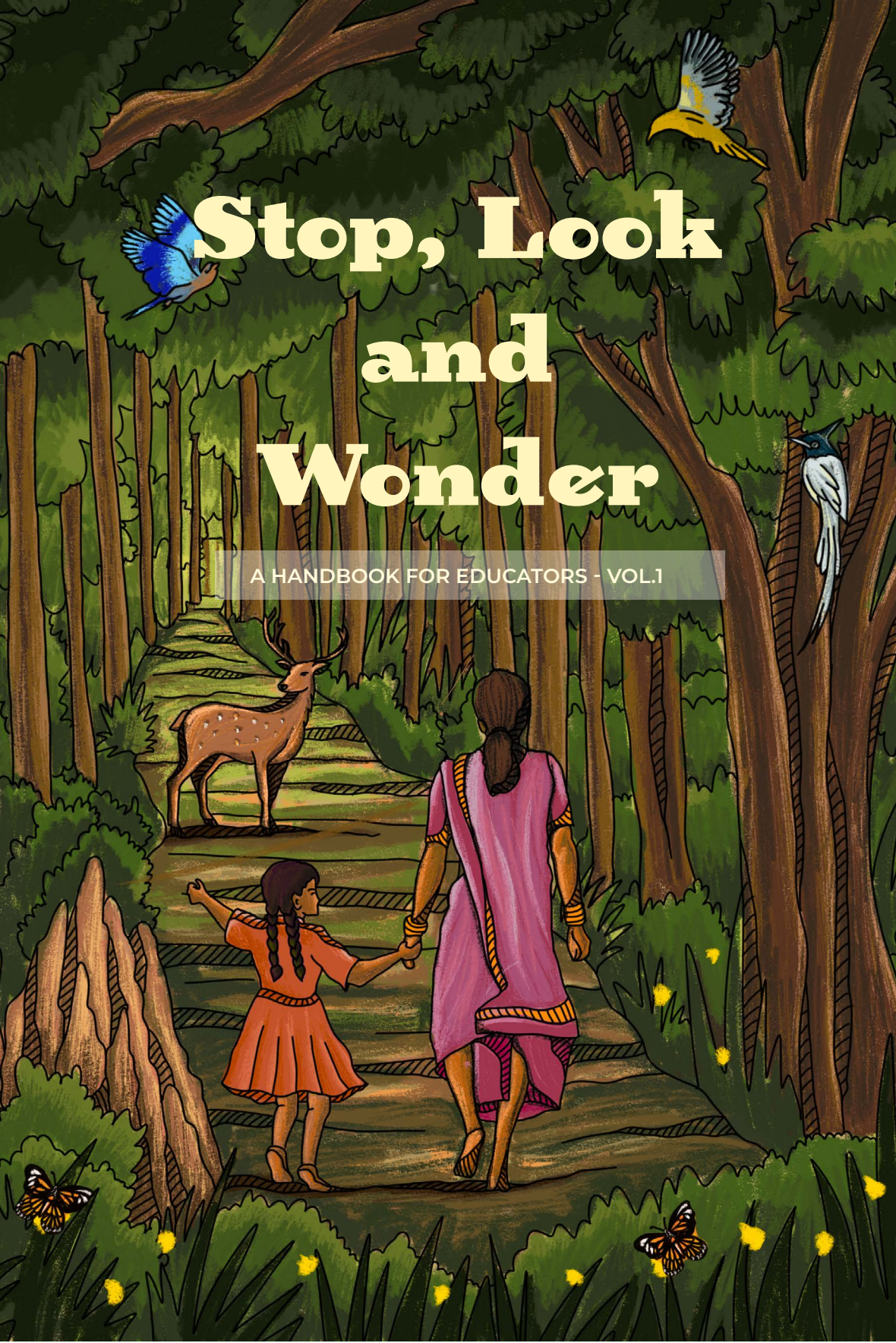
Stop, Look and Wonder
A HANDBOOK FOR EDUCATORS - VOL.1

‘A classroom full of ideas, a world full of possibilities’

Imprint

'Stop, Look & Wonder' - A Handbook for Educators
A Curriculum for Context-Based Learning (Vol. 1)

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Prashant Parsai

Welcome Note

We never think in our life that even an ant contributes to the environment, it also plays a very important role in the food chain and is beneficial to human life. The food that falls on the ground by us or our children becomes the food for the ant and by eating it, the ant cleans our surroundings. The beauty and cleanliness of the environment depends on all living beings due to the coordination of organic and inorganic components and all contribute to maintain the environmental balance. The question is why don't we pay attention to these small things? Perhaps it is because we have not been taught to pay attention since childhood, or because we have been scared since childhood that a small creature will harm us, as it was said for us - 'Baau...hai! It will bite' (baau is a local slang to refer to anything, insect or animal, that might bite). Perhaps since then we have started considering every creature as a threat to us and even today, on seeing any creature, we either look for food in it or try to kill it considering it a threat to us.

This book will be for you, a guide, who will play an important role in helping children understand nature. It will help us in developing the ability in children to know about biotic and abiotic components present in the environment, understand their contribution to the environment and also use these components but be careful that it is in a limited quantity and should not get exhausted. It is very important to realise how much imbalance will occur in nature if any living organism or substance present in any one ecosystem gets completely exhausted.

When children are taught to understand and know the environment closely, it is necessary that the children are freely able to see the things present in nature, feel them and if possible, touch them. Children should explore on their own and there should be adequate discussion on the things or curiosities discovered by them. For all this, a base of global knowledge should be made starting from the child's context- her environment, home, village etc. and this book hopes that with its use this curiosity and connection will be nurtured in children and the children will incorporate global knowledge starting from understanding their environment.
We hope this book will be useful for you.

Prashant Parsai
Education Program Coordinator, Earth Focus Foundation
September 2024


Aaran Patel


Vipul Gupta

Foreword

Earth Focus Foundation was born five years ago with the dream of forest-dwelling youth becoming stewards of their wild and wondrous landscape. Their forebears treaded lightly and lived through regenerative social and agro-ecological cycles. Today, after decades of marginalisation and with accelerating climate impacts, tribal youth are precariously placed. They often must choose between on the one hand continuing a traditional way of life with accompanying economic challenges and on the other hand integrating into the development mainstream and diluting their dignity and cultural richness.

We believe that a contextual education program can expand those choices so that forest-dwelling youth can thrive in their own context, for example through becoming entrepreneurs in a nature-based economy. **Our biodiversity curriculum has been designed to reflect the richness of Kanha and the Central Indian Highlands' ecology and communities.** Our hope is that the learning journeys inspired by this curriculum empower young minds from this landscape to be self-aware and proud of their context, and also navigate a rapidly changing world.

The first few modules of this biodiversity curriculum traverse the building blocks of shelter and soil to the Mahua tree that is sacred to the **Baiga, Gond and other tribal communities**. Each module has content and activities drawn from different disciplines and encourages learning in different ways, especially through stepping out of the four walls of a classroom and activating more of our senses. **The curriculum also pushes us to step back from our usual human assumptions so we can empathise with other living beings with whom we have co-evolved.**

We are deeply grateful to our wonderful colleagues who have helped us bring this work to life – **Ankita Rajasekharan** and **Shikha Nain**, both deeply imaginative and sensitive educators, **Prashant Parsai** and the **Earth Focus Foundation education team** for whom this has been a true labour of love, **Roopali Sood** whose vision has shaped the design and illustrations, **our community partners** whose tales and traditions have inspired this work,

and our students whose feedback and suggestions have helped us craft and shape this curriculum.

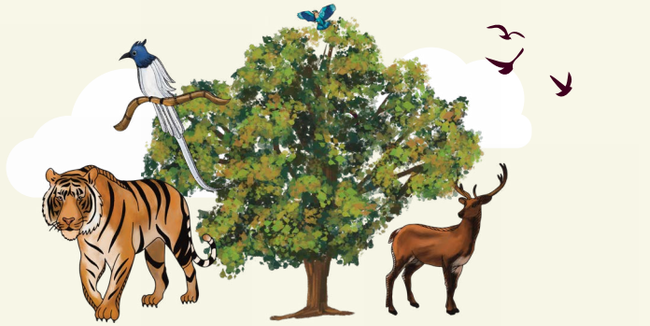
We invite you as fellow learners on this journey and look forward to seeing this work becoming a spark for curiosity and inquiry in varied settings across this special landscape.

We also hope that this work which lends itself to customisation, and is available as a open resource will find acceptance and provide learning to communities living around forests all across India.

Aaran Patel and Vipul Gupta
Co-Founders, Earth Focus Foundation
September 2024

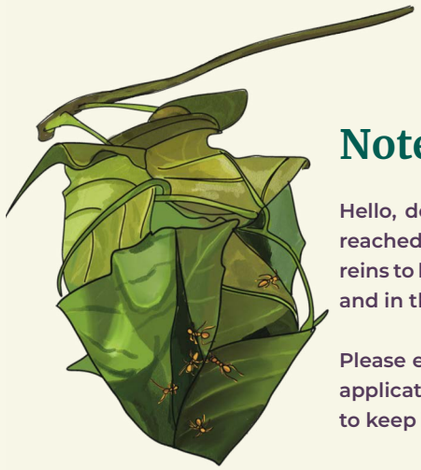
Introduction

No matter where we are, be it a forest, a water-body, a mountain top, a city, we are always in the company of a multitude of species. Some of these are magnificent and easy to behold- a giant tree, a wild mammal, a domesticated cat, a chirping bird. Several others, not so- a buzzing bee, a spider in the corner, a velvet mite in the soil, wild weeds in a garden, a plethora of microorganisms! What might we stand to gain, in paying attention and observing who we share our landscapes with? What might we stand to gain in stepping into the conversation amidst the human and more-than-human world that we find ourselves in?



It was with these questions and curiosities of learning about our immediate environment that we began the journey of developing a context and landscape based curriculum for the educators and children in the Kanha landscape. We wanted to be able to pause, observe and reflect so we may find ways to connect with the natural world we are part of, so we may nurture wonder for it and so we may want to preserve it. This first edition of this curriculum is only a beginning point and engages on themes including habitats of different species, how creatures build their homes, life in soil and could soil be living, the cultural and ecological role of the mahua tree, the myriad ways that different beings experience and sense the world, what creatures talk about and how do they do so, are there ways animals around us communicate with us?

With each theme, we have ensured that the content is rooted in the landscape of Kanha, be it in the activity design, the examples used to elaborate on a concept, and more. However, we have not limited the understanding of concepts to the same- where relevant and possible, we have also offered examples and questions that move beyond the local context to the national and global. We hope that the activities and teaching-learning materials in the handbook will make for deeply engaging and chatter-filled classrooms!



Note to the Educators

Hello, dear educators! We are so thrilled that this book has reached you. The journey begins now, with you holding the reins to how this curriculum may come alive in your classroom and in the children's experience.

Please exercise complete autonomy in how best you see the application of this curriculum in your context. A few pointers to keep in mind:

- This volume of the curriculum is designed keeping in mind children in the age-group of 7 to 10 years. Each activity may be controlled to address the needs, skills and age of your participants. For e.g., some worksheets may have pictorial and written versions, videos could be optional, discussion prompts may be chosen based on the group, etc.

- Each module begins with notes on various concepts that you'd benefit from reading and learning about before taking the activities to the class-room. There are also links to videos and articles for additional research, specially curated for educators. We have tried to use Hindi-narrated videos as far as possible.

- The modules are not designed in a linear fashion. This means, you may choose to start anywhere in the book, with whichever module peaks the interest of your group of children. The activities within each module are best experienced in order, as one may build on the other in most cases.

- We haven't put a time stamp on the activities. A single activity may be completed over a couple of different sessions, depending on the main activity, depth of discussion, group size, session duration of your class etc. Each session could be a minimum of 40 minutes.

- Each activity comes with a set of discussion prompts. You may choose to sprinkle the discussion throughout the activity, at the end of the activity or over a few different sessions.

- Exercise caution and safety protocols unique to your specific contexts while facilitating any outdoor activity such as nature-walks, nature-bingo, etc. For e.g., watch out for common allergens (itchy leaves, pesticide sprayed fields, etc.) in your area, be sensitive to not cause any harm or disturbance to the creatures or surroundings.

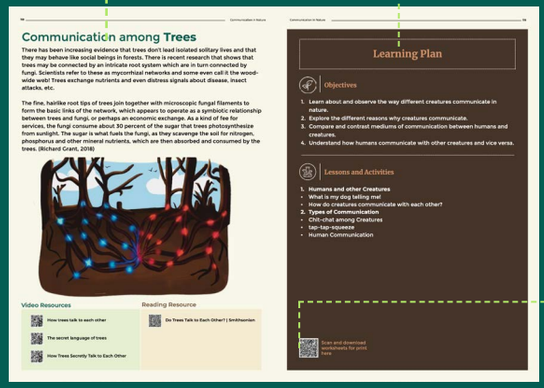
The curriculum is now yours, to make it your own. Have a great session!

How to Use

Chapter number and **main theme** for the lessons in the chapter

The **QR code** links to **video or reading resources** to further your understanding of a concept. This may be **scanned using a mobile or clicked** (in the digital copy)

Title of a **sub-theme or concept** within a chapter



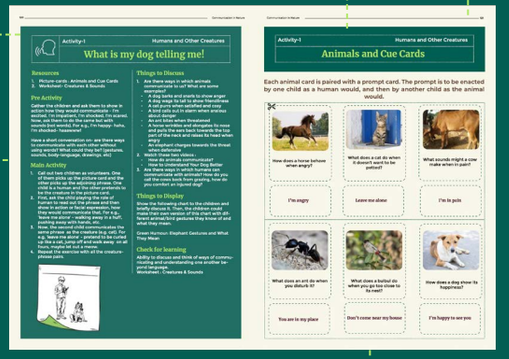
Each chapter has a corresponding **Learning Plan**. This is an overview of the **objectives and activities** to take to the class-room

The QR code at the **end of each Learning Plan** may be scanned or clicked on to **access lesson-wise worksheets**

Name of the **Lesson**

Name of the **Activity**

Activity Sheet



Lesson-plan including **resource list, pre-activity, main activity, discussion prompts**

Printable worksheet, accessible on the QR code in the Learning Plan

Nature is home.

CHAPTER-1

Our Home

All living things have some basic needs for survival. Shelter is one of the basic needs. Many living creatures build their own shelters, some live in ready shelters available in nature. For example, humans build houses, birds build nests, mice make burrows, lions and hyenas may take shelter in rocky dens sometimes, some birds live in hollows of tree-trunks, etc.

Why do **Humans and other living creatures** seek shelter?

Some of the reasons are:
(not applicable to all)

- To protect themselves from extreme weather conditions- cold, rain, heat.
- To stay safe from predators, natural ohuman-driven calamities and other dangers.
- To be comfortable and secure.
- To have a place to rest.
- To have privacy.
- Human beings have lived in shelters or centuries.

Human Made Shelters

Even before modern human beings came into existence, there is evidence of our ancestors using natural caves and dens as a place of shelter. Many of our ancestors were nomads. This means that they did not settle in one place for very long and were always on the move. This meant that they did not make permanent structures. They may have lived in make-shift shelters in the natural environment.

Slowly, human beings began to grow their own food and domesticate animals. When farming and dairy began, humans came to settle down in a place for longer durations. With this, they began to make more sturdy and permanent structures to live in. Human beings were very creative and skilled. They used whatever material they could source from their surroundings to build the earliest homes. Some examples of such material include- soil, wood, grass, moss, leaves, stones, etc.

Even today, many houses in villages are built from natural material. If we look around in our own villages in Kanha, we will find homes made of mud, wood and stone. Most homes in cities and urban areas are built using concrete, cement, iron and other material. These kinds of houses are being built even in villages today. These two types are named kutcha and pucca houses.

Kutcha (meaning raw or temporary) houses are built with mud as the primary material.

- Depending on the nature of terrain and climate, only locally grown/available materials were used to build these houses like sun burnt bricks, mud, bamboo, cowdung, straw, water, clay.
- Mud houses are cheaper in terms of the resources as most material is locally sourced.
- These houses are able to regulate temperature i.e. they are cool in the summer and warm in the winter.
- If the house is broken down, almost all the materials can be reused to make another house. They cause minimum damage to the environment and are very sustainable.
- The traditional designs ensured that in case of natural calamities like floods or earthquakes, kutcha houses caused lesser damage to life and rebuilding was easier.
- Overuse or over-exploitation of these resources to build houses will lead to a shortage of resources for the generations to come.

Pucca houses are made with cement as the primary material.

- It is more expensive to build, as the materials used include cement, iron, limestone, bricks, stones etc. Most of these materials are sourced from factories, however they indirectly come to us from nature.
- If a pucca house is broken down, reusing the cement, bricks etc. is quite difficult.
- These houses do not regulate in response to the external environment. We usually have to use fans and coolers during the summer and heaters during the winters.
- Pucca houses are sturdier and may have better resistance to some natural extremities such as hurricanes.

People choose the type of house they want to build or live in based on many things. Some of these include:

- Budget, how much money are they willing to spend on it.
- Awareness, how aware are they of the environmental impact of their home designs and construction.
- Convenience, how easy is it to get their house ready.
- Time, how much time are they willing to put in, to build their home.
- Personal preference.
- And many more!

Video Resource

Types of Houses

Animals, birds and insects create different types of shelters. Some creatures live in shelters only during breeding season, some only during hibernation, some only during the sleeping hours, some only have shelters in certain stages of their life (e.g. larvae of potter wasp, pupae in cocoons of butterflies) etc. Even though creatures build their homes for different reasons, they too are known to take great efforts to ensure safe home constructions, they too decorate their homes sometimes and they too use material available in their surroundings and in nature.

