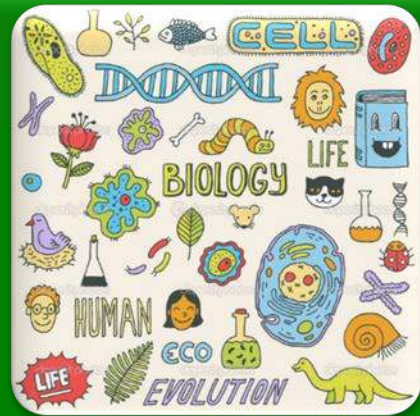


Biology

Biology

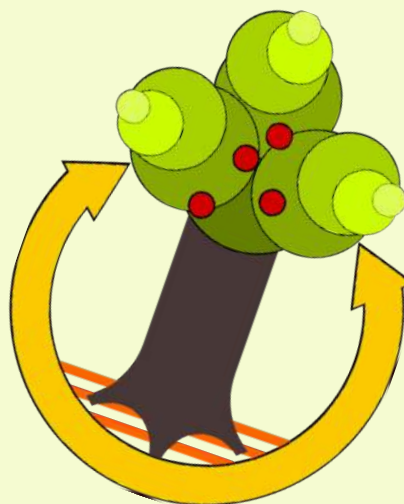


Biology is perhaps the most fascinating of all the sciences, as it is the science of life, and is aptly called life science. More than anything else, Biology is a quest, an ongoing inquiry about the nature of life.

Scientists all over the world are engaged in solving biological puzzles that once seemed unsolvable. We are moving closer to our understanding of many things such as how a single microscopic cell develops into a complex plant or animal; how plants convert solar energy into the chemical energy of food; how the human mind works; how various forms of life network in biological communities such as forests and coral reefs; how the great diversity of life on Earth evolved from the first microbes, etc.

The discovery of the double-helical structure of the DNA, deciphering of the genetic code, and three-dimensional structure of many macromolecules led to the phenomenal growth in the field of Molecular Biology. Recent breakthroughs in genetics and molecular cell biology are transforming medicine and agriculture. New models in ecology are helping scientists to evaluate environmental issues such as increasing atmospheric levels of carbon dioxide leading to global warming and the destruction of the ozone layer.

Biology also plays a valuable part in general education and its day to day relevance in the lives of children, in terms of nutrition, health and hygiene, medicines and a host of other useful products needs to be highlighted. At the same time, the curiosity of children towards environmental issues needs to be aroused and knowledge be imparted through the study of nature and the consequences of upsetting nature be addressed.



The core concepts of Biology for Classes VI – VIII are as follows:

Class VI

Plant Life
The Cell
Human Body
Health and Hygiene
Adaptation

Class VII

Tissue
Kingdom Classification
Plant Life
Human Body
Health and Hygiene

Class VIII

Transport of Food and Minerals in Plants
Reproduction in Plant and Animals
Ecosystems
Human Body- Endocrine, Circulatory and Nervous Systems
Health and Hygiene
Food Production



Theme 1: Transport of Food and Minerals in Plants

This theme deals with the movement of water containing minerals and food with plants. The exchange of water, gases, minerals and other substances into and out of the cells and also between neighbouring cells, takes place through a system called transportation system. In unicellular organisms (*Chlamydomonas*) and simple multicellular organisms like *Spirogyra*, diffusion is a major method of transportation. Diffusion of water across a semipermeable membrane is called osmosis. In complex higher plants because of enormity of size and complex organization, there is an elaborate transportation system and transport occurs through a vascular system of independent channels or conducting tubes (xylem and phloem). In addition to transport, xylem tissue also provides mechanical strength to the plant body. Essential mineral nutrients are also needed for the healthy growth of plant. In the absence or non-availability of the essential element the plant shows specific deficiency symptoms.

