humans but also for all other forms of life. Human survival has fundamental need for food, water, clean air, shelter and relative climatic condition. Other benefits that are derived include full complement of species, intact watersheds, climate regulation and genetic diversity. Stress of any form on ecological balance, biodiversity, freshwater sources, food-producing systems and climate regulation can cause major adverse health impacts[13] and overall wellbeing. Therefore, understanding an ecosystem as life-support-system in terms of its components,

interrelationship among the components, role of abiotic and biotic factors and its functions, significance of food chain, energy dynamics, ecological services, biodiversity (genetic and species varieties) are very important to develop ecological literacy. Moreover, understanding about human impact on ecosystems affecting health and wellbeing is also not less important[14]. It is essential to know how our activities disturb the ecosystem functions leading to various negative impacts. Hence, rectification and redesigning our daily activities at individual, family and community levels are required to reduce the negative impacts on ecosystem[15] to develop positive environmental externalities[16] for achieving ecosystem sustainability, health safety and security as well as wellbeing for all.

The Focus

The focal theme will focus on the major following aspects by engaging children for inquiry-based learning applying methods of science in their local contexts:

- Exploring and understanding ecosystem(s) in their neighborhoods and taking initiatives for ecosystem conservation and restoration;
- Making inquiry into the interlinkages of ecosystem with health, nutrition and well-being along with their implications;
- Taking initiatives for experimentation based on ecosystem approach for local level natural resource management, farm and non-farm based production, and finding out ways for food, nutrition and livelihood security, health safety, and developing resilience and adaptation towards climate change and disaster risk reduction.
- Looking into innovative S&T solutions for ecosystem conservation and restoration, nutrition and health safety.

Keeping these major focuses in view, the focal theme has been divided into the following five sub-themes:

(i) Know your ecosystem
(ii) Fostering health, nutrition and well-being
(iii) Social and cultural practices for ecosystem and health
(iv) Ecosystem based approach (EBA) for self-reliance
(v) Technological innovation for ecosystem and health

Sub-theme-I
Know your ecosystem

This sub-theme will encourage the children to identify and explore ecosystem(s) in their neighborhoods and carry out studies to know about its different components (abiotic and biotic), their interrelationships, functions, role and association of certain species in the ecosystems, ecological services, human dependency as well as impact of human activities on the ecosystem(s) and many more. Based on the geo-ecological context, children may carry out their studies considering either natural ecosystems (wetland, grassland, desert, mountain, coastal, forest, river, wood land, estuaries, etc.) or man- made ecosystem (fishery, agricultural field, agroforestry plot, garden, pond etc.) as their specific unit of observation and study. It is, thereby, desired that their study will find out the perspectives of ecosystem components and its functions with respect to time and space. Children may also identify the status of the chosen ecosystem in terms of sustainability and find out strategies and paths for its strengthening / upgrading.

Project Ideas

1. Comparison of butterfly populations in urban and rural environs
2. Diversity in the mangrove
3. Diversity of water plants in the local pond/wetland
4. Diversity of water plants in the disturbed pond/wetland and intact pond/wetland in the locality
5. Impact of urbanization on the mangrove ecosystem
6. Impact of solid and liquid wastes on the mangrove ecosystem
7. Impact of solid and liquid wastes on the wetlands
8. Diversity of flora and fauna in the sacred grove
9. Comparison of soil organism in sacred grove and agricultural land/plantations in the neighborhood
10. Urban birds and their survival tactics
11. Probe in to reasons of the disappearance of sparrows in urban/ rural environs
12. Pollinators in the home gardens
13. Diversity of spiders in the paddy fields and their role in pest control
14. Mixed hunting party of birds in rural areas and their dynamics
15. Birds in the paddy fields
16. Study of heronry and the dynamics
17. Fruit eating birds in the locality and their role in seed dispersal
18. Dragonfly and damselfly diversity in the locality
19. Dragonfly larvae and their role in mosquito larvae control
20. Bird flowers and flower birds
21. Ecosystem restoration of different mined areas
22. Coastal erosion and impacts
23. Choice of native and exotic plants in the home gardens and the transformations in the garden ecosystems
24. Change in riparian vegetations in different zones in a river

25. Analysis of change in the local landscape based on satellite images and land surveys
26. Riparian vegetation dynamics and its relation to diversity in aquatic fauna in the locality
27. Earthworm presence and density as an indicator of soil organic content and soil health
28. Study of pollinators in the mustard field.
29. Pollinators and pollination