There are several structures built by animals for shelter which can be seen around us. Some examples include wasp and bee hives, ant hills, termite mounds, birds' nests and spider webs. Let us look at some of these in detail:

Bee Hives: Honeybees live in colonies in a hive. Each hive contains one queen and thousands of worker bees. The hive is like a busy city. The hives contain hexagonal cells made by the bees from wax, and these are used to lay eggs by the queen, and to store honey. It usually has a single entrance. Bees naturally create these hives in caves, rock cavities or in trees.

Wasp Nests: Wasps make nests to lay eggs. Different wasps make different types of nests. The potter wasp makes a nest with mud and saliva. The paper wasp makes its nest from saliva and wood paste.

Video Resources

Bee Hives

Inside the BeeHive what honey bees do

Leaf Cutter bees

Wasp Nests

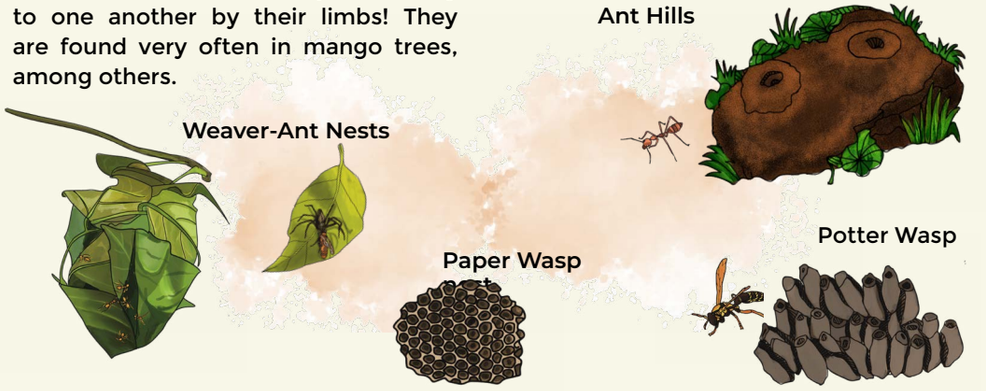
Wasp Builds Unique Nest for Her Young | Trials Of Life | BBC Earth

Fascinating: Hornets Build An Elaborate Nest Inside a Tree

Butterfly Cocoons: Butterflies and moths build cocoons for themselves at the final stage of their metamorphosis. First there are eggs that hatch into caterpillars. These caterpillars feed on leaves and other things based on the species. The caterpillars grow in size and change frequently in size and colours. At the final stage, each caterpillar makes itself a cocoon to stay in while it transforms into a butterfly or moth.

Weaver-Ant Nests: The weaver-ants are a particular species of ants that build nests high up in the trees. They weave together multiple leaves using the silk produced by the larvae to create an enclosure. To connect two leaves together, these ants are sometimes seen creating a long inter-connected chain by attaching to one another by their limbs! They are found very often in mango trees, among others.

Ant Hills: Ants hills are of various shapes and sizes. Some look like small mounds of soil, others spread over a large area, and contain elaborate underground tunnel systems. The ant hills of some species contain many chambers inside them.



Video Resources

Butterfly Cocoons

- Caterpillar Cocoon Timelapse | BBC Earth
- Tiger-moth
- How Do Weaver Ants Build Their Nests?
- What's Inside An Anthill?

Termite mounds

- Fascinating Termite Architecture | Trials Of Life | BBC Earth

Termite Mounds: Termite mounds come in a large variety of shapes and sizes. They are structures made of soil, water and termite saliva and contain extensive systems of tunnels. They can be up to 6 feet in height and are very strong and long-lasting. They are designed to allow ventilation without disturbing the temperature and humidity of the nest. The termite saliva helps make the mound waterproof.

Bird Nests: Birds build nests for themselves using twigs, leaves, mud, sticks etc. in order to lay their eggs and raise their young ones. Different species of birds build their nests differently based on their habits and requirements. E.g: Eagles build their nests on tall trees, peacocks build their nests in bushes near rivers, ponds or springs, and the female lays 3-5 eggs.

The cuckoo bird does not make its own nest, instead it lays its eggs in the nests of other birds like the crow, and the mother crow takes care of the cuckoo chicks too. The Myna bird makes its nest in the trunks of trees and in holes of houses etc. The Baya weaver birds build their nests near water, usually in thorny or palm trees to ensure that their eggs are safe and that their young ones will be protected from other birds. The blue jay (Neelkanth) builds a tunnel nest by digging the soft ground near rivers, and lays 5-7 eggs at a time.

Spider Webs: Webs are structures created by spiders from the silk that they produce. The webs are usually built to catch insects and trap them so the spider can feed. Some spiders actively design their webs, and it has been found that insects are attracted to the webs, they don't just get caught because they're unlucky. Many spiders spin new webs for themselves every day.

Others: Mongooses, rabbits and mice etc. build underground burrows to protect themselves from unfavourable weather conditions and predatory animals. Wild animals make their home in the caves of the mountains to shelter themselves and their young ones from harsh weather conditions. These are necessary to their survival and we must do our best to preserve these structures.

Video Resources

Bird Nests

Weaver Bird building Nest

Tailorbird building nest

How Swallows Adapted to Build Mud Nests

Spider Webs

How Spiders Make Webs

Indian Funnel Web Spider

Blog Resources

Spider Webs

Wild Wanderer - spiders

Learning Plan

Objectives

1. Understand the need and uses of homes for humans and other creatures.
2. Observing different types of homes constructed by humans and other creatures.
3. Learning about types of homes in different climatic conditions.

Lessons and Activities

1. **Homes around Us**
   - Homes around Us
   - Find your Home!

2. **Types of Houses made by Humans**
   - Kutcha and Pucca Houses
   - Types of Houses
   - Making a house with Nature

Scan and download work-sheets for print here

Activity-1 Homes around Us

Homes Around Us !

Resources

1. Homes around Us - Bingo card
2. Homes and Creatures - Matching worksheet
3. Note-books and pencils

Pre Activity

1. Gather the children and begin a conversation with questions like - where do they sleep at night, where do they go when it is raining heavily, where do their grandparents live, etc. Now, where do birds go when it is raining heavily, do cows and goats have somewhere they sleep at night, do butterflies have a home?
2. Have they seen any animal, insect or bird build a home? For e.g., a bird building a nest, a spider making a web.
3. Do all creatures build their own homes? Have they seen a goat building a shed or a jackal building a den?

Main Activity

1. Divide the children into small groups of 5-6 individuals. Each group is given a copy of the 'Homes around Us - Bingo' sheet.
2. Instruct the children that they are to take a walk around their school premises and find as many homes as possible from the Bingo card.
3. When they find a home from the Bingo card, they circle it on the card. Encourage the children to observe the home and make note of them. For e.g., how big is the home, are there any creatures living in it, what is the home made of, etc.
4. Gather back for a discussion.

Things to Discuss

1. Is a spider's web actually its home? Is there a difference in what homes are for humans and other animals?
2. What are the different materials they saw being used in constructing homes- both human and other creatures?
3. Were the creatures decorating their homes, the way we do sometimes?
4. Are all homes in nature permanent?
5. Do creatures live in their home all the time or seasonally? Did they see any abandoned homes?
6. Are there creatures that don't live in any kind of home?
7. Are there creatures that live in ready-made homes? For e.g., birds in hollows of trees.
8. Do creatures who don't build a shelter have no home? What would you say is the home of a tiger or a crocodile? Discuss how the habitat can be home. For e.g.,the river is the crocodile's home, the forest is the tiger's home.

Things to Display

Get each group to pick any one home from their observations that they found very interesting and draw it on a chart paper. Encourage them to label it and add a few points of information about the home - who lives in it, what is it made of, why they find it interesting, etc.

Check for learning

Homes and Creatures - Matching

Activity-1 Homes around Us

Homes around Us - Bingo

Find as many homes of different creatures as possible!












Activity-1 Homes around Us

Homes and Creatures

Match the living thing to their home

Living Thing	Home of the Living Thing
	
	
	
	
	

Activity-1 Homes around Us

Homes and Creatures

Match the living thing to their home

Name of the Living Thing	Home of the Living Thing
Spider	
Potter Wasp	
Termite	
Mouse	
Human Being	

Activity-1 Homes around Us

Homes and Creatures

Match the living thing to their home

Name of the Living Thing	Name of home
Spider	Hut
Mouse	Termite hill
Human Being	Stable
Termite	Cow-shed
Bird	Honeycomb
Cow	Web
Horse	Burrow
Honeybee	Nest

Make a drawing of any one living thing and it's home from the list above :

Activity-2 Homes around Us

Find your Home!

Resources

Picture cards of homes and creatures, attached to a string that can go around the neck.

Pre Activity

Gather the children and recall the different homes they observed in the previous session. Recount names of creatures and their homes, orally. Discuss the features of the different homes from your set of picture cards- what are they made of, where are they found, who lives in them, etc.

Main Activity

1. Divide the children into two groups. Take one group out of the classroom and hand-over the creature cards to each one, and help them put it around their neck.
2. In the classroom, distribute the home cards to each child. Each child picks one spot in the classroom to set up their home. Since they are homes, they have to be stationary in their chosen spot. Their cards are hung around the neck facing them, so no one else can see what type of home they are.
3. The first group now enters the classroom. The children make sounds like their assigned creatures and go from home to home, to identify their correct match. They have to go to each home and ask a few questions to identify if that is their right match. For e.g., a buzzing bee goes to a home and asks - What are you made of? Are you found on trees or on the ground? After about 5 questions, they have to guess the type of home. If they get the right match, they become a pair. If not, they go to the next home and repeat.
4. The game is over once all creatures have found their homes.
5. Note: to make the game challenging, you may add a rule that the creatures can only ask yes/no questions to the homes. For e.g., a buzzing bee asks a home- Are you made of wax? Do you have a repeated pattern of hexagons? Do you hang on trees?

Things to Discuss

1. Each pair may come up and introduce themselves - name of the creature and name of the home, with one interesting fact about the home. E.g.,I am a honeybee and this is my home- a honeycomb. A honeycomb is made of hexagonal patterns.

2. Encourage children to ask each other questions to know more about the creature or the type of home.

Activity-2 Homes around Us

Find your Home

Cut-out the picture cards and attach to a string

Spider

Potter Wasp

Cup moth

Bird

Termite

Human

Squirrel

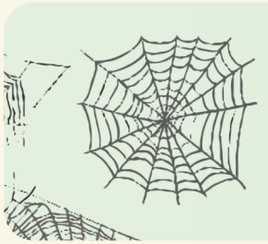
Honeybee

Jackal

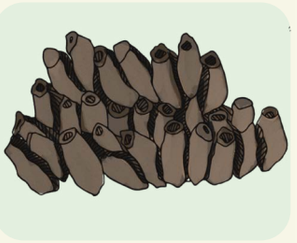
Cow

Cut-out the picture cards and attach to a string

Spider Web



Potter Wasp Nest

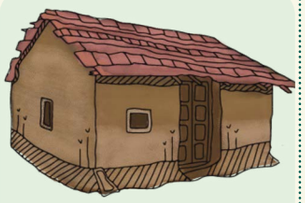


Cup moth Shell

Nest

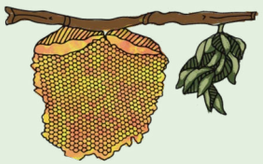
Termite Mound

Kutcha House

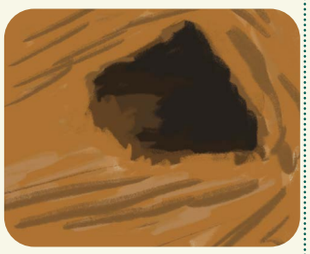


Burrow

Honeybee Comb



Den



Cow Shed

Activity-3 Types of Houses made by Humans

Kutcha and Pucca Houses

Resources

1. Find a kutcha and a pucca house to visit and observe beforehand.
2. Kutcha and Pucca House - Worksheet

Pre Activity

Gather the children and hold a conversation on the types of homes they live in. What is it like living in a kutcha house during the summer, what is it like in a pucca house, how many kutcha houses have they seen in the village, do they know when pucca houses became more popular. Encourage children to go back and find out more from their parents and grandparents.

Main Activity

1. As a group, visit a kutcha and pucca house in the village. Observe and talk about some key elements while on the visit- what are the materials used in construction, what is the design of the house like- are there large windows, is the roof high or low, what is the ventilation system, how old is the house, are there any repairs that need to be done, how is the house maintained, etc.
2. Come back and recall the observations made on the visit and note them down on the blackboard as the children call them out.

Things to Discuss

1. What are the benefits of a kutcha house, a pucca house?
2. Which of the houses is more sustainable from an environmental perspective, an economical perspective and an aesthetic perspective. Allow for both facts and opinions to come into the conversation.
3. Why have pucca houses become popular?
4. If we had to build a house only with material from our surroundings, what all can we use?

Things to Display

Drawings of Kutcha and Pucca houses with information points.

Check for learning

Kutcha and Pucca Houses - worksheet

Activity-3 Types of Houses made by Humans

Kutcha and Pucca Houses

Place the raw materials in the correct column.

brick, wood, sand, cement, iron, soil, water, cable, rope, bamboo, cow dung, limestone, steel, straw, clay tiles, asbestos sheet

Kutcha House	Pucca House

Make a drawing from memory or imagination

Kutcha House

Pucca House

Activity-4 Types of Houses made by Humans

Types of Houses

Resources

Homes in differents Climates - Picture cards

Pre Activity

Have a conversation with the children on different landscapes and houses built there. How is a house built in a place that is surrounded by water or in water, why do places prone to snow have sloping roofs, why are houses in hot places made of mud, etc.

Main Activity

Bring out the picture cards and lay them out. Ask the children to guess what climatic condition a specific house is designed for. How do they know, what are the indicators? E.g., a house on stilts is to keep above water, mud houses to keep cool, etc.

Things to Discuss

1. How does the material used have an impact on the house and climate?
2. In what ways does the design of the house depend on climatic conditions?
3. Are the houses we live in designed for our climate? Is there a difference between the older homes and the more recent homes being constructed?

Activity-4 Types of Houses made by Humans

Types of Houses

Houses on water-bodies

Thatched roof and mud-houses in hot places

Sloping roof and stone homes in cold places

Activity-5 Types of Houses made by Humans

Making a house with Nature

Resources

An outdoor space with a variety of natural material to build with- soil, water, stones, twigs, grass etc.

Pre Activity

Gather the children together in a circle outside. Take a moment to look around and then ask the children what all raw material they see around them with which they could build something. For e.g, mud, stones, leaves, creepers, wood, etc. Is it possible to build a miniature house using only what is available in nature? Let's find out!

Main Activity

1. Divide the children into small groups of 5 each. Each group is given a specific setting - windy, snowy, rainy, extreme heat. Now, each team works on building a miniature house using the materials available keeping in mind their setting. What kind of house will you build in a very hot place? Will you use stones or mud? What kind of roof will you make if it is a place with heavy rain or snow?
2. Encourage children to use their creativity to come up with a house design that is suited to their setting. When complete, each team presents their house sculpture and explains the idea behind their design. Other children may ask questions and offer feedback/comments.

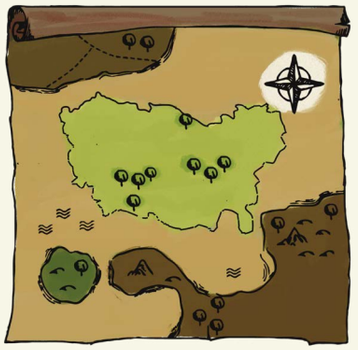
Things to Discuss

1. Was there any material missing that would have helped with their design better?
2. What was the easiest material to work with? E.g., soil or wood, stone or soil, etc.

Things to Display

Pictures of the house sculptures or the sculptures themselves

‘Stewards of the future’



CHAPTER-2

Exploring Mapping

A map is a diagrammatic representation of an area of land or sea. It includes the physical features of the area, boundaries of cities, states and countries, major roadways and railways, capitals of states, etc. Maps are 2-dimensional representations made on a flat surface and are drawn to scale. Globes on the other hand are maps represented on the surface of a sphere. The art and science of making maps is cartography and one who does this work is called a cartographer.

Types of Maps

1. Depending on the use of a map and what is being depicted, they may be categorised into several types of maps. These include-
2. Physical maps showing the landforms (plains, plateaus, mountains) that are present in the region or area represented in the map.
3. Political maps showing the national and state boundaries, including national and state capitals.
4. Topographic maps showing details of the landform and terrain, lakes and rivers, forest cover, populated areas, etc.
5. Weather maps showing the weather/meteorological features in a selected area at a given time by indicating barometric pressures, temperature, wind direction, etc.
6. Population mapzs showing the number of people and their density in a given area.
7. Nautical charts are maps depicting coastal and marine areas. These are used for navigation.