Learning Outcomes:

Children will be able to:

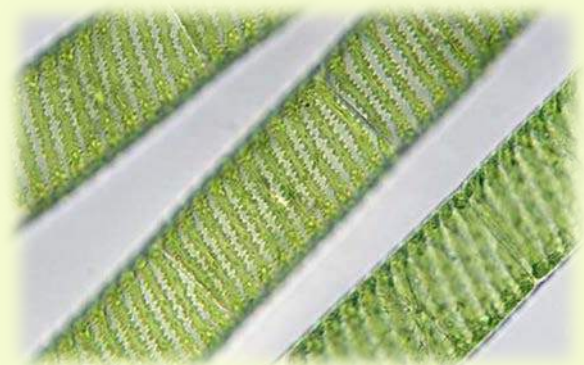
- ✓ learn about the existence of a transport system inside the plant body of complex multicellular higher plants;
- ✓ explain that transport in unicellular and simple multicellular plants takes place by diffusion;
- ✓ define and discuss diffusion, osmosis, transpiration, root pressure;
- ✓ perform experiments and demonstrate the process of osmosis;
- ✓ realize that the minerals required are either micronutrients or macronutrients depending upon the quantity required by the plants;
- ✓ relate that the deficiency or lack of essential nutrients leads to specific symptoms and diseases.
- ✓ define transpiration, interpret its role in xylem transport and know about the factors affecting rate of transpiration.
- ✓ demonstrate transpiration through simple experiments.

Transport of Food and Minerals in Plants

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<p>Transport in Plants</p> <ul style="list-style-type: none"> ▷ Diffusion – definition; ▷ Osmosis – definition, example, semipermeable membrane, root pressure; active transport. ▷ Transpiration - definition, importance and factors affecting transpiration. ▷ Structure and function of Xylem and Phloem in detail; ▷ Importance of minerals: macro and micro- 	<ul style="list-style-type: none"> ▷ Asking children to find out the presence/absence of conducting tissues in simple plants like <i>Chlamydomonas</i>, <i>Spirogyra</i> and higher plants like <i>Petunia</i>, <i>Vinca</i>, mustard, balsam, mango tree and neem tree; ▷ Experiments <ul style="list-style-type: none"> • Putting a twig of (with white flowers) of petunia, balsam or <i>Vinca</i> in coloured water and noting the flower and portion of stem that becomes coloured (in a 	<ul style="list-style-type: none"> ▷ Charts, models ▷ PPTs, Videos ▷ Laboratory experiments ▷ Discussion ▷ Drawings

Transport of Food and Minerals in Plants

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<p>nutrients; three deficiency diseases caused by lack of these essential nutrients.</p>	<p>transverse/ vertical section of the twig).</p> <ul style="list-style-type: none"> ☛ Demonstrating experiments on osmosis (potato osmoscope), diffusion, root pressure and transpiration (covering the aerial part with a bell jar/transparent colourless bag). ☛ Performing simple experiments to study the process of diffusion, osmosis, active transport and transpiration. ➤ Transverse section of wood of neem/mango or any other locally available specimen. ➤ Providing opportunities for observation of the conducting tissues through permanent/ freshly prepared slides, charts, models and PPTs; ➤ Asking children to draw the outline of transverse and vertical sections of stem of some of the above mentioned plants and locate the presence of xylem and phloem under the microscope; ➤ Drawing and labelling diagrams of experiments on osmosis, diffusion. 	



Theme 2: Reproduction in Plants and Animals

Reproduction is one of the most important functions of living organisms. It is essential for perpetuation of species. There are two ways by which living organisms give rise to new organisms - Asexual (vegetative propagation) and sexual reproduction. While asexual reproduction involves a single individual parent, sexual reproduction involves two different individuals of different sexes, one male and another female. In this theme children will learn more about various methods of vegetative/asexual reproduction in plants and animals, a brief account of fertilization and post fertilization changes in flower and main organs of reproductive system of human male and female.

Learning Outcomes:

Children will be able to:

- ☑ record during a visit to garden the common names of plants and how they are multiplied;
- ☑ observe and correlate butterflies and honeybees moving around flowers to the process of pollination;
- ☑ ask the gardener how he raises or multiplies plants like jasmine, rose, Bryophyllum, Chrysanthemum, Dahlia, potato and money plant;
- ☑ observe in a nursery how cuttings and budding methods of vegetative propagation are used for growing larger number of roses;
- ☑ observe how grass plants which are planted at some distance from each other cover the entire soil after some days due to vegetative propagation;
- ☑ recognize that sexual reproduction involves the fertilization of an egg cell by a sperm cell to produce offspring that may closely resemble the parents.