Sub-theme- II
Fostering health, nutrition and well-being

The World Health Organization (WHO) defines health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' [17]. This is in consistent with the bio-psycho-social model of health, which considers physiological, psychological and social factors in health and illness and interactions between these factors. Health and well-being are also related to food and nutrition not only of human being, but also of all life forms. A well-balanced diet with adequate nutrients and appropriate calories are the fundamental requirements for continued better health. An appropriate diet contributes to healthy development, healthy ageing and greater resilience against disease. Further, 'wellbeing' has been defined as the combination of feeling good and functioning well. In reality, balanced nutrition, healthy mind and body and wellbeing - all are interconnected, which, in totality, reflects the status and situation of a community /society. Moreover, wellbeing commonly covers the aspects of psychological, emotional, social, and physical aspects of human life and its connectionto nature. With these perspectives, this sub-theme basically focuses to inspire the children to make scientific inquiry about situation of health, nutrition and well-being in their own localities and will also encourage them to make efforts to identify ways and means to foster/ promote the situation ensuring health safety and security, nutritional security and wellbeing at individual, family and community levels.

Project Ideas

1. To study nutritional values of food and to carry out comparative analysis of various physiological factors affecting health and diet.
2. Water Disinfection/Treatment Through Solar Energy
3. To study Vitamin-D deficiency in the community
4. To study Vitamin-B12 deficiency in the community
5. To Study The Pet Animals Health
6. To study the food chain/food web in an ecosystem
7. Identifying locally available edible mushroom and estimating their food values
8. To study nutritional values of mid-day meal of the school

9. To study mental health of the children in post COVID situation

10. Study on occurrences of of Zoonotic diseases

11. Study on indigenous food system

12. Study on insect farming as a source of protein

Sub-Theme- III
Social and cultural practices for ecosystem and health

Social situation of a society develop a social make-up in relation to family structure, social groups and institutions and creates a social foundation, where culturalbeliefs and practices are embedded with food system, habitat development, spiritualism, occupational practices, traditional knowledge system, and many more. By and large, these are interlinked with nature and ecosystem as well as with health-related practices. In fact, social and cultural practices are evolved around an ecosystemwith respect to social and cultural values. As a consequence, dependency on ecosystem and ecosystem services are gradually increased to fulfill social and cultural needs. Moreover, in relation to health, there are social and cultural value-based perceptions, which are sometimes linked to myth and in certain cases there are practices linking to health safety through specific food, herbal medicine, sanitation management, etc. All these aspects develop local level prospects and challenges differently in different geo-ecological and cultural contexts. Therefore, the proposed sub-theme will inspire the children to identify the prospects and challenges related to conservation/restoration of ecosystem and health, which will evolve through socio-cultural practices in their local contexts through systematic scientific inquiry. Children will try to find out ways and means to tap the potentialities and overcome the challenges involving local communities.

Project Ideas

1. Agriculture related social and cultural practices leading to non-chemical farming with respect to biological pest and nutrient management.

2. Human animal conflict and linkage to local ecosystem degradation and coping mechanisms.

3. Land use changes causing ecosystem changes leading to flash-floods/land-slides including vulnerability mapping of potential landslide hotspots.

4. Cloud-burst and resultant flooding and its impact on agro-ecosystems.

5. Rain-gardening/farm ponds/soil erosion control measures / Continuous Contour Trenches/gabion etc. and study of regeneration of green cover over sloppy terrains.

6. Season watch – mango and other fruit orchards / other species / link to local marketing and study the process of flowering and its linkage to whether they have the same latitude/longitude etc.

7. Sacred groves and their importance / role in conservation and local traditions and ecosystem services.

8. Selective and controlled pruning of trees/fodder for cattle rearing / Jack tree leaves for goats etc. as a conservative measure.

9. Role of traditional games/sports and their linkage to health / Physical activity mapping/ seasonal games etc.

10. Food preservation/processing linked to seasonal availability of resources / fish/meat /vegetable process / in various agro-ecosystems.

11. Fisheries / Conservative measures leading to sustainable fishing.

12. Pest-predator balance in agro-eco systems and cultural pest control measures as opposed to conventional farming / comparative study / economics of input-based farming with natural farming systems.

13. Study on sustainable menstruation as a means to avoid plastic waste.

14. To study role of rain garden in water recharge.

Sub-theme – IV
Ecosystem based approach (EBA) for self-reliance

Ecosystem based approach (EBA) is an integrated approach of planning and management that recognize the functional interaction of ecosystem with human activities focussed to natural resource management, farm based activities like - sustainable agriculture, agroforestry, animal husbandry, sericulture, aquaculture, apiculture etc. along with non-farm based activities like value addition of farm-based products etc. EBA is also applied to develop local level planning for climate change resilience, climate change adaptation, and disaster risk reduction etc. Such approaches aim at bio-economic functions through sustainable use and management of natural resources, developing natural resource-based livelihoods, local level food and nutrition sufficiency and well-being for all. In these broader perspectives the proposed sub-theme will encourage the children to explore about natural resource potentiality and challenges in their localities for management and find out path for local level. Sustainable management of natural resources, application of bio-economic principle for farm and non-farm activities to generate livelihood security, resource sufficiency and planning for climate change resilience, adaptation and disaster risk reduction.