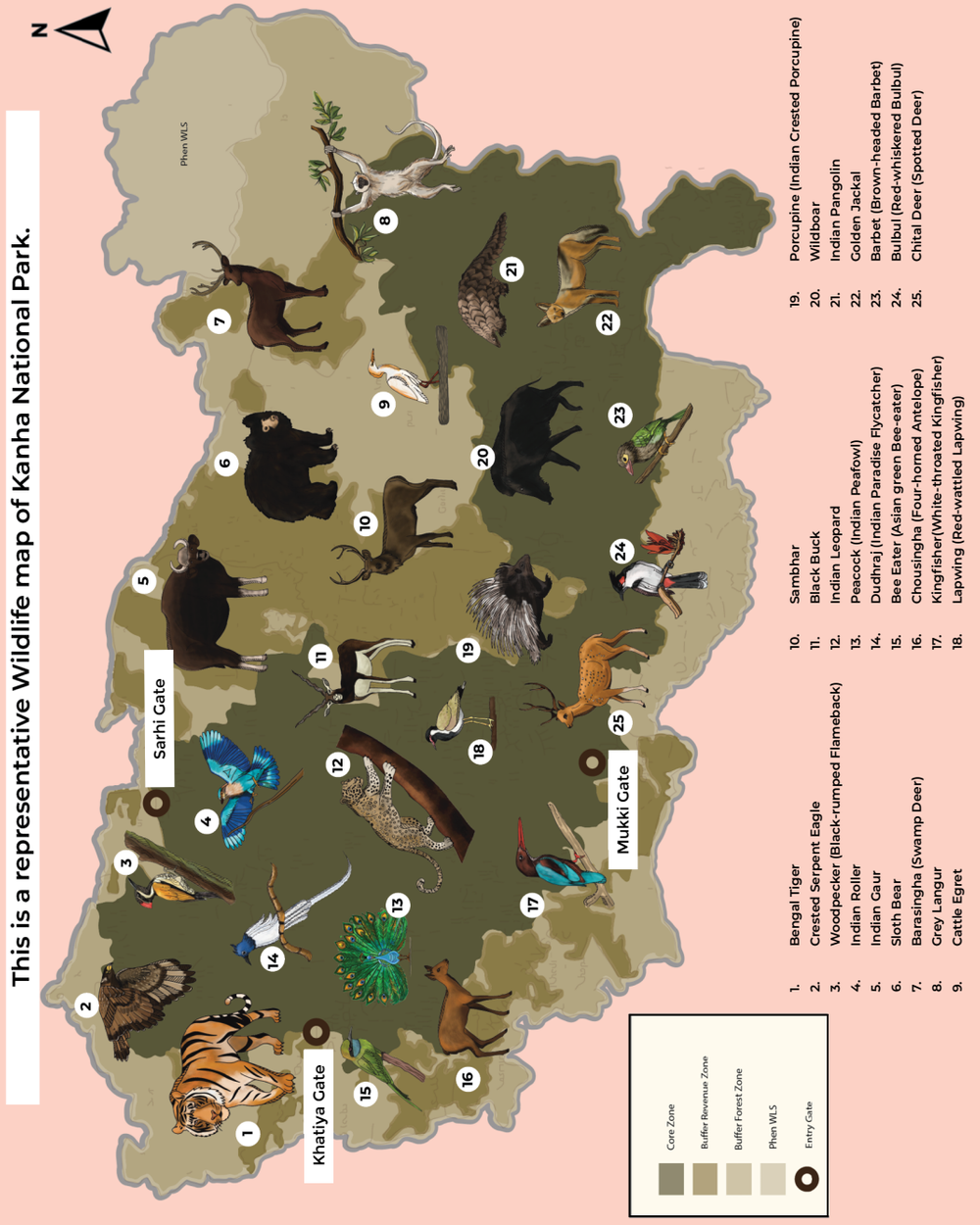
One could use a map to represent a variety of data about a selected area of landform. For example, wildlife maps show the spread of different species across an area, maps could be used to represent migratory patterns of birds, etc.

Video Resources

Types of Maps

Maps and Directions

What is a Map?



Features in a Map

Regardless of the type of map, there are some features that most maps have. These include-

1. Scale, which indicates the relationship between the distances on the map and the true distances on Earth. It becomes important to read and understand scale in a map when it is being used to navigate from one point to another.
2. Symbols, which indicate different geographical features on a map. For example, a rail track represents a railway line, a blue line may indicate a river, green cover to indicate forest, blue for large water bodies such as seas and oceans, etc. The map will usually have a legend or a key that provides information on the different symbols and what they represent.
3. Grid, which is a series of horizontal and vertical lines that create a grid pattern like that on a graph paper. The lines that run east to west are latitudes and the ones north-south are longitudes. The intersection of latitudes and longitudes provide coordinates that indicate the most accurate location of the place.
4. Compass, which indicates the cardinal directions on the map. The four cardinal directions are North, South, East and West.

A map will also feature information about the date when it was designed or date relevant to the information depicted on the map, the author or cartographer who created it, sources that were used to gather data for the map and the title of the map informing what the map is showing.

Mercator Projection

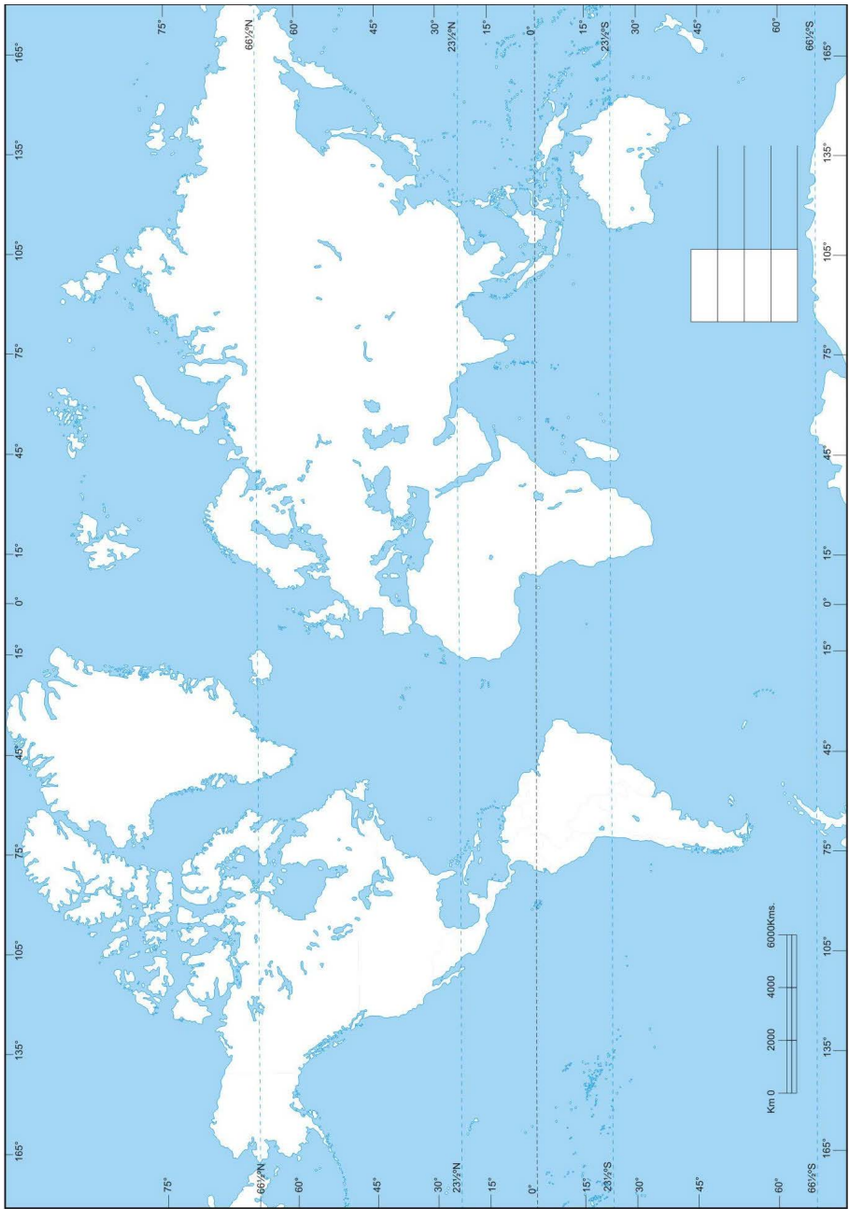
Gerardus Mercator was a 16th century cartographer. One of his most famous works is called the mercator projection. The maps that we most often come by when we look at a world map is the mercator projection. It is a 2-dimensional map created by flattening out a map from a spherical globe.

Although this is the most used and popular world map used in class-rooms and across other fields, this map isn't a true representation of scale when it comes to sizes of countries. For example, the landmass of Greenland appears larger than the entire continent of South America in the mercator projection. In reality, Greenland is smaller than the Arabian Peninsula! The continent of Africa is, in reality, much bigger than Canada. Watch the video below to have a visual understanding of how the mercator projection is derived and what it means for how we perceive the world in terms of landmass.

Reading Resources

Maps and Geography in the Ancient World

Map - National Geographic



Video Resource

Why all world maps are wrong

Reading Resources

Mercator Misconceptions:

Extra Exploration

Habitat Mapping Game

Learning Plan

Objectives

1. Learn how to read basic maps and icons.
2. Exploring the uses of maps.
3. Create a map of your school or village.

Lessons and Activities

1. Basics of a Map
- Perspective - Bird's eye-view
- Cardinal Directions & Legends

2. Uses of a Map

Seek and Find

3. Creating Maps
- Mapping the way to School
- Mapping an Imaginary Village

Scan and download worksheets for print here

Activity-1 Basics of a Map

Perspective - Bird's eye-view

Resources

1. A few objects such as a box, a bottle, a book, a watch, a pencil, etc.
2. Paper and pencil
3. Perspective-drawing worksheet
4. What's the Perspective worksheet

Pre Activity

Gather the children and hold up any one of the objects, say the book. Pass it around and ask the children to observe the object from all different angles. Look at it from above, from below, on the sides, inside, etc. Now, hold the book straight and ask the children what shape the book is in, place it horizontally in your palm with just the bottom edge of the book facing the child and ask what shape it is now. Is there a difference in shape or size of the shape? Now, stand up and hold the book between your fingers by the back and ask the children to look up at the book. What shape do they see? Do the same with a watch- look at it from top, at eye-level along the side, etc.

Main Activity

1. Place the objects on a table or desk such that it is at eye-level of the child when they are seated. Give children a few minutes to draw out what they see from this perspective.
2. Place the objects in the same way, but on the floor. Children should be able to have a top-view of the objects now. Give children time to draw what they see from this angle now.

Things to Discuss

1. Why does the same object seem to look different when observed from different angles?
2. Imagine there is a tree and a mouse is looking at it from the ground and a bird is looking at it while flying above, do they both have the same visual? What might be the difference?
3. What's a bird's eye-view and a worm's eye view?
4. When might we need to use a bird's eye-view?

Things to Display

A perspective image of a bird's eye view and a worm's eye view.

Check for learning

What's the Perspective worksheet

Activity- 1 Basics of a Map

Perspective-drawing worksheet

Bird's eye view

Child's eye view

Activity- 1 Basics of a Map

What's the Perspective

Identify the perspective for the images - bird's eye view, worm's eye view, child's eye view

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Activity-2 Basics of a Map

Cardinal Directions & Legends

Resources

1. Wildlife Map of Kanha
2. Cardinal-directions game

Pre Activity

Gather the children outdoors. Draw a large circle with four quadrants. Get the children to stand on the circumference of this circle. Ask the children if they know where the sun rises and sets each day, are they able to see the sun in the sky right now?

Main Activity

1. Introduce the names of the four cardinal directions as you mark these out on the circle. Use the symbols - N for North, S for South, E for East and W for West.
2. Ask the child at E to raise their hand, now the child at S, and so on.
3. What direction are the children in between N and E then? Introduce NE, SE, NW and SW.
4. Now call out the different cardinal directions and children associated with it by their position in the circle, raise their hands or do a little hop. For e.g., all in the E jump up, all in the N clap your hands, all in the NE jump and clap your hands.
5. All children sit down in their position. Now, call out statements like 'I'm the sun and I'm just now rising.' and the person who is in the associated direction stands up. E.g., I'm Kerala, I'm a state in the SW. I'm a snow leopard, I live in the mountains up N. Use the Cardinal-directions game sheet for examples of statements. Add a few more about your local context.
6. Gather the children back in class and spread out the Wildlife map of Kanha. Find the N,S,E,W on this map and have a conversation on the different highlights in each of these directions. E.g., In which direction is Mukki gate?
7. Also observe the map and note the different icons. Could you identify the different zones in the park?

Things to Discuss

1. Names of cardinal directions.
2. Where is their home in reference to the school, N of the school, W of the school, etc.
3. Do birds and animals have a sense of cardinal directions? What about trees?
4. What is the use of a map?
5. What is a legend on a map? How do you identify the different icons in a map?

Things to Display

Wildlife map of Kanha

Check for learning

Are the children able to respond correctly while playing the cardinal-directions game?

Activity- 2 Basics of a Map

Cardinal Directions & Legends

Wildlife Map of Kanha

1. Bengal Tiger
2. Crested Serpent Eagle
3. Woodpecker (Black-rumped Flameback)
4. Indian Roller
5. Indian Gaur
6. Sloth Bear
7. Barasingha (Swamp Deer)
8. Grey Langur
9. Cattle Egret
10. Sambhar
11. Black Buck
12. Indian Leopard
13. Peacock (Indian Peafowl)
14. Dudhraj (Indian Paradise Flycatcher)
15. Bee Eater (Asian green Bee-eater)
16. Chousingha (Four-horned Antelope)
17. Kingfisher(White-throated Kingfisher)
18. Lapwing (Red-wattled Lapwing)
19. Porcupine (Indian Crested Porcupine)
20. Wildboar
21. Indian Pangolin
22. Golden Jackal
23. Barbet (Brown-headed Barbet)
24. Bulbul (Red-whiskered Bulbul)
25. Chital Deer (Spotted Deer)

Activity- 2 Basics of a Map

Cardinal Directions & Legends

Children are seated in a large circle. They are assigned cardinal directions- N,S,E,W,NE,SE,NW,SW.

Read out the statements below, and let the participants respond by performing the assigned action if it applies to them.

1. I'm the sun, and I'm just now rising.
2. I'm Kerala, I'm a state in the SW part of India.
3. I'm a snow leopard, I live in the mountains up N.
4. I'm a large mangrove forest called the Sunderbans. I'm in the E part of India.
5. I'm Mukki gate in the Kanha tiger reserve. I'm on the SE part of the park.
6. I'm a continent named Africa, I'm W of India.
7. I'm Kanyakumari. I'm the S most tip of India.
8. I'm called the 7 sisters of India, and I'm in the NE.
9. I'm the Thar desert, also called the Great Indian desert. I stretch out in the NW part of the country.
10. I'm a pack of lions, I live in the Gir National Park. It is in Gujrat, a W state in India.

Activity-3 Uses of a Map

Seek and Find

Resources

1. A treasure map designed for your respective environment. This could either be within your class-room or school ground. Your map will be unique to your surroundings.
2. A treasure- it could be an object like a ball, a book or a basket of fruits.

Pre Activity

Recall the concepts of cardinal directions and legends with the children. Holding out the treasure-map, refer to the legend and gather from the children if they can make sense of the different iconography and if they can place themselves on the map- where are we right now, according to this map.

Main Activity

1. Divide the children into small groups. And hand out the map. Give them some time to read the map and discuss it among themselves.
2. Instruct the children to find the treasure marked at 'x' on the map.
3. You may choose to make a few different maps for each group or make it a timed activity with one single map. You may also choose to have one map but different paths for each group to follow to the same treasure.

Things to Discuss

1. What did they need to know and understand to read the treasure map?
2. Were there any challenges in finding the treasure or understanding the map?
3. What was the experience of working together as a team to find the treasure?

Things to Display

The treasure-map may be put up in class.

Check for learning

Are the children able to use the legend and read the map, are they able to follow it to reach from one place to another.

Activity-4 Humans and Other Creatures

Mapping the way to School

Resources

1. Chart paper
2. Markers and colours

Pre Activity

Gather the children and have a conversation on the different things they see on their way to school- are there any shops or buildings, do they pass a friend's home enroute, is there a particularly large tree, is there any water-body or a field, do they cross any major roads, etc. Recall also the bird's eye view perspective with the children.

Main Activity

1. Each child is given half a chart paper and markers/colours, etc.
2. Using a bird's eye-view perspective, each child draws out a map of the way from their home to school. Remind them to mark out the different major landmarks along the way.
3. Encourage them to include a legend in their map to denote the different icons and what they stand for.
4. When done, they may put up their maps and share with the class.

Things to Discuss

1. Importance of legends in the map.
2. Different common icons used in a map- roadways, water-body, trees, buildings- school, hospital, shop, bus stop, etc.

Things to Display

Maps made by the children may be displayed in the class-room

Check for learning

Check for appropriate use of icons and legends in the maps.

Activity-5 Humans and Other Creatures

Mapping an Imaginary Village

Resources

1. Chart paper
2. Markers and colours

Pre Activity

Gather the children and have a conversation on what their ideal village would look like. What all things would it have? Would it be in a forest or by an ocean or in a desert? What would be some of the key features? Would there be a children's only area? An ice-cream store? A place for animals and wildlife?

Main Activity

1. Divide the children into small groups of 3-4. Each group gets one large chart paper and markers/colours.
2. Each group creates a map of their own imaginary village. Encourage them to be creative in how they design their village, what kind of road-ways or paths they have, what kind of buildings, what the terrain would be etc. They may give this village a name as well.
3. When complete, each group may present their respective imaginary villages.

Things to Discuss

1. What are the things to keep in mind while creating a map- topography, iconography and legend, pathways, major landmarks, etc.
2. The need to use a bird's eye-view while drawing out a map.

Things to Display

Maps made by the children may be displayed in the class-room.

Check for learning

Check for appropriate use of icons and legends in the maps.