Reproduction in Plants and Animals

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<p>PLANTS</p> <p>▷ Types of Asexual reproduction: Binary fission, budding, fragmentation, spore formation, vegetative propagation, artificial propagation by tissue culture (basic process along with a suitable example of each)</p> <p>▷ Sexual reproduction in Plants:</p> <ul style="list-style-type: none"> ☛ Review of parts of a typical flower (4 whorls and their structure and function) ☛ Pollination: self and cross; ☛ Agents of pollination: three characteristics of plants pollinated by insects, water and wind (with examples). 	<p>▷ Asking children their experiences about multiplication and reproduction in plants and animals seen by them in their surroundings.</p> <p>▷ Analysing the advantages and disadvantages of vegetative propagation in group work.</p> <p>▷ Learning the economic importance of artificial propagation.</p> <p>▷ Providing opportunities for observations through various ways –</p> <ul style="list-style-type: none"> ☛ <i>Observations of actual specimens in the field, dissecting a bisexual flower (mustard, china rose, vinca) to study the</i> 	<p>▷ Actual specimens of flowers</p> <p>▷ Biology laboratory with a dissecting and a compound microscope.</p> <p>▷ Dissection of typical bisexual flower to study the different whorls.</p> <p>▷ PPTs and Videos.</p> <p>▷ Permanent/temporary slide preparations of budding in yeast and Hydra, dividing bacterium, fragmentation (fungal hypha/any filamentous algae, conidiophores or any other vegetative spores of any fungus.</p> <p>▷ Bagging technique (emasculation and artificial pollination)</p> <p>▷ Tissue culture photographs</p>

Reproduction in Plants and Animals

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<p>Characteristics of flowers of each kind.</p> <ul style="list-style-type: none"> ☛ Fertilization process in brief by flow chart. ☛ Mention of artificial pollination. 	<p><i>different whorls;</i></p> <ul style="list-style-type: none"> ☛ <i>Observing permanent slides in the laboratory;</i> ☛ <i>Observing the pollinators (butterflies/ bees) and their movement from one flower to another of same plant, or from a flower of one plant to flower of another plant, observing a flower changing into a fruit in a kitchen garden (tomato/chilli/lady's finger etc.) and discussing pollination process in them.</i> 	
<p style="text-align: center;">ANIMALS</p> <ul style="list-style-type: none"> ➤ Sexual reproduction in humans: ➤ Main organs of male and female reproductive system 	<ul style="list-style-type: none"> ➤ Observing the flower of wheat, rice and maize plants; ➤ Learning through charts, PPTs, videos, the process of fertilization and artificial pollination. ➤ Explaining the main organs of human reproductive system (male and female) through charts and models. 	<ul style="list-style-type: none"> ➤ Charts/models/PPTs/videos of human reproductive system (male and female)

Theme 3: Ecosystems

A community of organisms (plants and animals) in a given area, live in harmony with the environment. There is a close interaction between the living (called biotic) and non-living (called abiotic) components of the environment. The study of interaction between biotic and abiotic components is known as ecology and the ecosystem is the basic unit of study. There are many types of ecosystems, namely aquatic (fresh water/ marine), terrestrial (forest/ grassland/ desert), etc. The composition of biotic community and the abiotic components (environment) varies in different ecosystems. Organisms develop adaptations suited to live in a particular environment. Living organisms, which may be producers (plants), consumers (animals) or decomposers (micro-organisms), are linked to each other through food chains. Ecosystems exhibit two important functional attributes (a) A unidirectional flow of energy from sun to producers to consumers and finally to decomposers, and (b) Cyclic flow of nutrients.

Learning Outcomes:

Children will be able to:

- ✔ define the terms ecosystem, producer, consumer, decomposer, food chain, food web and pyramid of numbers, with examples (technical terms);
- ✔ explain and analyze the biotic and abiotic components of an ecosystem;
- ✔ interpret the relationship between different biotic components in terms of food chain, food web and pyramid of numbers;
- ✔ evaluate the abiotic factors and their influence on biotic factors;
- ✔ describe and provide examples for inter dependence relationships between organisms (symbiosis, parasitism and predation);
- ✔ draw relationship between the flora and fauna of a particular forest ecosystem;
- ✔ make a flow chart of a food chain and food web.