Project Ideas

1. Study of dependency of a village on the nearby forest.
2. Documentation of the wild edibles from different habitats in the surrounding area.
3. Assessment of current scenarios of different natural resources in the surrounding area of your school.
4. Management of solid waste in urban areas- Reduce, Segregation, Collection (efficiency), Transportation, Resource recovery, Disposal.

5. Study of impact of traditional agriculture on water harvesting system.
6. Study of propagations techniques of different wild edibles.
7. Study of vulnerable/ degraded resource areas in the surrounding.
8. Study of restoration practices (indicative) for degraded ecosystems.
9. Study of different man-made habitats like gardens and other open spaces and their role in urban areas.
10. Study of aquatic flora to reduce water pollution.
11. To study different practices of crop rotation, relay cropping, etc. for sustainable production (documentation, reflected in soil health, comparison between two patches).
12. To study the diversity of birds in agriculture systems and their role.
13. Study of mushroom cultivation.
14. Study of beekeeping and its role in maintaining the ecosystem.
15. Effect on food supply chain during pandemic.
16. Study and documentation of food preservation practices for crisis period.
17. Study of per capita water resource availability (domestic use) for a village or town.
18. Study of salt tolerant and salt loving plants in coastal agroforestry and agriculture.
19. Assessment of existing fish habitats and measures to improve them.
20. Study of aquaponics cultivation.
21. Study of different groundwater recharge practices.
22. Study of role of vegetation in water percolation, retention,reducing runoff and erosion.
23. Integrating plants and water for cooling and air conditioning within settlements and buildings.
24. Micro watershed mapping.
25. Carbon sequestration in your surroundings (Vegetation- Height, girth of trees-)
26. Terraced cultivation in hilly areas
27. Study on After effect of flash floods, storms, landslides.
28. Water usages in packaged water bottle vs from Tap bottle water
29. Study of road killed small vertebrates and invertebrates
30. Survey and documentation of the biodiversity in the potential Biodiversity heritage sites
31. Study on different Tree species in an Homestead Agroforestry systems
32. Study of multipurpose tree species in the locality

Sub-theme – V
Technological innovation for ecosystem and health

Technology has evolved on the application of scientific principles in different activities of human being by improving efficiency through reducing resource consumption on the basis of the principle of 'low inputs to get high output', reducing wastage of material, time and labour (drudgery), tapping renewable energy resources, creating wealth from waste, mobilizing information and communication technology for effective management for appropriate decision-making at appropriate time, adopting or modifying already existing technology(ies) in a local context etc. Ideal design and development of technology can provide ways for ecosystem conservation, sustainable resource management, health safety, sanitation management, appropriate solutions for disease diagnosis and management (both physical and mental) , on-time information communication for crisis mitigation, and long-

term ecological monitoring. The post-pandemic world demands new technological interventions and innovations for ecosystem security, health securityand overall well-being. With these broader perspectives the proposed sub-theme will encourage children to find local-level problems and take initiatives for developing local technological solutions from the perspectives of green technology, appropriate technology, information communication technology and also improvising traditional technology based on the principles of frugal innovation.

Project Ideas

1. Biomass (Algae, Bio-residue, waste, etc.) as green energy
2. Design and development of simple and economical devices for measuring water quality
3. Appropriateness of water purifiers
4. Technology for potable drinking water delivery during flood
5. Design, development of a solar water still for coastal and brackish water areas
6. To develop a simple tool for measuring water table depth in tube well
7. Bamboo as a sustainable engineering material.
8. Solar/ biomass based crop dryers for farmers
9. Simple technology for weather monitoring (measurement of rainfall, wind, solar radiation duration, humidity, etc.)
10. Technologies for person with disability
11. Grey water treatment using plants and micro organisms.
12. Use of Biochar to improve moisture and nutrient retention in soil
13. To study traditional fishing tools and gears and its modification to make it more efficient and productive
14. Rain water harvesting accessories
15. Comparative study of thermal performance of traditional and modern houses
16. Exploring electric mobility
17. Measuring specific heat of water and appreciating its role in ecosystem maintenance
18. Information and communication technology (ICT) for decentralized healthcare delivery – to develop a frugal process
19. Application of artificial intelligence for estimating market demand for agri-products
20. To study micro climate condition at the habitat level
21. To develop solutions for stubble burning issue
22. To explore the use of fruit and vegetable waste for extraction of value added materials like pectin or pigments