Note : Refer to this video for ideas on map-making
Fun for children: How to make a town map

‘Working with and in the soil, the heart of our food systems’

CHAPTER-3

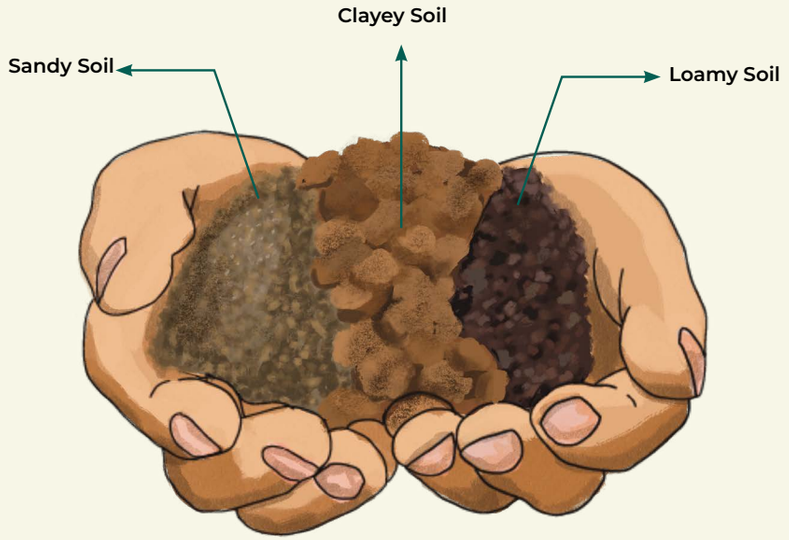
Exploring Soil

The upper layer of the earth is called soil. It is made of organic and inorganic matter, air and water. Inorganic matter includes rocks, minerals, nutrients etc. Organic matter includes any organisms living in or on the soil surface, decaying matter, etc.

Physical **Characteristics**

The physical characteristics of soils include all the aspects that you can see and touch such as:

- Texture
- Colour
- Depth
- Structure
- Porosity (the space between the particles)
- Stone content



Video Resources

Soil Properties

What is Soil (and Why is it Important)?

Types of Soil found in **Central India**

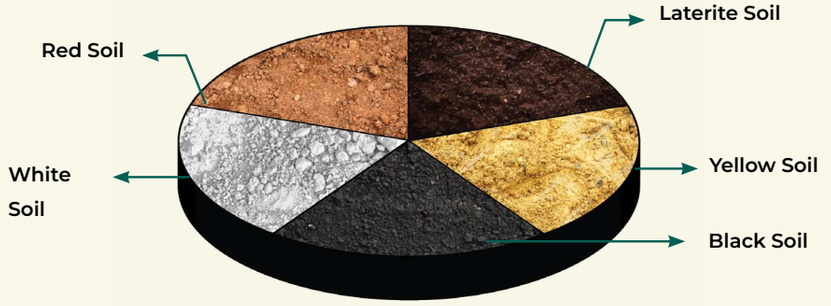
Soils vary greatly in their chemical and physical properties. Processes such as leaching, weathering and microbial activity combine to make a whole range of different soil types.

Red Soil

This type of soil is known as red soil because it has a high percent of iron contained which gives the red v. The texture varies from sandy to clayey. It is good for producing cotton, wheat, pulses, tobacco, fruits, potatoes etc.

Laterite Soil

This soil is red or pink in colour, and is found in those regions which receive heavy rainfall. It is rich in iron oxide and alluminum. It becomes soft when wet and hard when dry. It supports crops like rice, ragi, tea, coffee, etc.



White Soil

This soil is high in calcium carbonate content and is also known as calcareous soils. The light colour is due to calcium compounds. It can grow melons and palms like coconut.

Black Soil

This soil is rich in minerals and can hold a lot of water. It is rich in iron, lime, aluminium, magnesium and also potassium. It becomes sticky in the rainy season and develops cracks when dry. Black soil is good for producing cotton, wheat and millets.

Yellow Soil

This soil is yellowish or pale in colour. It contains a relatively higher proportion of iron and aluminium hydroxides. It can retain water and is beneficial in agricultural use for crops like millets, rice, wheat and pulses.

Video Resource

Soils of India

Reading Resource

Types of Soil in India

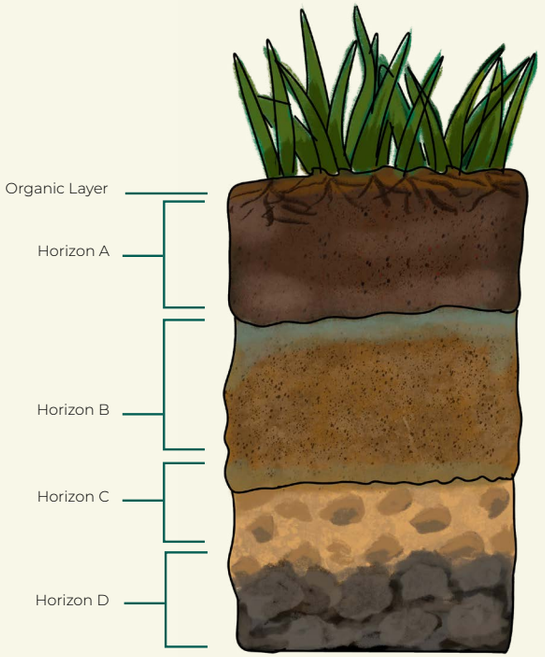
Soil Profile-Layers

Horizon-A: **Upper surface soil or topsoil**- It contains dried leaves, grasses, dead leaves, small rocks, twigs, surface organisms, fallen trees, and other decomposed organic matter. It is dark brown in colour. It is where seeds germinate and plants grow.

Horizon-B: **Subsoil**- It holds more water than topsoil and contains more minerals than organic matter. The soil of Horizon A and B is mixed when the fields are ploughed.

Horizon-C: **Partially degraded rocks**- This layer does not contain any organic matter and is made up of broken bedrock.

Horizon-D: **Unchanged parent rocks**- This is a compact layer made of different types of rocks.



Video Resources

Soil Profile and Soil Horizons

Reading Resource

Soil Horizons: Definition, Features, and Diagram

Animals and Soil

There are many different types of animals that live in the soil. Soil is a living, dynamic resource, and contains many animals that live in it or depend on it for many things. Soil condition is very important, as poor quality soil will lead to disruption of the ecological balance. Many creatures are dependent on soil because of the following reasons:

1. Soil enables their food to grow. The growth of plants in a region is very dependent on the quality of the soil. These plants form the base of the food chain.
2. Soil acts as a habitat for many animals- Creatures like rabbits, rats, earthworms, beetles, ants, lizards, snails etc live in the ground. Soil is their main housing. It helps protect them from predators and extreme weather conditions.
3. Soil contains air and water and many animals depend on soil to meet their water requirements. Creatures like frogs, toads and salamanders breathe and drink through their skin, and thus their primary means of obtaining water is through the soil.

In return, the health of our soil is also defined by the microbial life in the soil. The soil is home to many important bacteria, fungi and microorganisms that help keep the soil nutrient-rich and healthy.

Video Resources

A close-up of creatures living beneath the soil

Life in the Soil

Soil and **Farming**

Agriculture or farming has been the primary livelihood of the majority of people in India since olden times. Over the years the requirement and method of farming has changed, leading to changes in the quality and fertility of the soil.

1. Traditionally, people got involved in farming just to feed themselves and their families. They practised Jhum cultivation (slash and burn), where patches of forest were burned down, and seeds were sown. The ashes of the plants burned down acted as fertiliser. This process was advantageous because it helped maintain the fertility of the soil, did not require any chemical pesticides and fertilisers, prevented the growth of weeds and was highly efficient. The disadvantages of this process include reduction of the quality of soil (if the same patch of land was used repeatedly), possible deforestation, loss of biodiversity and pollution. Farmers were careful about not using the same piece of land often (each plot was left for 10-20 years to regenerate after being burnt once), and they grew multiple crops like kodo, kutki, jowar, corn, rye, arhar in the same plot, ensuring that the soil did not get depleted of nutrients in an imbalanced way.

2. As times changed and commercial farming became the requirement, people needed to grow certain crops like rice, wheat etc. to sell and get money. Thus, they cleared forests completely, created farms, and sowed the same crop every season. Cultivating just a single crop used up only certain nutrients in the soil, leaving it disproportionately depleted. To combat this, chemical fertilisers and pesticides were introduced, and it was found that these reduce the quality of the soil in the long run. They can also run off into water bodies and pollute them, leading to a loss in aquatic biodiversity, and loss of a water source.

3. Thus, in order to save the soil and maintain its quality and fertility, we must adopt farming practices like intercropping (growing two or more different crops on the same plot of land at the same time in order to maintain the nutrient content of the soil, reduce soil erosion and minimise the need for chemical pesticides and fertilisers) and terrace farming (A technique of farming whereby "steps" known as terraces are built onto the slopes of hills and mountains. Whenever it rains, instead of rain carrying away the soil nutrients and plants down the slope, they flow to the next terrace and soil erosion is minimised). We must also cultivate fruit trees and native species of plants like bamboo, mahua, harra, khamer.

Video Resources

The Living Soil: How Unseen Microbes Affect the Food We Eat

Farming Types: 12 Different Types of Farming Methods Practised in India

Learning Plan

Objectives

1. Learn the importance and uses of soil.
2. Understand the different varieties of soil by colours and mineral composition.
3. Study the major pollutants in soil.
4. Explore the need for soil conservation.

Lessons and Activities

1. Types of Soil
   - Exploring Soil Textures and Colours
   - Painting with Soil
   - Soil Profile
2. Life in Soil
   - Soil for Agriculture
   - Above or Under
3. Protecting and Conserving Soil
   Soil Erosion

Scan and download worksheets for print here

Activity-1 Types of Soil

Exploring Soil Textures & Colours

Resources

1. Samples of different types of soil- red,yellow, black, white, laterite, mica rich soil, etc.
2. Samples of dry cow dung, leaves, twigs, gravel
3. Small baskets or trays to keep each type of soil and other material

Pre Activity

1. Place the different material (leaves, twigs, cow-dung, gravel) in separate baskets. Also place the different types of soils in separate baskets.
2. Gather the children together and ask them to close their eyes. Pass around each basket one by one. The children are to touch the material in the basket and call out what they think it is.
3. Can they differentiate which basket holds soil and which holds other natural materials?

Main Activity

1. Now, keep aside the baskets of miscellaneous natural materials and line up the baskets with different types of soil. Ask the children to stand around and observe the baskets of soil. What do they see? Encourage them to describe each soil visually- what colour is it, does it look lumpy or fine?
2. Sitting back now, invite a volunteer. Blindfold the child and ask them to touch and feel each of the soils. Are they able to differentiate one from the other? Invite other children to experience the activity one by one.
3. Explain each type of soil by name and share why each of them has a certain colour. Speak about the mineral composition of each soil type, the texture of each and what they are used for.

Things to Discuss

1. Mineral composition of each soil variety and names.
2. What grows in each variety of soil.
3. Where each variety of soil is found prominently.

Things to Display

Different types of soil with name-cards

Check for learning

Types of Soil - Matching worksheet

Activity- 1 Types of Soil

Types of Soil by Colour

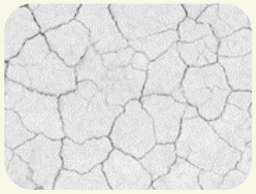
Match the soil types to their names

Laterite Soil - rich in iron oxide and aluminium

Brown Soil - contains mica particles in and around Kanha

White Soil - high in calcium carbonate

Black Soil - rich in minerals and can hold lot of water

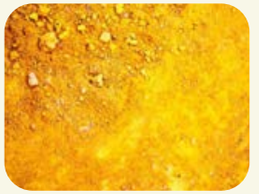


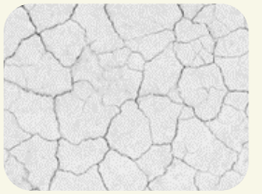
Yellow Soil - high percentage of iron

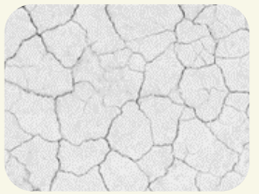
Activity- 1 Types of Soil

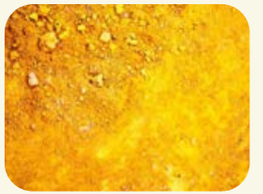
Types of Soil by Colour

Match the soil types from one column to the other.









Activity-2 Types of Soil

Painting with Soil

Resources

1. Different coloured soils - brown, red, black, white, yellow, laterite
2. Buckets with water
3. Paint brushes, sponge pieces and paper

Pre Activity

Recall the names of the different soils and why they each have distinct colours. Recall what mineral composition gives each soil their colour. Invite the children to paint with soil colours!

Main Activity

1. In separate containers, make a thick paste of each type of soil and water.
2. Invite the children to come and take a sample of the pastes they would like to work with. They may add some more water to it and thin it down to paint or use as is. Encourage children to mix different soils and experiment to see what colours they get. What happens when it is very dilute vs concentrated?
3. Children could use paint brushes, sponge or their fingers to paint with the soil on paper.

Things to Discuss

1. What is the experience of mixing soil colours? Is it like mixing regular paint?
2. Was it easier to paint with a brush or fingers?
3. Did they try painting on different mediums- paper, wood, wall, skin, etc. How does the soil paint look in different mediums?

Things to Display

Art-work made from soil paints.

Note: Watch this video for some guidelines : Paint with Clay

Activity-3 Types of Soil

Soil Profile

Resources

1. A glass or plastic jar that is clear and see-through
2. Water
3. Soil
4. Soil Profile - label worksheet

Pre Activity

Gather the children and hold a conversation on what they think makes up soil. Are all the particles in soil uniform? Is soil made of mud particles alone? Can they see the minerals in the soil?

Main Activity

1. Conduct the Soil Profile experiment.
2. Take a glass jar and fill it 3/4th with water. Add a handful or two of soil in it. Shake it vigorously and let it sit. Allow the jar to sit undisturbed for a few hours.
3. Later in the day, come back and observe what has happened to the soil in the glass jar.
4. Point out the different layers formed - gravel, sand, silt, clay, humus, mineral dissolved in water giving it its colour, etc.

Things to Discuss

1. What particles began to settle first? Did the heavy particles settle at the bottom or top?
2. What are the tiny floating particles at the top of the water's surface? Is it mud or something else?
3. Do the experiment with different types of soil- does the colour of the water vary? Do the layers vary?

Things to Display

1. Glass jars with different types of soil and their soil profiles.
2. Soil profile picture card with labels

Check for learning

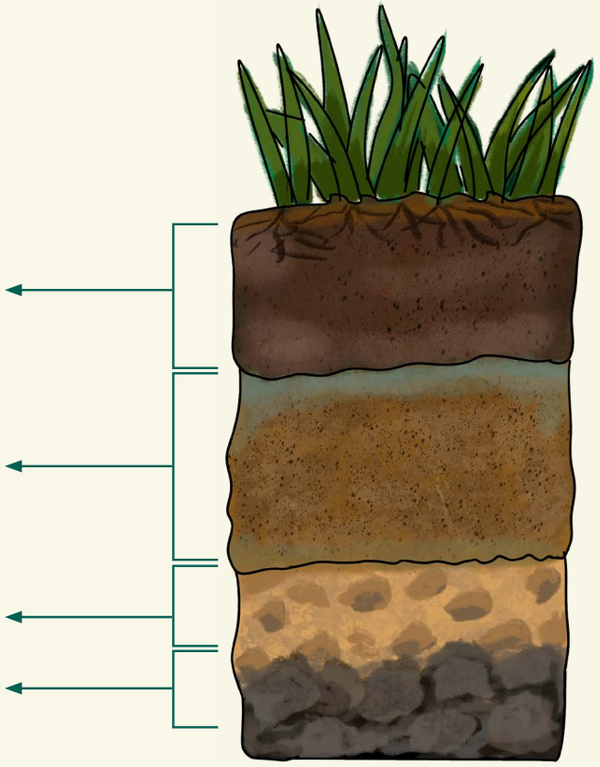
Soil Profile - label worksheet

Note: Refer to this video for the experiment:
Soil Profile

Activity- 3 Types of Soil

Soil Profile

Label the different layers of soil.



Activity-4 Life in Soil

Soil for Agriculture

Resources

1. Samples of silt, sand, loam, clay
2. Plastic cups - 4 wide-rimmed ones with holes pierced at the base and 4 narrow-rimmed ones (with no holes)
3. Water

Pre Activity

Gather the children and place the 4 types of soil to observe. Ask the children if they can name the different types of soil, what do they know about it, what are the textures of each like, do they know what grows in each type of soil, etc.

Main Activity

1. Conduct the water flow experiment.
2. Pour out a handful of each soil in 4 different cups with the bases pierced. Place these cups over the narrow-rimmed cups such that they stay stationary at a height. Use a cardboard piece as a stopper if required.
3. Measure out equal amounts of water and pour it into each of the soil cups. Observe as the water gets partially absorbed by the soil and the excess drains out into the bottom cup. Wait for all the water to pass through in each cup.
4. Observe and note which type of soil absorbed the most amount of water, which bottom cups have the largest quantity of drained out water.
5. Note: Refer to this video for the water-flow experiment: Water Flow and Absorption Test

Things to Discuss

1. What can you state about the soil's water retention quality based on how much water is drained out into the bottom cup?
2. What type of soil absorbs most water? What does this mean for growing plants in this type of soil?
3. What vegetables and fruits can be grown in the different types of soil based on their water absorption quality?
4. Is there any soil in which nothing grows?

Things to Display

The experiment cups may be placed in the classroom for the children to repeat the experiment and make observations.

Check for learning

Children may make an information card to place next to each type of soil with name of the soil, observation on water absorption quality, what grows in this soil, etc.