Ecosystems		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none"> ▷ Understanding ecosystems: definition, interaction between biotic and abiotic factors; ▷ Biotic components consisting of producers, consumers, decomposers. Meaning of food chain. Food web, and pyramid of numbers. ▷ Interdependence between organisms: symbiosis, parasitism and predation. ▷ Brief account of abiotic or non-living components such as air, soil, water and climatic factors such as sunlight, temperature, humidity and wind; ▷ Only, forest ecosystem with its flora and fauna to be taught. 	<ul style="list-style-type: none"> ▷ Asking children to observe plants and animals in their surroundings and noting down: <ul style="list-style-type: none"> ☛ <i>their names (help of the class teacher may be sought);</i> ☛ <i>names of animals which consume plants.</i> ☛ <i>names of larger animals which eat smaller ones.</i> ☛ <i>names of omnivores (if any)</i> Using the data collected to construct food chain, food web. ▷ Providing opportunities for observations on the flora and fauna of a forest ecosystem, and noting down: <ul style="list-style-type: none"> ☛ <i>The different producers and consumers;</i> ☛ <i>the decomposers acting on the leaves fallen on the forest floor, and</i> ☛ <i>the abiotic factors.</i> 	<ul style="list-style-type: none"> ▷ Visit to school/local garden, forest area ▷ Charts, photographs, PPTs. ▷ Specimens/pictures /charts of examples for predation, symbiosis, parasitism

Integration: Geography, Languages

Life Skill: Concern for environment

Theme 4: Human Body – Endocrine, Circulatory and Nervous Systems

This theme focuses on the nervous system. It aims at enabling children to know and understand that in human beings, there are two kinds of control and coordination (nervous and chemical). The nervous coordination is brought about by the nervous system, and the chemical coordination by the chemicals called hormones. Children will also learn about the hormonal system called endocrine system. In addition, this theme will build and expand on the respiratory, circulatory and systems, which were introduced in earlier classes.

Learning Outcomes:

Children will be able to:

- ☑ explain that in addition to nervous control, another control/coordination mechanism called hormonal control also exists in humans;
- ☑ define the terms – endocrine system, hormones, endocrine and exocrine glands;
- ☑ draw a diagram showing the location of endocrine glands in the body and describe the functions of hormonal glands namely the thyroid, adrenal, pituitary and pancreas;
- ☑ relate the knowledge gained and explain the changes in their own bodies;
- ☑ become aware about the changes that occur during adolescence and how to manage the emotional and physical changes;
- ☑ explain the techniques used in the management of stress;
- ☑ draw diagrams of the heart, circulatory system, neuron and reflex action;
- ☑ list out the functions of the heart, nervous system, lymph, RBC and WBC.

Human Body – Endocrine, Circulatory and Nervous Systems

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<p style="text-align: center;">Endocrine System</p> <ul style="list-style-type: none"> ➤ Two types of glands- exocrine, endocrine (basic concept and difference); ➤ Hormone (definition). ➤ Hormonal glands - (thyroid, adrenal, pancreas, pituitary); location and function of each. ➤ Following points to be studied in tabular form: name of gland, location in body, secretion, function. 	<ul style="list-style-type: none"> ➤ Discussing and explaining to children, the concept of hormones and endocrine glands. ➤ Describing the endocrine system in human beings through chart, models, PPTs and videos. ➤ Asking children to show the location of endocrine glands in the human body by means of a labelled diagram. ➤ Talk by the school physician emphasizing the role of endocrine glands in the life of the children; changes during adolescence and management of stress. 	<ul style="list-style-type: none"> ➤ Charts and models. ➤ PPTs and videos. ➤ School Physician/Doctor. ➤ Photographs of the structure of heart, neuron, circulatory system, nervous system. ➤ B.P measuring instrument, ECG; ➤ Charts and videos on reflex action.
<p style="text-align: center;">Adolescence and accompanying changes</p> <ul style="list-style-type: none"> ➤ Physical and emotional changes in the body during adolescence. ➤ Importance of personal hygiene. 	<ul style="list-style-type: none"> ➤ Discussing how hormones bring about changes in the body. ➤ Explaining the changes taking place (physical and emotional) in the body during adolescence; ➤ Discussing the importance of personal hygiene; 	

Human Body – Endocrine, Circulatory and Nervous Systems

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<p>➤ Stress management (meaning of stress; ways to tackle stress: yoga, meditation, time management, sports, hobbies, rational thinking etc.)</p> <p style="text-align: center;">Circulatory System</p> <p>Revisit learning of earlier class</p> <p>➤ Internal structure of heart in detail (including valves, septum; pace maker).</p> <p>➤ Schematic diagram of the heart;</p> <p>➤ Blood vessels - aorta, pulmonary trunk, coronary artery & vein, vena cava.</p> <p>➤ Circulation of blood as double circulation.</p> <p>➤ Blood Groups (A, B, AB and O): universal donor and universal acceptor.</p> <p>➤ Conditions related to the functioning of the heart: palpitations, cardiac arrest and hyper tension.</p> <p>➤ Introduction of lymphatic system as a parallel circulatory system.</p> <p style="text-align: center;">Nervous System</p> <p>Revisit learning of earlier class</p> <p>➤ Types of nerves: sensory, motor, mixed (function only). Cranial and spinal nerves (only definition and number).</p> <p>➤ Structure of a motor neuron</p> <p>➤ Central nervous system (CNS) in detail with its parts and their functions.</p> <p>➤ Reflex action: definition and basic terms used to describe reflex action stimulus, response, impulse, receptor, effector); common examples of reflex action.</p>	<p>➤ Discussing various ways to tackle stress.</p> <p>➤ Revisiting previous concepts learnt by children.</p> <p>➤ Revising what has been discussed in previous class.</p> <p>➤ Building on children's previous learning.</p> <p>➤ Explaining the internal structure of heart in detail including information on valves, septum and pace maker.</p> <p>➤ Encouraging children to draw a labelled diagram of the heart.</p> <p>➤ Discussing about the different types of blood vessels and double circulation.</p> <p>➤ Introducing the lymphatic system and its role.</p> <p>➤ Revising what has been discussed in previous class.</p> <p>➤ Learning about the structure of a neuron.</p> <p>➤ Explaining the central nervous system in detail through charts and diagrams.</p> <p>➤ Discussing with children about Reflex action and its impact in their daily lives. Citing the example of Pavlov's experiment on the dog, and its relation to our body.</p> <p>➤ Providing experiences to children by making them experience common reflex actions – when a hand is moved in front of the face – eyes close; when a knee is tapped while sitting, the foot moves forward etc.</p>	

Theme 5: Health and Hygiene

In the previous classes, children learnt about health, personal and public hygiene, balanced diet, deficiency diseases, life style associated health problems and diseases caused by infection. In this class this theme aims at enabling children to know more about communicable diseases and understand their mode of transmission and prevention. Further, they will also understand the role of the immune system of the body in resisting diseases and the concepts of vaccination and immunization. Children will also appreciate the importance of 'First Aid' and learn to undertake some simple common first aid measures to deal with emergency situations.

Learning Outcomes:

Children will be able to:

- ☑ identify some communicable diseases, their causative agents and symptoms;
- ☑ show concern towards maintaining personal hygiene and cleanliness of the surroundings;
- ☑ list some common vector borne diseases;
- ☑ differentiate between vaccination and immunization;
- ☑ list the harmful effects of consumption of tobacco, drinking alcohol and taking habit forming drugs;
- ☑ use some simple first aid methods in day to day emergency situations.

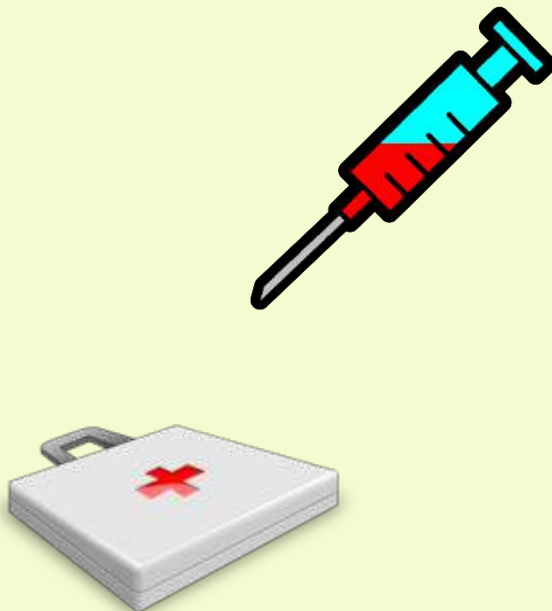
Health and Hygiene		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<div style="background-color: red; color: white; text-align: center; padding: 2px; margin-bottom: 5px;">Diseases</div> <ul style="list-style-type: none"> ➤ A brief idea of communicable diseases (influenza, measles, malaria, dengue, chikungunya, HIV) – causative agents, symptoms and prevention to be dealt with in a tabular form. ➤ The meaning of vector. ➤ Method of preventing diseases in general; use of vaccines to be mentioned. ➤ Vaccination and immunization: the concepts and difference between the two. ➤ Harmful effects of consuming tobacco, drinking alcohol, taking drugs. 	<ul style="list-style-type: none"> ➤ Revising the topic on diseases, done in class VI. ➤ Revisiting concepts learnt by children. ➤ Building on children's previous learning. ➤ Explaining briefly about communicable diseases, their causal organisms, symptoms produced and methods of prevention and control. ➤ Discussing the general methods of preventing diseases. ➤ Explaining the concept of vaccination and immunization, giving examples. ➤ Discussing the harmful effects of consuming tobacco, drinking alcohol and taking drugs. 	<ul style="list-style-type: none"> ➤ PPTs, videos, documentaries on communicable diseases, first aid, harmful effects of liquor, drugs and tobacco. ➤ First aid Box. ➤ Visit to a hospital/ consulting the school physician. ➤ Hospital. ➤ School Physician/Doctor. ➤ Specimens/pictures of tobacco products showing warning messages. ➤ Charts/ PPTs/ of diseases such as malaria, chikungunya, measles, etc. ➤ Medicine shop, school dispensary.
<div style="background-color: red; color: white; text-align: center; padding: 2px; margin-bottom: 5px;">First Aid</div> <ul style="list-style-type: none"> ➤ First aid- meaning. ➤ First aid given in the following cases: (burns, bleeding, fracture, 	<ul style="list-style-type: none"> ➤ Requesting the school physician to demonstrate the methods of giving first aid. 	