Water Flow and Absorption Test

Activity-5 Life in Soil

Above or Under

Resources

A long rope, about 1.5 m

Pre Activity

Gather the children and ask them to name different fruits and vegetables that they have seen, eaten or grown. Have a conversation on which of these grow above the ground and which grow under the ground. For e.g., potatoes and onions grow underground, lady's fingers and beans grow above the ground. Also have a conversation of different creatures that live on soil and in soil. For e.g., earthworms and some types of ants live in the soil, some mice and scorpions live in burrows in the ground, cows and goats live on ground.

Main Activity

1. Hold out the rope horizontally, parallel to the ground. It should be held at the waist level of the shortest participant in the activity.
2. Get all the children to stand at a short distance from the rope so they are not touching it.
3. Now, call out loudly 'I'm a vegetable, I'm a potato. Where do I grow? Above or under?' All children duck down and squat under the rope line.
4. Continue calling out different fruits, vegetables, animals, birds and insects that live and grow above or under the soil layer. The children stand up right and jump for those that live and grow above ground, duck and squat below the rope for those that live and grow underground.

Things to Discuss

1. Is soil a living or non-living substance?
2. Can you say that soil holds life? What life forms could be supported by soil?
3. What are the signs of healthy and rich soil?
4. What happens if soil is unhealthy or polluted? Watch this video : Soil Pollution

Things to Display

Children could be asked to draw on a sheet of paper, things that live and grow above and underground. On a sheet of paper, draw a line across the page; this is indicative of the soil layer. Now, draw the respective things above the soil layer and below the soil layer.

Watch this video : Soil Pollution

Activity-6 Protecting and Conserving Soil

Soil Erosion

Resources

1. 3 plastic bottles
2. 3 plastic cups
3. Soil
4. Dry leaves and mustard seeds

Pre Activity

1. Work with the children and prepare in advance for an experiment to observe soil erosion.
2. Take the 3 plastic bottles and make a rectangular cut out along the length of the bottle.
3. In one bottle, add a layer of soil. In a second bottle, add a layer of soil and top it with a layer of dry leaves and twigs. In the third bottle, add a layer of soil and any quick sprouting seeds.
4. Keep these bottles aside until the third bottle has little seedlings sprouted.

Main Activity

1. Place the three bottles on a raised platform such as a desk with their mouths beyond the edge of the platform.
2. Place a plastic cup under each of these mouths at a short height. This is where the water will collect.
3. Now, use a jug and add equal amounts of water in each of the bottles, make sure to pour excess, so it begins to overflow out of their mouths, into the cups placed below.
4. Observe the water collected in each cup.

Things to Discuss

1. What is the colour of the water in each cup? Why is it murky and brown in one and close to clear in another?
2. How do plants help hold the top soil in place with their roots?
3. Why is it advisable to not completely clear out dry leaves and twigs from the forest floor?
4. What is soil erosion and how can it be prevented?

Things to Display

Let the experiment set-up be displayed in the class so children can try out the experiment by themselves and note observations.

Note: Refer to this video for detailed instructions:
Soil Erosion Experiment

‘The sacred tree of Life’

CHAPTER-4

Life of Mahua

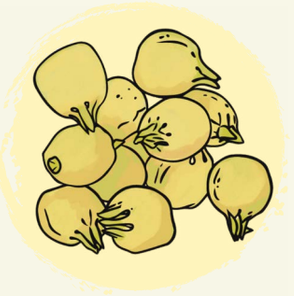
The Mahua tree is a tropical tree. It is commonly found in central India. In India, Mahua trees are found in significant numbers in the states of Uttar Pradesh, Madhya Pradesh, Orissa, Jharkhand, Chattisgarh, Andhra Pradesh, Maharashtra, Bihar, West Bengal, Karnataka, Gujarat and Rajasthan. It is also known as the ‘tribal tree of India’ or the ‘tree of life’ because of the immense importance and value it holds. The word ‘mahua’ is derived from the Sanskrit word ‘madhu’ meaning honey. The scientific name of the tree is Madhuca longifolia.

The tree is considered God’s gift to the Adivasi community of central India. It is considered to be sacred, and it is worshipped by the people of many tribes in the country. The Mahua tree forms an integral part of the customs and traditions of the tribal people. Different parts of the tree and products made from it are used in prayer rituals and ceremonies like births, marriages and deaths.

Physical **Description**

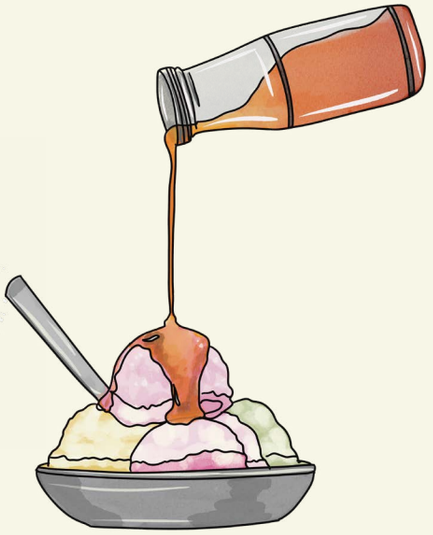
The Mahua tree is of medium height, with a stout trunk and dense branches. The bark is grey and vertically cracked. The leaves are thick, oblong and emit a milky sap when
broken. The flowers are small grapes, cream/ yellow coloured, and are borne in bunches. They only live for one night and then fall to the ground. The flowers that are pollinated develop into a fleshy green fruit which usually contains 1 seed. Each part of the tree is considered to be useful and it is called a survival tree because of its countless uses, its social/cultural and ecological impact, and its ability to sustain people and animals in the hot summer months when food is scarce.

The Uses and Benefits of the Mahua Tree



Mahua Flowers

- Mahua flowers are edible and are used in a wide variety of dishes all over the country. They are eaten fresh or dried (when they look and taste like raisins).
- They are fermented to make a colourless, potent alcoholic drink. Flowers that have been used to produce alcohol are also fed to the livestock.
- They have a very high sugar content and are used as a sweetener. It is used to make syrup which is used in some Indian sweets and desserts like halwa, kheer, barfi. Mahua flowers are also used to make jams and jellies.
- It also has medicinal value. Ayurveda considers mahua flowers as a cooling agent, carminative, galactagogue, and astringent. Tribal people use Mahua flowers to cure skin diseases, headache, pitta and bronchitis.
- In some parts of the country, the flowers are dried in the sun, ground to make flour, and used to make different kinds of breads.
- During periods of food scarcity, mahua flowers are boiled with Sal seeds to create a substitute for food grains.



Mahua Fruits & Leaves

The fleshy part of the fruit is used as a vegetable in many parts of the country, and has a high nutritional value. The leaves are cut up and used as fodder to feed cows and goats.

Mahua Seeds

Mahua seeds contain a very large amount of oil and production of this edible oil is very high in India. The fat in the seeds is used to manufacture soaps, detergents, candles, and as vegetable butter. It is also used in cosmetics and chocolates. It is used as a seed preservative against pests and as biofuel. The seed cake produced after oil extraction is used as fertiliser.

Seed Cake

Video Resources

Mahula Flower | Traditional and Contemporary Uses

Brewing of Mahua Wine in Chhattisgarh

Mahuya Flower Laddu Recipe by Santali Tribal Women

महुआ का पकोड़ा और लप्सी

Madhuca Indica (Longifolia) oil extraction

Medicinal Properties of Mahua Tree

The mahua tree is called the 'tree of life' and holds very important medicinal value in the lives of tribal people and the field of Ayurveda. This tree is considered no less than a boon and is being used to cure many different types of diseases. Several parts of the tree are used for their medicinal properties.

Video Resource

महुआ के फायदे जानिए क्यों कहा जाता है महुआ को

Reading Resource

Mahua: A boon for pharmacy and food industry

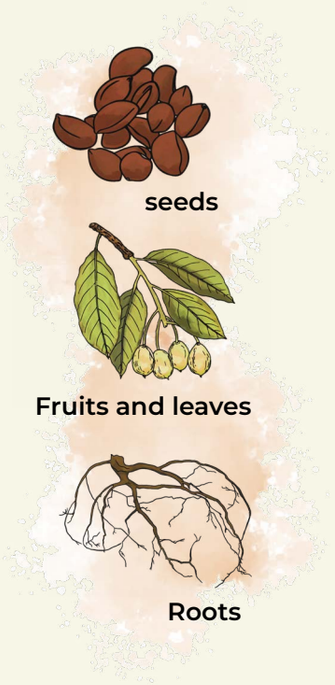
Mahua Seeds
Mahua oil from the seeds is used to cure headaches, fever, piles, constipation, haemorrhoids and heart diseases as it has many soothing properties. Oil is used to massage arthritic joints.

Mahua Tree Bark
The bark contains antibacterial properties that can heal wounds, help cure diabetes, rheumatism etc and dental problems. Powder from the bark can help with reproductive problems.

Mahua Flowers
The flowers are used by adivasi communities to cure nausea, cough, bronchitis and tonsillitis, headaches, skin conditions, eye conditions and itching. Raw flowers are also used to increase lactation in mothers.

Mahua Leaves and Roots
Leaf extracts help remove intestinal worms. The roots of the tree can help with fever, diarrhoea and inflammation.

Mahua Fruits
- The fruit keeps hair healthy and strong and is used in hair oils. It can also be used to treat blood diseases.
- Mahua spirit is used as rubbing alcohol.



Environmental Role of Mahua

The mahua tree plays an important environmental role in the forests and plains of India.

- Mahua trees blossom in late Spring and bear fruit, functioning as a nutritional buffer for the ecosystem during the following hot summer months. They serve as a food source for many animals like birds, bats, monkeys, deer, wild pigs and a variety of insects. It helps serve as a primary link of the food chain.
- The trees serve as a habitat for many species of insects and small animals like squirrels that depend on it for shelter.
- The roots of the tree bind the ground and help prevent soil erosion.
- The tree recycles carbon dioxide and releases oxygen.
- They help reduce temperatures and regulate the climate.
- They also make the spaces around them beautiful and green.
- Mahua creates a resource that both humans and animals compete for and leads to conflicts.

Video Resources

Mahua- The People's Tree

Reading Resource

Mahua: Tribal lifeline in MP.

Learning Plan

Objectives

1. Learn about the lifecycle of a Mahua tree.
2. Explore the uses of Mahua for humans and animals.
3. Understand the economic use of Mahua in village livelihood.
4. Explore the role of Mahua in cultural life.

Lessons and Activities

1. Observing a Mahua Tree

   Nature-walk to a Mahua tree

2. Significance of Mahua tree in Humanlife
   - Food preparations with Mahua
   - Medicinal uses of Mahua
   - Livelihood & Cultural Significance

Scan and download worksheets for print here

Activity-1 Observing a Mahua Tree

Nature-walk to a Mahua tree

Resources

1. Mahua Jumble - worksheet
2. A Mahua tree in the neighbourhood
3. Art material and paper/notebook

Pre Activity

1. Gather the children together and have a conversation to understand what they already know of the Mahua tree- do they have one in their backyard, do their family have a Mahua based livelihood, have they seen the use of it in their home kitchens, do they know any songs or stories about it.
2. Also encourage children to have a few questions about the tree that they are curious to find out. For e.g What species live in the Mahua tree, what kind of bark does the tree have, etc.

Main Activity

1. Take a walk to the nearest Mahua tree in the neighbourhood.
2. As you approach the Mahua tree, stop at a distance. Observe the tree from afar. What kind of shape does it have, are you able to distinguish its leaves from afar, are there other trees nearby, is it a single tree or are there many clumped together.
3. Continue walking towards the tree. On reaching the tree, stop and observe the tree from different angles. Encourage children to make these observations on their own. Look at the tree standing close to the trunk and facing up, look at it side-ways, look at it from atop a small rock or platform if available, etc.
4. Gather the children to sit under the tree and share observations- what is the bark like, what colour is it, what about the leaves, is the tree in bloom, are there any creatures living on or in the tree, what other trees are around the Mahua, what is the soil like near the tree, etc.
5. Children make two drawings - one of the tree from any angle they choose and one detailed drawing of any one aspect of the tree (bark, leaf, flower, branch, fruit)

Things to Discuss

1. Does the tree look healthy, what are the indicators? How old might the tree be?
2. Is there anything new observed about the tree?
3. Do Mahua trees fall sick? What might be the potential diseases a tree could have?
4. Do you observe any impact of the climate on the flowering and fruiting of the tree?
5. Are the flowers and fruits together on the tree?
6. Do all Mahua trees flower at the same time?
7. Life-cycle of a Mahua tree from seed to fruit. Discuss how long it takes for a seed to germinate, for a tree to reach maturity, when does it flower and fruit, etc

Things to Display

Art-work of the children depicting the Mahua tree as they see it from different perspectives.

Check for learning

Use the Mahua Jumble - worksheet to assess if children have made accurate observations of the different parts of the Mahua tree.

Activity-1 Observing a Mahua Tree

Nature-walk to a Mahua tree

Put a tick mark or circle the picture that represents a part of the Mahua tree

Flower



Fruit



Leaf



Bark



Activity-2 Significance of Mahua tree in Humanlife

Food preparations with Mahua

Resources

1. Ingredients for the selected recipe (refer to video links below or use any known family recipe).
2. Utensils to prepare the dish.

Pre Activity

1. Prior to the activity, gather from the children the various dishes prepared with Mahua in their homes. Create a collection of recipes. Pick any one or two simple recipes to work on together in the classroom.
2. Do a practice session of reading out a recipe, making a list of required ingredients, etc. Distribute the responsibility of collecting the ingredients amongst the children.

Main Activity

1. Under adult supervision, work together to prepare the decided Mahua based dish with the children. Ensure that all children have a role to play either in the preparation, making or serving.
2. Ensure that children are involved right from gathering ingredients to cleaning up after the preparation.

Things to Discuss

1. What does the flower taste like? Is it distinctly different when raw and cooked?
2. What are the steps to ensure before one makes a dish?
3. Are there other flowers that the community consumes?
4. How do we know what things in nature are edible and not?
5. What should we be careful about while cooking and working in the kitchen?

Things to Display

1. Children may write out the recipes on a chart paper with an adjoining illustration.
2. A few pictures of the activity may be put up.

Watch the following videos:
Mahua Flower Laddu Recipe by Santali Tribal Women

महुआ का पकोड़ा और लप्सी

Activity-3 Significance of Mahua tree in Humanlife

Medicinal uses of Mahua

Resources

1. Different parts of a Mahua tree- leaf, flower, fruit, bark, root. If unable to access these, have picture-cards of the same.
2. Prepared medicine samples- raab cake, gulli oil, mahua flower juice
3. Uses of different parts of Mahua - matching sheet

Pre Activity

Gather the children and if possible, have a conversation with a village elder about their knowledge of the Mahua tree and its medicinal usage. If not, have a conversation about what the children know of its medicinal uses either from observations at home or from their parents/ grandparents.

Main Activity

1. Lay out the different parts of the Mahua tree and the medicinal samples. Pick each one and have a conversation about what is extracted from it or what is done to it to make it medicinal in nature and what ailments are treated by it.
2. Ensure to discuss with children the importance of making informed decisions when it comes to treating ailments and to seek expert advice whether that be a doctor, ayurveda practitioner, a reliable community elder/medicine-person, etc.

Things to Discuss

1. How are medicinal properties of trees discovered?
2. What is the scientific method of claiming anything as a cure or safe for human consumption?
3. What are indigenous and native knowledge systems that have been in use to make these discoveries?
4. What are the protocols while using something to treat a disease?
5. What other plants are you aware of that have medicinal properties?
6. What are the risks of incorrectly using Mahua or its extracts?

Things to Display

A chart displaying the different parts of the Mahua tree and their respective medicinal uses.

Check for learning

Use the matching worksheet -Uses of different parts of Mahua- to assess if children have a basic understanding of the different parts of the Mahua tree and their respective uses.

Activity-3 Significance of Mahua tree in Humanlife

Medicinal uses of Mahua

Match the picture to the correct usage

It produces oil which is used to treat skin ailments.

Grinding it and applying it on the wounds provides some relief and helps in healing.

Raab is made from it which is used in treating arthritis, piles and dental diseases.

It is used to treat heart disease.

Effective in diabetes, swelling, diarrhoea, fever.

Activity-4 Significance of Mahua tree in Humanlife

Livelihood & Cultural Significance

Resources

1. Dried mahua flowers, mahua syrup, sweets or food samples made with mahua or any mahua derived products sold locally
2. Collection of Mahua flowers - picture cards with phrases

Pre Activity

1. Visit any families of children in the class whose families are dependent on Mahua for their livelihood. Engage in conversation to understand how they harvest the products of the tree, how do they store it, where do they practise their trade, what challenges they face, etc. If possible, visit them and offer support in their work- gathering the flowers, storing, etc.
2. Invite the person(s) to class if possible and have an interactive conversation.

Main Activity

1. Begin by gathering information from the children about ways in which the Mahua is part of their life- aesthetic beauty, spiritual significance, symbolic presence in different rituals, livelihood, etc.
2. Display the different products and discuss with the children how these are extracted/ prepared.
3. End the conversation with a folklore or song about the mahua.

Things to Discuss

1. Processes involved in harvesting, storage and trading mahua and mahua derived products.
2. Challenges in depending on mahua for livelihood.
3. Who is involved in the harvesting, storage and trading of mahua?
4. Are there any impacts of environmental change on the yield in mahua and consequentially, the livelihood of local communities?

Things to Display

Stories and poems involving the significance of mahua- written out or printed with added illustrations by the children.