Health and Hygiene

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
object in the eye, unconsciousness, swallowing poison, snake bite, stings).	<ul style="list-style-type: none">➤ Organising a visit to the nearby hospital asking children to observe and then conduct a discussion with them.➤ Asking children to prepare a first aid box which they can use at home.	

Integration: Health and Physical Education, Languages

Life Skills: Health Awareness, taking care of oneself and others



Theme 6: Food Production

Plants and animals provide a number of useful products to mankind. Plants are useful to us in many ways - as sources of food, fibre, timber, medicines, oils, dyes, resins and as ornamentals. Likewise, animals provide us milk, flesh, eggs, fibre, honey, silk, lac, and many more items. Micro-organisms like bacteria are also useful to us - in the production of cheese, bread, alcohol, vinegar and vaccines. There has been a great improvement in the techniques of food production and their scientific management over the years. This theme introduces children to the various methods of food production.

Learning Outcomes:

Children will be able to:

- ☑ discuss uses of bacteria in the food industry;
- ☑ list importance of mushroom and yeast in the food industry;
- ☑ explain the meaning of agriculture, horticulture, pisciculture (fish farming), apiculture, sericulture, green revolution, white revolution and animal husbandry;
- ☑ identify and provide examples for various food crops and cash crops cultivated in India and make a list of useful cereal, fruit and vegetable plants;
- ☑ list common names of (i) useful plants and animals, (ii) ornamental plants/decorative flowers;
- ☑ list the milk-yielding (milch) animals, meat and egg-laying animals, draught animals and poultry.

Food Production		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none"> ➤ Bacteria: uses of bacteria in food industry. ➤ Fungi - Importance of mushrooms and yeast in food industry. ➤ Agriculture: cultivated crops (food-crops and cash crops), crops grown in India. ➤ Horticulture- vegetables, fruits, decorative plants and flowers. ➤ Organic farming and green revolution in brief (awareness level). ➤ Animal husbandry: milk yielding (milch) animals; white revolution; meat providing livestock; draught animals (heavy work); poultry; fish farming (pisciculture); sericulture and apiculture (awareness level). 	<ul style="list-style-type: none"> ➤ Giving opportunities to children to: <ul style="list-style-type: none"> ☛ <i>observe the use of bacteria in making curd and cheese</i> ☛ <i>observe specimens of mushroom, and note down the useful parts;</i> ☛ <i>draw pictures of the plants along with the useful parts;</i> ➤ <i>Organizing visits to:</i> <ul style="list-style-type: none"> ☛ <i>a garden to observe the decorative plants and listing the plants observed;</i> ☛ <i>farms for studying the milk- yielding, meat-yielding and poultry animals;</i> ☛ food industries ☛ sericulture and a pisciculture centre ☛ Collecting photographs of above listed categories of animals. ➤ Growing plants organically within the school premises and comparing these plants with plants grown otherwise. ➤ Showing a film on the green and white revolution in India followed by a discussion/class debate about the about the same. 	<ul style="list-style-type: none"> ➤ Field Visits ➤ PPTs and videos. ➤ Visit to food industries ➤ Visit to sericulture and a pisciculture centre ➤ Pictures of ornamental plants. ➤ Decorative flowers. ➤ Film on Green revolution/ white revolution.

Integration: Geography