Check for learning

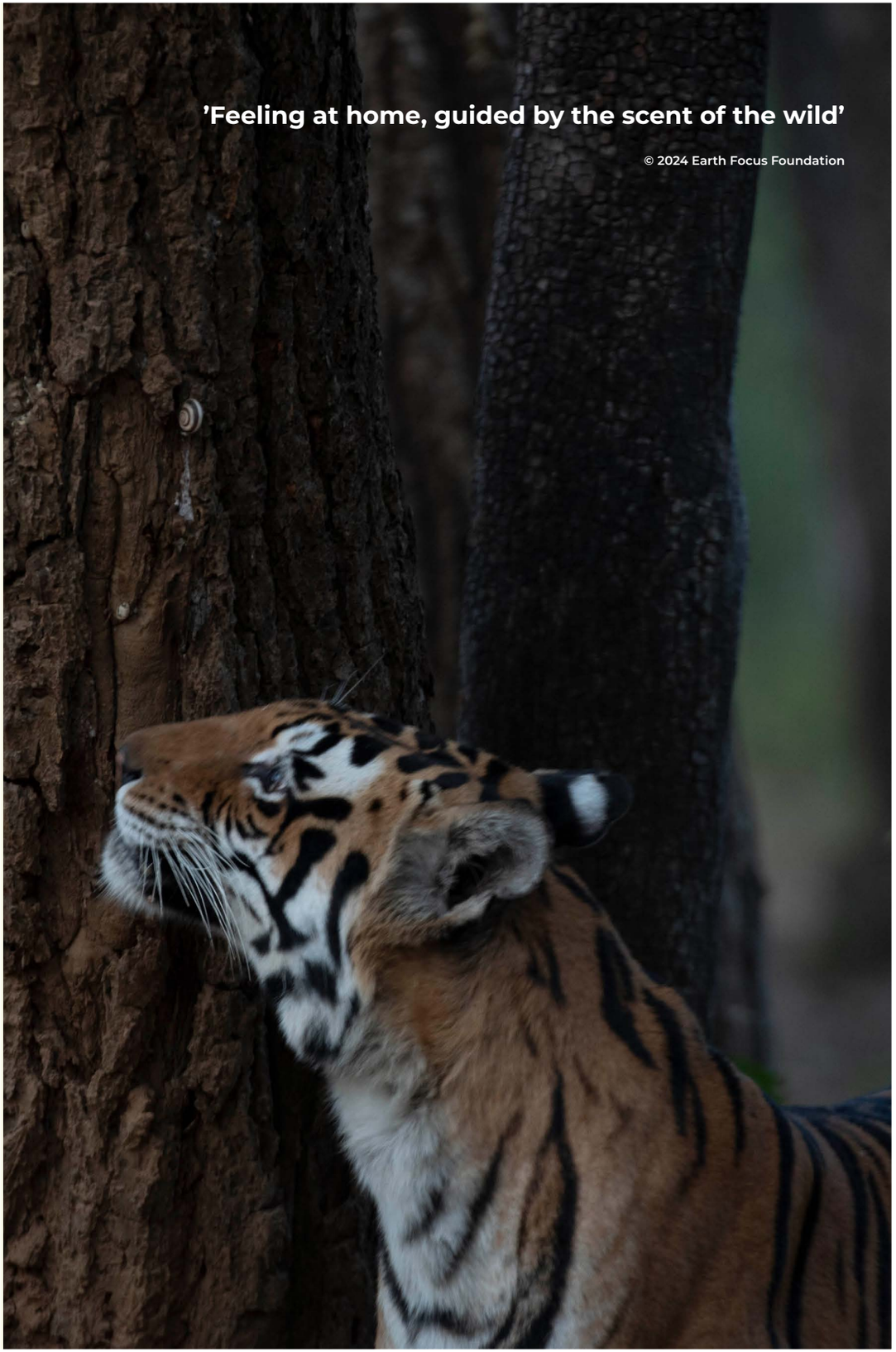
Use the picture cards -Collection of Mahua flowers- to assess if children have an understanding of the different steps in harvesting mahua flowers for trade and their sequence.

Activity-4 Significance of Mahua tree in Humanlife

Livelihood & Cultural Significance

Match the picture card to the correct step and arrange them in the correct order.

Mahua flowers in the tree	
Fallen Mahua flowers	
Collecting Mahua flowers	
Drying of Mahua flowers	
Storing Mahua flowers	
Selling Mahua flowers	



CHAPTER-5

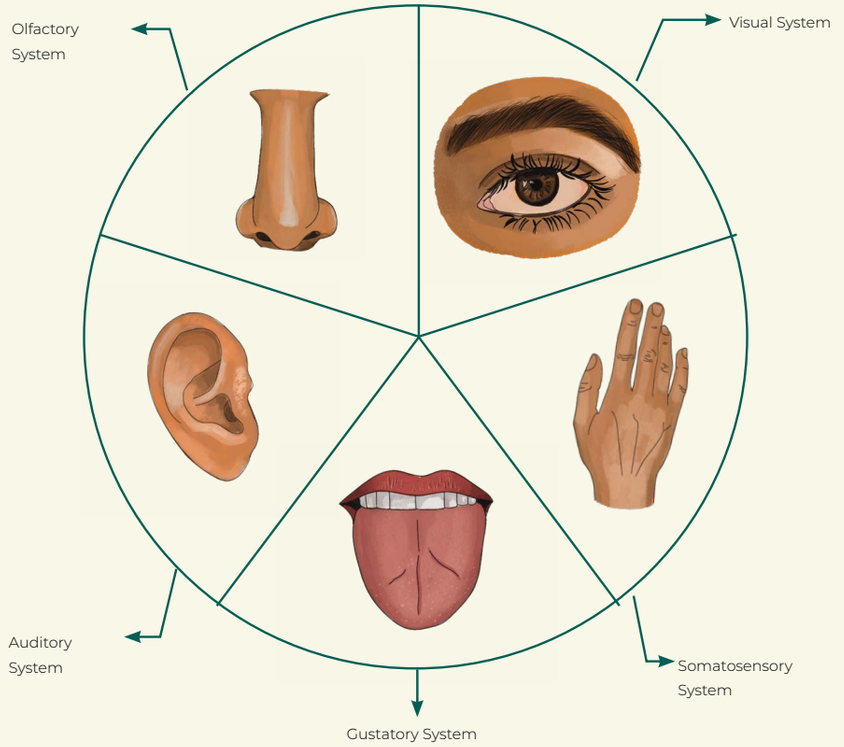
Sensorial World

As humans, we experience the world around us through various means. Most able-bodied people tend to use their eyes and ears as a primary means of knowing their surroundings. However, there is much to gain in training and strengthening our other senses as a means to learn about our surrounding environment. A sense is a biological system used by an organism to experience sensation. Sensation is the process of gathering information about one's surroundings through interacting and detecting stimuli. We use sensory organs for sensation.

Sensory **Organs**

Humans have five different sense organs that associate with five different sensorial systems.

Visual System - Eyes (sense of vision)
Auditory System - Ears (sense of hearing)
Somatosensory System - Skin (sense of touch)
Olfactory System - Nose (sense of smell)
Gustatory System - Mouth (sense of taste)



Video Resources

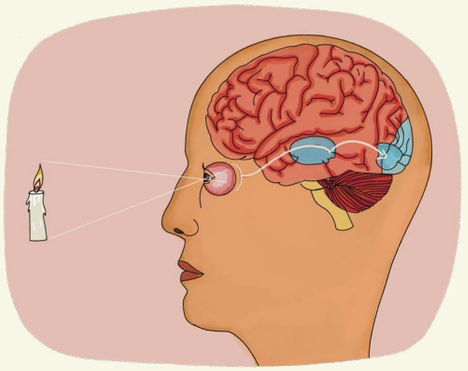
The Five Senses | The Dr. Binocs Show

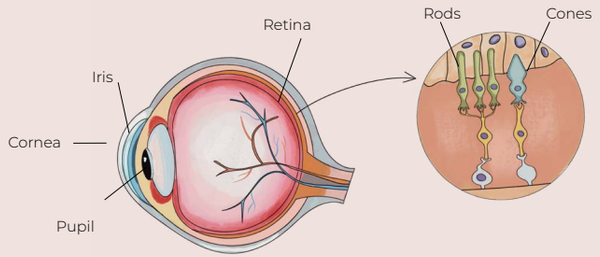
Human Sense Organs | Learn about five Senses

Sensory **Systems**

Visual System

Eyes are the visual sensory organ in the human body. It is what helps us see the world as images with colour. Different people may have varied eye-colours. Our eyes are sensitive to light. The iris in our eye controls the amount of light entering our eye by influencing the size and diameter of the pupil. At the back of the eye is the retina. It contains photoreceptors that detect light. It contains two types of cells- rods and cones. Rods aid peripheral vision and function in low light. Cones help detect details and colour, they function in bright light.





Some people experience colour blindness and cannot see all the colours on the spectrum that an average human can. The inability to see at all is called blindness. Some people are born with partial or complete blindness and some develop it either due to an accident, natural ageing or other medical condition.

Video Resource

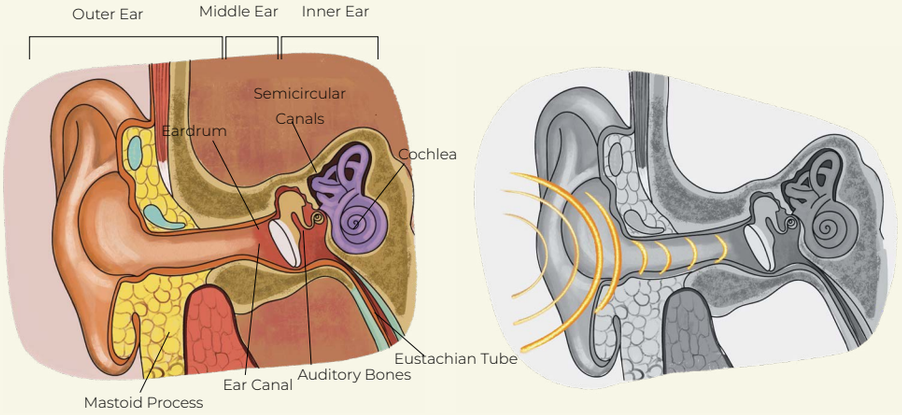
Visible Body | The 5 Senses - Sight, Sound, Smell, Touch, and Taste

Reading Resources

Sensory Experiences

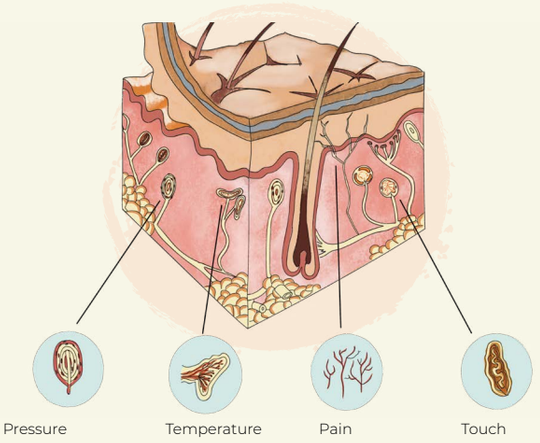
Auditory System

Ears are the auditory sense organs of our body. They help us experience sounds. The ear is divided into three sections - outer ear, inner ear and the middle ear. The vibrations of sound pass through each section, and finally to the brain where it is detected and identified as meaningful sound. In addition to hearing, the auditory system also helps in balancing our body.



Somatosensory System

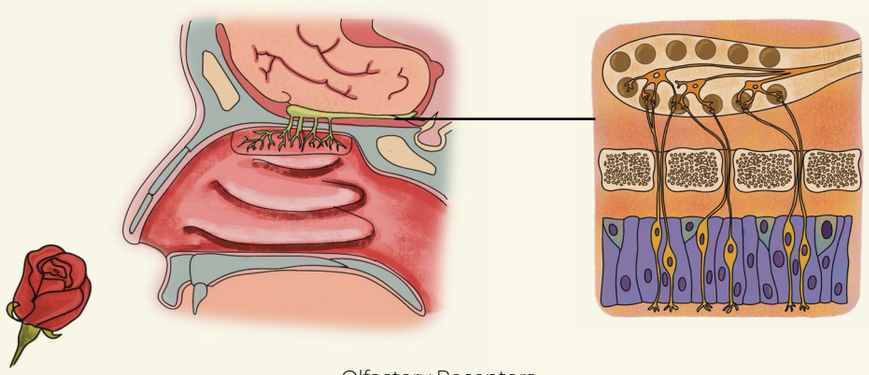
Skin is the somatosensory organ of our body. It is also the largest organ in our body. Our skin contains numerous receptors that can detect touch, pain, pressure and temperature. It is our tactile connection to the external world. When any stimuli comes in contact with our skin, it generates an impulse that is carried to the spinal cord and then the brain where it is given meaning.



Olfactory System

The nose is our body's olfactory organ. It helps us perceive different types of smells and odours. It also supports our sense of taste. The olfactory cells that line the nasal cavity are chemoreceptors. This means that they can detect subtle differences in chemicals. The cilia (hair like structures) and olfactory nerve fibres detect these chemical differences, conduct them as nerve impulses that reach the brain which translates it into meaningful smell.

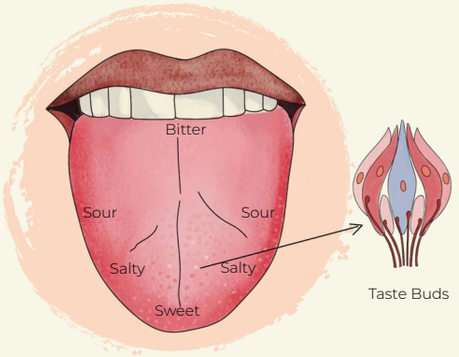
Our sense of taste is influenced by our sense of smell. When we have a cold, the body produces mucus which blocks our sense of smell. This causes us to experience the food we are eating as being bland.



Olfactory Receptors

Gustatory System

The tongue is the sensory organ for the gustatory system. It helps us experience tastes and flavours. Our tongue has several taste buds that help sensing different tastes. We have four primary types of taste buds that detect tastes like sweetness, sourness, bitterness and saltiness.



Special Sensory **Experiences**

Synesthesia is a special sensory phenomenon that some individuals experience. It causes a crossover of different sensory experiences, such as tasting colours, feeling sounds, smelling images, etc. A stimuli causes more than one sense to be activated simultaneously. This isn't a disease or a medical condition. Some people are born with it, some acquire it and sometimes it is drug-induced.

Touch

Sight

While you have five main senses, there are many different things you can identify with each sense. These are perception abilities. Some examples include:

Sight: Colours, patterns, textures, shapes.
Hearing: Volume, pitch, frequency.
Touch: Temperatures, pressure, textures, vibrations, pain.

Taste

Video Resources

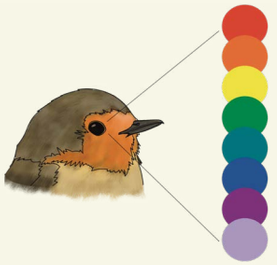
What Is It Like To Have Synesthesia?

Some perception abilities involve more than one sense, like balance. Because there are so many possible combinations between your senses and perception abilities, researchers can identify at least 60 different forms of synesthesia. Some experts estimate there are more than 150 different forms. This is also why many people with synesthesia have it but don't know what it is or that it's unusual.

How Other Creatures **Experience Sensation**

As humans, we have five basic sensory mediums to experience and learn about the environment around us. Different creatures experience the environment around them by different senses, which may not necessarily be similar to humans. For example, birds and bees also have the sense of vision but are able to see different colours than humans, they are able to see lights in the ultraviolet spectrum. Houseflies are able to experience taste from tastebuds on their feet when they land on food. Dolphins are able to assess distances and potential food underwater by means of echolocation.

And so animals, birds and insects all have unique ways of experiencing the world around them sensorially.



Human View

Bird View

Human View

Deer View

Video Resources

The World Through the Eyes of Animals

Reading Resource

The human sensory experience is limited. Journey into the world that animals know.

Learning Plan

Objectives

1. Experience the environment one is in through various sensorial stimuli.
2. Creative expression of different perspectives in observing one's environment.
3. Practice observing, paying attention and documenting one's surroundings.

Lessons and Activities

1. **Observe & Draw**

- Nature Walk - spot, observe and draw
- Nature Walk - a creature of my imagination
- Textures around us

2. **What's that sound!**

Listen, to find out.

3. **Sniff & Slurp!**

Sniff & Slurp

Scan and download worksheets for print here

Activity-1 Observe & Draw

Nature Walk - Spot, Observe & Draw

Resources

1. Nature Walk - collector's list
2. Art supplies

Pre Activity

1. Gather the children and place a simple leaf or flower to look at. Give the children one minute to look at the object and keep it away. Children make a quick sketch of what they recall. Now, pass the object around so each child can hold, feel and observe the object up close. Have multiple objects so each child or small groups of 3 have one. Now, make a drawing of what you observe slowly and pause now and again to observe the object. Inform the children that they are to practise paying close attention and detailed observation for the activity today.
2. Divide the children into small groups of 3-4.

Main Activity

1. Hand out the collector's list to each group. Instruct them that they are to walk around their school premises and find as many things as possible on the list. When they find anything on the list, they are to spend a few moments observing it closely by seeing it up close, touching it and sensing the texture if possible, sniffing it if safe. Make a rough drawing of each of these things.
2. In about 20 minutes, gather the children back and have a short sharing session of all the interesting things they observed and documented.
3. Encourage each child to share the one special thing that caught their attention and what about it attracted them. Encourage them to describe it in as much detail as possible.
4. Inform the children there will be a continuation to this activity the following day.

Things to Discuss

1. Ways of observing anything in nature- see clearly (hold it close, see from a distance, see different angles), does it make any sound, what is it like to the touch, does it have a distinct smell, can it be tasted, etc.
2. Was it challenging to observe one thing for long?
3. Did anything new stand out when observing things closely? Something that they had already seen before but not paid much attention to?

Things to Display

Each child would have brought back one special thing that caught their attention, or a drawing of it. Put these up in a place everyone can walk up to and observe.

Check for learning

Observe the children as they step out in nature to make their observations and drawings. Encourage them to slow down and experiment with different senses while making observations.

Activity-1 Observe and Draw

Nature Walk - Spot, Observe & Draw

Take a walk and find examples of the following prompts in nature. When you do, take a while and observe closely. Make a pictorial depiction of what you observe.

Something with a hole in it

3 things that are yellow

A leaf that is not green or brown

Something that is asymmetrical

Something that is sharp

5 types of flowers

A leaf that is larger than your palm

Something that can fly

Something that creates sound

Something that dissolves in water

Something that catches your attention as being unique or special. If possible, pick it up and bring it back to class with you. Ensure no harm is caused to you or the other in doing so.

Activity-2 Observe & Draw

Nature Walk- a creature of my imagination

Resources
Art supplies

Pre Activity
Gather the children and recall the previous activity of spotting and observing things in nature. Recall what different colours they observed, textures, shapes, elements, etc.

Main Activity
1. Get the children to look over their collector's list from the previous activity. They will be
2. drawing a creature of their imagination.
3. Instruct them that they may go wild with their imagination. The creature may have multiple eyes, no limbs, multiple heads, twigs for hair, thorns for teeth, etc.
4. They are to choose any 5 or more elements from the collector's list while they make this
5. creature. For e.g., a creature with feathers, six legs, yellow in colour, soil like skin texture, a sharp body-part, eyes like one of the flowers and limbs that create a rattling sound like a seedpod.
6. Encourage children to experiment with the different elements from their list and play with the idea of a creature that is unique.
7. When complete, hold a sharing circle for children to present their art work and share a few thoughts about their creature.

Things to Discuss
1. What is a unique characteristic of the creature they made?
2. Was it challenging to break away from the prototype creatures they know of while trying to reimagine a creature?

Things to Display
Children's artwork could be put up in the classroom.

Check for learning
Are the children able to move away from the regular idea of a creature and reimagine something unique, is there a use of at least 5 or more elements from the collector's list.

Activity-3 Observe & Draw

Textures around us

Resources
1. White sheet of paper
2. Crayons
3. Coins- 1, 2 or 5 rupee denominations

Pre Activity
1. Have the children place the coin on a flat surface. Place the sheet of paper on top of the coin. Using a crayon, colour on the paper over the surface of the coin. You will see the design on the coin imprinted onto the paper.
2. Let children experiment with this technique a few more times. Now, let them know that they are going to take a walk and collect texture imprints like these from nature!

Main Activity
1. Divide the children in smaller groups of 4-5. Encourage them to go out and explore the
2. different textures they see. Feel it with their fingers first and then place the paper on it and colour with the crayon gently to get an imprint.
3. Some textures they could gather- different types of tree bark, stone/rock, leaf venation, grainy soil, bird feather etc.
4. Gather back and share the textures each group collected.

Things to Discuss
1. What do textures feel like when you touch them and what do they look like on paper? Is there a difference?
2. If they closed their eyes and felt the texture, does the mind make an imprint like the one on paper?
3. What are the different types of textures they can name- smooth, rough, grainy, rocky, etc.

Things to Display
Children's nature imprints could be displayed in the class.

Check for learning
Check that the children are exploring different types of textures when out in nature.

Activity-4 What's that sound!

Listen, to find out.

Resources

1. Blindfolds for all participants
2. A mixture of different objects that you can create sound with - two stones, a jar of mustard seeds/cumin, two glasses, with water in one, a handful of dried leaves, two sticks, etc
3. Chits with names of different birds and animals that children can mimic- dog, cow, koel, peacock, goat, cat, tiger, etc. Ensure there are two chits per creature.

Pre Activity

Gathering the children together, go over the list of the animals and birds in the chits. As you call out the name of the creature, children call out and mimic the sound of the creature. Ensure that the group agrees on the unique sounds for each creature.

Main Activity

1. Find an open space. Pass the chits around and inform the children that they are not to disclose the names of creatures on their chits. Blindfold all the children.
2. They are to mimic their animal sounds and walk around, finding their partner simply by the sound. Once they find their respective pair, they may stay still.
3. Play a few rounds of this, depending on the energy of the group and their ease with following the game.
4. Settle down, and inform the children that you are going to bring out different things and create a sound. They are to listen carefully and guess what is creating the sound.
5. Ask them all to close their eyes and be as quiet as possible. Bring out each object and create the sound- scratching stones together, pouring water from one glass to another, crushing the dried leaves, etc. Encourage children to guess what the sound might be.

Things to Discuss

1. What can we know about our surroundings by listening carefully?
2. Can all creatures see as clearly? Are there animals that can't see very well but hear clearly? E.g., bats
3. What is the sense organ we seem to use most to know our world? This can be different for different individual

Things to Display

1. The different sound creating objects may be placed around so children could experiment creating
2. different sounds with them and listening.

Check for learning

Are the children able to listen carefully and guess accurately?

Activity-5 Sniff & Slurp!

Sniff & Slurp

Resources

1. A collection of different objects with distinct smells- cut onion, wet soil, cinnamon stick, bay leaf, over-ripe fruit, a flower.
2. A collection of different objects with distinct tastes- cumin seeds, mildly spicy chilly, sweet fruit, sour lemon, cooked potato, curry leaf, etc.

Pre Activity

1. Gather the children and hold a conversation on the different tastes they can define- sweet, salty, sour, spicy, etc. You may choose to discuss with them about the different parts of the tongue that these different tastes are experienced.
2. Do the same for types of smell- sweet, fresh, rotting, etc.

Main Activity

1. Have children sit in small groups of 4-5 and one set of the different objects in small cups at the centre of each group. Some groups could work with smell, and others with taste simultaneously.
2. Within each group, one child picks up a bowl and takes a sniff or small taste. Then pass it around so others may do so as well. They try to describe the object by smell or taste. For e.g., wet soil has a pleasant smell that reminds of rain, lemon has a sour taste, etc. You may choose to do this activity with blindfolds/eyes-closed as well.
3. Repeat the exercise with each object.
4. The same exercise could be manipulated to also experience touch as a way to identify objects. Close your eyes and feel the object. Can you guess what it is?

Things to Discuss

1. Can you taste food by smell? How does something smell 'tasty'?
2. If something smelt bad, could it still taste good?
3. What smells feel comforting? The smell of rain, of old books, of your parent's hug, etc.
4. What are some tastes you enjoy?
5. What would dal taste like if you added jaggery to it? Could you add chillies in Kheer? How does one decide the recipe of dishes?
6. Why does a raw mango and a ripe mango taste so different?
7. Why does food taste bland when we have a cold or a fever?

Things to Display

The different objects may be placed around so children could continue engaging with them through different sensory experiences.

Check for learning

Are the children able to smell/taste carefully and describe them?

‘A quiet moment of greeting in the wild’

CHAPTER-5

Communication in Nature

We are constantly surrounded by all sorts of interactions and exchanges between creatures in nature. Whether it be a colony of ants foraging, a flock of birds calling out to one another or the quiet exchange of nutrients in the wood wide web of fungi amidst the roots of trees, there is communication transpiring in small and big ways, in quiet and loud ways, in visible and seemingly invisible ways! Humans understand one another by means of verbal language, non-verbal cues in body language and gestures and even through art and music. Similarly, creatures in the larger environment have their own unique means of passing messages around and understanding one another.

Communication among Humans

For as long as human beings have been around, we have had a means of communication; be that via gestures, sounds, or complex languages. Humans use language as the primary means of communication in most cases. Different regions and communities have their own language and dialects. Within India, we have 22 official languages. However, there are several dialects of these languages and also languages spoken in remote communities that may not be recognised yet.

Human communication could be broadly classified into the following:

Verbal Communication

This includes all communication using spoken words, or gestures if using sign language.

Non-verbal

This includes the tone, body language, facial expression, use of eye-contact, etc.

Written

This is part of verbal communication but includes language beyond the spoken word and that which comes in the form of writing like letters, emails, posters, billboards, newspapers etc.

Visual

This includes artwork, presentations, imagery, illustrations, physical models etc.

Listening

This includes paying attention to what is being spoken, actively processing it, and responding appropriately.

Video Resource

Types of communication explained with examples

Reading Resource

Types of Communication

Communication among Creatures

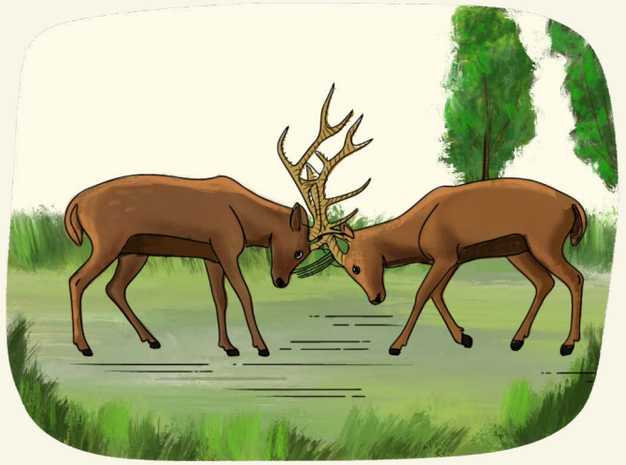
Like humans, creatures in nature too communicate by means of sounds, body language and other visual cues. In addition, they also use chemical and olfactory cues to pass and receive messages. Let us look at some of these basic means of communication.

Tactile communication

Tactile means touch. Mother cats nuzzle their kittens to comfort them, dogs lick their owners to show positive emotion, deers, sheep and other horned or animals with antlers may interlock their horns/ antlers to show domination.

Auditory communication

Animals use a variety of sounds to pass messages. A drongo may call out to warn babblers of a predatory bird, a langur calls out in alarm when there is a big cat around, birds call out to each other to attract mate or communicate with young ones or each other, cows call out to their young with moos, a tiger grunts in greeting to another, whales call out in song to young ones.



Reading Resources

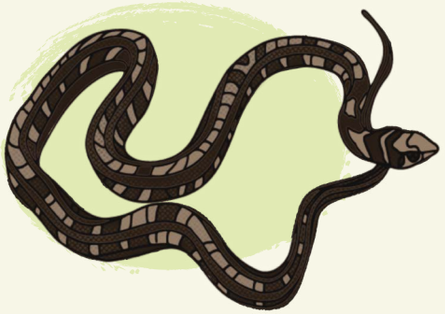
The four types of animal communication

Chemical communication

Many animals have a very strong sense of smell. Some animals may release pheromones during mating season to attract a mate. Tigers, bears, leopards, dogs and cats leave scent trails by urinating to mark their territory. Insects leave scents to warn of danger, ants leave a scent trail for other ants to follow during foraging trips. What might creatures communicate to one another? Do creatures communicate only with other species of their own kind or is there communication between species as well? Dive into the reading and video links below to explore these questions.

Visual communication

Animals and birds may use visual communication to display themselves during breeding season. Some birds will fluff up their feathers, do acrobatic spirals in flight to impress a potential mate. Deers hold up their tail when alert, dogs hide their tail between their legs to show submission, cobras hold up their hood to show defensiveness, etc.



Video Resources

How to Understand Your Dog Better

Monkeys Sound Alarm

How to read elephant body language

जंगल का सोशल नेटवर्क: पन्ना में खलिते जीवन की जड़

Communication among **Trees**

There has been increasing evidence that trees don't lead isolated solitary lives and that they may behave like social beings in forests. There is recent research that shows that trees may be connected by an intricate root system which are in turn connected by fungi. Scientists refer to these as mycorrhizal networks and some even call it the wood-wide web! Trees exchange nutrients and even distress signals about disease, insect attacks, etc.

The fine, hairlike root tips of trees join together with microscopic fungal filaments to form the basic links of the network, which appears to operate as a symbiotic relationship between trees and fungi, or perhaps an economic exchange. As a kind of fee for services, the fungi consume about 30 percent of the sugar that trees photosynthesize from sunlight. The sugar is what fuels the fungi, as they scavenge the soil for nitrogen, phosphorus and other mineral nutrients, which are then absorbed and consumed by the trees. (Richard Grant, 2018)

Video Resources

The secret language of trees

How Trees Secretly Talk to Each Other

Reading Resource

Do Trees Talk to Each Other? | Smithsonian

Learning Plan

Objectives

1. Learn about and observe the way different creatures communicate in nature.
2. Explore the different reasons why creatures communicate.
3. Compare and contrast mediums of communication between humans and creatures.
4. Understand how humans communicate with other creatures and vice versa.

Lessons and Activities

1. **Humans and other Creatures**

- What is my dog telling me!
- How do creatures communicate with each other?

2. **Types of Communication**

- Chit-chat among Creatures
- tap-tap-squeeze
- Human Communication

Scan and download worksheets for print here

Activity-1 Humans and Other Creatures

What is my dog telling me!

Resources

1. Picture-cards : Animals and Cue Cards
2. Worksheet- Creatures & Sounds

Pre Activity

1. Gather the children and ask them to show in action how they would communicate - I'm excited, I'm impatient, I'm shocked, I'm scared. Now, ask them to do the same but with sounds (not words). For e.g., I'm happy- haha, I'm shocked- haaawww!
2. Have a short conversation on- are there ways to communicate with each other without using words? What could they be? (gestures, sounds, body-language, drawings, etc)

Main Activity

1. Call out two children as volunteers. One of them picks up the picture card and the other picks up the adjoining phrase. One child is a human and the other pretends to be the creature in the picture card.
2. First, ask the child playing the role of human to read out the phrase and then show in action or facial expression, how they would communicate that. For e.g., 'leave me alone' - walking away in a huff, pushing away with hands, etc.
3. Now, the second child communicates the same phrase as the creature (e.g. cat). For e.g, 'leave me alone' - pretend to be curled up like a cat, jump off and walk away on all fours, maybe let out a meow.
4. Repeat the exercise with all the creature-phrase pairs.

Green Humour: Elephant Gestures and What They Mean

Things to Discuss

1. Are there ways in which animals communicate to us? What are some examples?
   - A dog barks and snarls to show anger
   - A dog wags its tail to show friendliness
   - A cat purrs when satisfied and cosy
   - A bird calls out in alarm when anxious about danger
   - An ant bites when threatened
   - A horse wrinkles and elongates its nose and pulls the ears back towards the top part of the neck and raises its head when angry
   - An elephant charges towards the threat when defensive
2. Are there ways in which humans can communicate with animals? How do you call the cows back from grazing, how do you comfort an injured dog?

Things to Display

Show the following chart to the children and briefly discuss it. Then, the children could make their own version of this chart with different animal/bird gestures they know of and what they mean.

Check for learning

Ability to discuss and think of ways of communicating and understanding one another beyond language.

Worksheet : Creatures & Sounds

Activity-1 Humans and Other Creatures

Animals and Cue Cards

Each animal card is paired with a prompt card. The prompt is to be enacted by one child as a human would, and then by another child as the animal would.

How does a horse behave when angry?

What does a cat do when it doesn't want to be petted?

What sounds might a cow make when in pain?

I'm angry

Leave me alone

I'm in pain

What does an ant do when you disturb it?

What does a bulbul do when you go too close to its nest?

How does a dog show its happiness?

You are in my place

Don't come near my house

I'm happy to see you

Activity-2 Humans and Other Creatures

How do creatures communicate?

Resources

1. Magnifying lens
2. Observation Sheet

Pre Activity

1. Gather the children and recall the conversation about interaction between humans and other creatures. How do humans communicate to cows or dogs? Now, do dogs talk to each other? What about birds?
2. Do birds talk to dogs? Do monkeys talk to deer? What would they talk about? How would they talk to each other?

Main Activity

1. Watch this video :
   - Monkeys Sound Alarm To Save Deer From A Tiger (English)
2. Have a conversation on what was watched- what did the langur do, why is the langur trying to alert the deer? Is the langur alerting the deer or just other langurs?
3. Inform the children that they are going to step out and try to observe other creatures in communication. For e.g., a colony of ants, birds calling to one another, dogs interacting with other dogs or cows, insects, etc.
4. Step out for a short nature walk with the observation sheet. Children could work in small groups of 2-3 and fill up the observation sheet. Use the magnifying lens to observe ants or other small insects.

Things to Discuss

1. What are the different ways animals communicate with each other? Sniffing, making sounds, gestures like rubbing against each other/stomping the foot.
2. Why is there a need to communicate between creatures?
3. What happens if communication is disturbed? E.g., what happens if birds can't hear each other because of loud traffic sounds in the city or if we disturb a line of ants?
4. Put up the infographics on racket-tailed drongo and barking deer. Discuss what calls they make and why they do so, if possible play audios of the same.

Things to Display

1. Children could make a pictorial chart of different intra-species (line of ants) communication or inter-species (langur and deer) communication.
2. Infographics from RoundGlass Sustain :
   - Greater Racket-tailed Drongo : Facts , Calls , Threats
   - Barking Deer: Facts, Alarm Call, Chromosomes

Check for learning

Ensure that children are observing keenly, are they aware of communications happening around them between things in nature.

Monkeys Sound Alarm To Save Deer From A Tiger

Barking Deer: Facts, Alarm Call, Chromosomes

Greater Racket-tailed Drongo : Facts , Calls , Threats

Activity-2 Humans and Other Creatures

Creatures and Sounds

Match the creature to the sound it makes

Name of the Creature	Sounds of Creatures	What does it actually sound like, phonetically?*
Horse	buzzes	
Cow	chirps	
Donkey	barks	
Mosquito	roars	
Frog	neighs	
Crow	trumpets	
Snake	moos	
Dog	hisses	
Tiger	croaks	
Elephant	brays	
House Gecko	caws	

* Don't worry about the spellings children use. For e.g., house gecko's sound could be 'tchak-tchak'.

Activity-2 Humans and Other Creatures

Observation Sheet

How do creatures communicate with each other?

Name of the Creature with a rough sketch of what you see.			
Describe the environment where the creature is.			
What is it doing?			
Is it interacting with its own kind or a different species?			
What do you think it is communicating?			

Name of the Creature with a rough sketch of what you see.			
Describe the environment where the creature is.			
What is it doing?			
Is it interacting with its own kind or a different species?			
What do you think it is communicating?			

Activity-3 Types of Communication

Chit-chat among Creatures

Resources

1. Picture cards of Creatures in Conversation
2. Audio Clippings of some species
   - Whale Song
   - Alarm call by Deer and Langur
   - Koel Song
   - Sound of Cicada

Pre Activity

Gather the children and recall the observations made in the previous classes on different ways in which creatures communicate with each other. Today, they will be learning about some select creatures and how they communicate with one another.

Main Activity

1. Pick up the picture cards and holding out each card, spend a few minutes discussing:
   - What is the name of the creature? Does it live in groups or solitary?
   - What kind of things would they communicate with each other?
   - How do they communicate?
2. Where relevant, play the audios. You may choose to play the audio first and ask children to guess what is making the sound, and then introduce the picture card and follow with a discussion.

Things to Discuss

1. Talk to children about how ants leave a chemical trail that can be sniffed by other ants, dogs sniff each other's behind, rhino's smell each other's poop to know the health of the other, birds call to each other, bees use a dance to communicate source of food, crickets make sounds with their body to attract mates, tigers leave their scents on trees, etc.
2. Share perspectives on how different creatures have evolved unique ways to communicate based on their biology and environment.

Things to Display

Picture cards with information may be put up in class. Children could add some of their own as well.

Check for learning

Children could be encouraged to write an imaginary story of a conversation between animals using the different types of communication they have learnt about. They may also enact the story if writing is a challenge.

 Whale Song

 Koel Song

 Alarm call by Deer and Langur

 Sound of Cicada

Activity-3 Types of Communication

Chit-Chat among Creatures

Ants are eusocial insects. They form colonies that could range from a few dozen individuals to millions. They communicate with one another using sounds, touch and pheromones (chemical secretion). When ants are out foraging, they leave a pheromone trail so other ants may follow. When their path is blocked, ants try to find a new route and leave a chemical trail once found. They also release these chemical signals to communicate distress when attacked. Some ant species produce sound by stridulation using their mandibles.

Dogs that we interact with in our homes and surroundings are a domesticated species. There are several breeds of dogs today. Dogs communicate via facial expressions, vocalisation, eye-gaze, body posture (movement of tail/limbs, etc), gustatory means (scents, pheromones, taste). Dogs mark their territories by urinating, leaving their scent. They also sniff each other to identify one another as individuals and also as a calming mechanism. They can detect the health, sex and mood of the other individuals by sniffing. Dogs may avoid eye contact to show submissiveness, snarl to show aggression, wag their tails to show joy. There are intricate details and differences in these behaviours that mean different messages.

Whales are among the heaviest known animals, the blue whale being the largest of them all. The picture here is of a humpback whale. They live in social groups and are known to be very intelligent. Whales have been recorded to have different vocalisations, including melodic sounds known as whale song. They emit two distinct acoustic signals- clicks and whistles. They use these sounds for various purposes, including calling to one another or to an offspring. Small whales have been observed playing by producing bubble rings in the water.

White-throated kingfishers are tree kingfishers. They are often found well away from water bodies and prey on small reptiles, crabs, rodents and even birds. During the breeding season, they call loudly in the mornings from prominent perches. The male will take a 'gift' for the female as a courtship gift. The gift could be a small reptile or some other prey. They also spread their wings in display and hold their bill up to show their white throat.

Grey langurs are a social species and live in social groups that could either be one male, several females and offspring or multiple males and females of different ages or all male groups. They have intricate hierarchies and display dominance in aggressive ways with vocalisations and fights. Females tend to have friendly relations and engage in many activities together- foraging, travelling and resting. Langurs can be seen grooming one another. They have several vocalisations- whoops by adult males during display, cough barks during movements, honks while interacting, hiccups when they find another group, harsh bark to signal alarm on seeing predators, etc.

Sambar is the largest deer species in India. They prefer dense cover of deciduous shrubs and grasses. The males live alone most of the year, while the females live in small herds. They communicate mostly by scent marking. They stomp their feet when alert to potential predators and may also raise their tail. They can also make short, high-pitched sounds. When threatened, say by dogs, several sambar may stand together touching rumps and vocalising loudly.

Cicadas are social insects, not hyper-social like ants and bees though. There are about 200 different species in India alone! Some species of male cicada create a sound by rubbing their wings in a process called stridulation. This is the sound that fills the forests in the monsoon. Cicadas sing in scattered groups to attract females during breeding season. Sometimes, they also make a broken and erratic sound to communicate panic or distress when in danger.

Honey bees are social insects and live in large colonies. Each member in the colony has distinct roles - queen bee, drone bee, worker bee - to keep the colony thriving.
Worker bees are females and are primarily responsible for foraging, among other responsibilities at different stages of their lives. When they find a source of nectar, they come back to the hive and use a waggle dance (moving in a certain pattern) to communicate to the others about the direction and distance to the nectar. This is tactile communication.
They also rely on chemical and olfactory communication. For example, the queen bee emits pheromones to summon worker bees.

The **Indian rhinoceros** or great Indian one-horned rhinoceros is mostly a solitary animal. They come together during breeding season and when rearing calves.
They have an excellent sense of hearing and smell, but relatively poor eyesight. More than 10 distinct vocalisations - snorting, honking, bleating, groaning, rumbling, humphing- have been recorded. In addition to verbal and auditory communication, rhinos use olfactory (sense of smell) communication. They defecate in dung piles and individuals are able to recognise identity, age, sex-category and reproductive status of other individuals from smelling the dung. They often greet each other by waving or bobbing their heads, nuzzling noses or licking.

Sloth bears walk in slow, shambling gait. Adults may sometimes travel in pairs. They are known to produce several vocalisations such as howls, squeals, screams, barks and trumpet-like calls. Each of these sounds are used to communicate different messages, some to show aggression during an encounter, some as a warning signal, some to convey disturbance, etc. Young cubs yelp when they are separated from the parent. Bears also leave their scent on trees by rubbing their flanks and scraping with their forepaws to communicate territory.

The **Bengal tiger** is mostly a solitary animal, coming together for breeding and rearing offspring.. Adults sometimes congregate temporarily when there is plentiful food.
Tigers usually maintain home ranges and tend to move within this territory for prey, water and shelter. Tigers are aware of each other's movements and territories by the scent trails they leave by spraying urine. The odour can last up to 40 days! It is this same scent that helps cubs track their mother's path as each individual has their unique scent. Scent glands are present between toes, tail, anus, head, chin, lips, etc.
Tigers also use visual cues to communicate. Aggression can be displayed by rapidly moving the tail from side to side or intense twitches. They use sounds like roaring to signal sexual receptivity, calling to young, moaning while calmly walking and chuffing as a friendly greeting with other tigers.

Trees are among the oldest beings on the planet. Whether they communicate with each other is an ongoing question in research. Some researchers suggest that trees of the same species can be social beings and communicate with one another through an underground network of mycelium.
They have been found to share resources with one another through this fungal network. They use chemical, hormonal and slow-pulsing electrical signals, which are still being studied by scientists. Trees are also known to engage in chemical signalling- flowers emit fragrance to attract pollinators, plants may emit a chemical signal to communicate threat, say of an insect attack, which causes other nearby plants to emit foul tasting chemicals into their own leaves to ward off the insect.

Activity-4 Types of Communication

Tap-Tap-squeeze

Resources

1. Any large, light weight object that won't roll away. For e.g., a book, a small rock, a basket, etc. You will need as many as the number of groups.
2. Blindfolds- as many as the number of groups.

Pre Activity

1. Recall with the children how humans and creatures both use different ways of
2. communicating with each other. Humans have used language as the easiest means to pass on a message. What if we did not have a language or if we did not have the ability to speak, how do we communicate then?

Main Activity

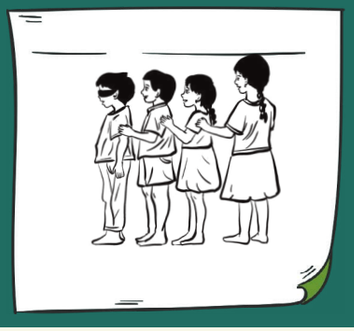
1. Divide the children into groups of 6-7 children. Line them up, the person in the front will be blindfolded. The person at the end is the main guide.
2. Before you blindfold anyone, show the group the object they are going to be looking for. Now, blindfold the first member and place the object at a slight distance.
3. All groups stand in a straight line, with their arms resting on the shoulders of the person in front, like a chain or a train.
4. Now, the person at the end begins to guide the train to move towards the object.
5. The rules are:

- They cannot use any verbal communication. Only through gestures and the sense of touch, the group needs to find a way to get to the object.
- Only the person at the end gives/changes instruction, the rest only follow and copy.
- The person in the front is blindfolded.
- The mission is complete when the person in the front picks up the object.

6. Let the children have a few minutes to discuss what gestures they are going to use before you start the game. For e.g., single tap on the right shoulder means turn right, tap on both shoulders means keep walking straight, pinch on the neck means bend down, double pinch means bend and pick up, etc.
7. You may choose to do a trial round before the final. You may choose to time the groups.

Things to Discuss

1. How did they arrive at what the gestures would be?
2. Was it easy to follow the instructions without any verbal cue?
3. What was challenging about following the cues?



Check for learning

Is the child able to follow the rules of the game, come up with gestures and follow them, etc.

Activity-5 Types of Communication

Human Communication

Resources

Paper cups, string and tape
(enough for each pair in the group)

Pre Activity

1. Gather the children and have a short conversation on different ways in which humans communicate- speech, gestures, body-language, writing, etc.
2. What if you can't see the person? How do you communicate then?

Main Activity

1. Let the children know that they are going to be making a short distance telephone set-up!
2. Divide the children into pairs. Demonstrate how to make a string phone and have children do the same in pairs.
3. Let the children experiment with using this string phone- what makes it work, when does it not work, what is the best way to use it, etc.
4. Once children have experimented with this, gather them back to discuss the different means of communication we have to talk to people far away - cellphone, email, letters. And means to communicate to larger groups at once - radio, posters, newspaper, microphone.
5. Divide the children into small groups of 5 each. Present each group with a scenario and ask them to come up with a plan to carry out the communication. For e.g., Make an announcement to the villagers about a new clinic opened for cattle, inform a family member living in a different city about a wedding in your house and invite them, share a picture of your notebook with a friend who missed school, find out if someone in class has seen your pencil box, etc.
6. Let the children come up and share how they'd communicate and enact it out with some props. For e.g., make a demo poster announcing the new clinic, role-play to ask around for the lost pencil box, etc.

Things to Discuss

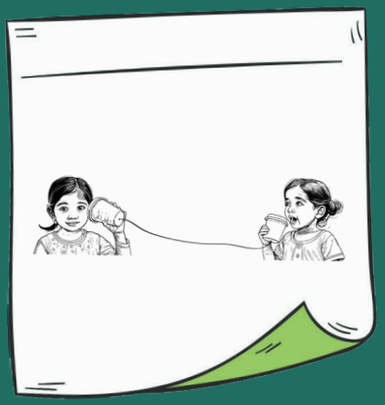
1. Why do we have so many different means to communicate? Did they always exist?
2. What are some means of communication that we no longer use?
3. How do we decide the most effective means to communicate?

Things to Display

A model of the string phone may be kept in the classroom.

Check for learning

Are they able to decide the most effective means of communication as per the situation.



Paper Cup Telephone

The Sciencew of the String Phone!

‘Enthusiasm in children, a key aspect of learning’

Hyperlinks

Ch1 - Our Home

Kutcha and Pucca Houses

Video Resource:

Types of Houses

Shelters made by other Creatures

Bee Hives - **Video Resource:**

Inside the BeeHive what honey bees do

Leaf Cutter bees

Wasp Nests

Wasp Builds Unique Nest for Her Young | Trials Of Life | BBC Earth

Fascinating: Hornets Build An Elaborate Nest Inside a Tree

Butterfly Cocoons

Caterpillar Cocoon Timelapse | BBC Earth

Tiger-moth

Weaver-Ant Nests - **Video Resource:**

How Do Weaver Ants Build Their Nests?

Ant Hills

What's Inside An Anthill?

Termite Mounds

Fascinating Termite Architecture | Trials Of Life | BBC Earth

Hyperlinks

Bird Nest - **Video Resource:**

Weaver Bird building Nest

How Swallows Adapted to Build Mud Nests

Tailorbird building nest

Indian Funnel Web Spider

Spider Webs:

How Spiders Make Webs

Blog Resource:

Wild Wanderer - spiders

Ch 2 -Exploring Mapping

Types of Maps

Video Resource:
Types of Maps

Maps and Geography in the Ancient World

Maps and Directions

Map - National Geographic

Why all world maps are wrong

Habitat Mapping Game

What is a Map?

Mercator Misconceptions: Clever Map Shows the True Size of Countries

Activity 5:

Fun for children: How to make a town map

Hyperlinks

Ch-3 Exploring Soil

Physical Characteristics

Video Resources:
Soil Properties

What is Soil (and Why is it Important)?

Types of Soil found in the Area (Central India)

Video Resource:
Soils of India

Reading Resource:
Types of Soil in India

Layers of the Soil/ Soil Profile

Reading Resource:
Soil Horizons: Definition, Features, and Diagram

Soil Profile and Soil Horizons

A close-up of creatures living beneath the soil

Life in the Soil

Video Resources:
The Living Soil: How Unseen Microbes Affect the Food We Eat

Farming Types: 12 Different Types of Farming Methods Practised in India

Activity 2:

Paint with Clay

Activity 3:

Soil Profile

Activity 4:

Water Flow and Absorption Test

Activity 5:

Soil Pollution

Hyperlinks

Ch-4 Life of Mahua

The uses and benefits of the Mahua tree

Video Resources:
Mahula Flower | Traditional and Contemporary Uses

Brewing of Mahua Wine in Chhattisgarh

Mahuya Flower Laddu Recipe by Santali Tribal Women

महुआ का पकोड़ा और लप्सी

Madhuca Indica (Longifolia) oil extraction

Medicinal properties of Mahua tree

महुआ के फायदे जानिए क्यों कहा जाता है महुआ को

Reading Resource:
Mahua: A boon for pharmacy and food industry

Role of Mahua in the Environment

Watch: How the mahua flower shapes the life and culture of tribal communities in Madhya Pradesh

Video Resources:
Mahua- The People's Tree

Activity 2:

Mahua Flower Laddu Recipe by Santali Tribal Women

महुआ का पकोड़ा और लप्सी

Hyperlinks

Ch-5 Sensorial World

Sensory Organs

Video Resources:
The Five Senses | The Dr. Binocs Show

Human Sense Organs | Learn about five Senses

Sensory Systems

Video Resource:
Visible Body | The 5 Senses - Sight, Sound, Smell, Touch, and Taste

Sensory Experiences

Special Sensory Experiences

What Is It Like To Have Synesthesia?

How other creatures experience sensation

Video Resources:

The World Through the Eyes of Animals

Reading Resource:
The human sensory experience is limited. Journey into the world that animals know.

Hyperlinks

Ch-6 Communication in Nature

Communication among Humans

Video Resource:
Types of communi-cation explained with examples

Reading Resource:
Types of Communication

Communication among Creatures

How to Understand Your Dog Better

How to read elephant body language

जंगल का सोशल नेटवर्क: पन्ना में खलिते जीवन की जड़

The four types of animal communication

Activity 1:

Green Humour: Elephant Gestures and What They Mean

Activity 2:

Monkeys Sound Alarm To Save Deer From A Tiger

Greater Racket-tailed Drongo : Facts , Calls, Threats

Barking Deer: Facts, Alarm Call, Chromosomes

Activity 3:

Whale Song

Koel Song

Alarm call by Deer and Langur

Sound of Cicada

Activity 5:

Paper Cup Telephone

The Science of the String Phone!

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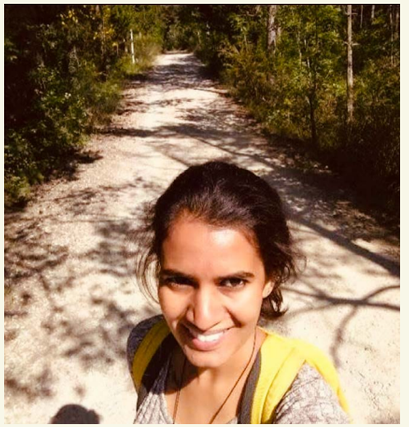

Ankita cherishes leisure and enjoys spending time observing and documenting the going-ons in the natural world. She grew up in the University of Hyderabad campus where much time was **spent by the lakes, climbing trees, spotting birds and reptiles**. Her childhood continues to inform her interests and curiosities.

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If you have used our book in your class-rooms, we'd love to hear from you!

Please share any feedback, thoughts and queries on :

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‘Like a tigress in the wild, the Gond woman roams her sacred land’