# Kaushal Bodh

## Vocational Education

## Activity Book for Grade 7




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एन सी ई आर टी
NCERT
राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

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Vocational Education Activity Book for Grade 7

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# Foreword

The National Education Policy 2020 envisages a system of education in the country that is rooted in Indian ethos and its civilisational accomplishments in all domains of human endeavour and knowledge, while at the same time preparing the students to constructively engage with the prospects and challenges of the 21st century. The basis for this aspirational vision has been well laid out by the National Curriculum Framework for School Education (NCF-SE) 2023 across curricular areas at all stages. Having nurtured the students' inherent abilities and touching upon all the five planes of human existence, the *pañchakośhas*, in the foundational and the preparatory stages have paved the way for the progression of their learning further at the middle stage. Thus, the middle stage acts as a bridge between the preparatory and the secondary stages, spanning three years from Grades 6 to 8.

The NCF-SE 2023, at the middle stage, aims to equip students with the skills that are needed to grow, as they advance in their lives. It endeavours to enhance their analytical, descriptive, and narrative capabilities and to prepare them for the challenges and opportunities that await them. A diverse curriculum, covering nine subjects ranging from three languages, including at least two languages native to India, science, mathematics, social sciences, art education, physical education and well-being, and vocational education, promotes their holistic development.

Such a transformative learning culture requires certain essential conditions. One of them is to have appropriate textbooks in different curricular areas as these textbooks will play a central role in mediating between content and pedagogy—a role that will strike a judicious balance between direct instruction and opportunities for exploration and inquiry. Among the other conditions, classroom arrangement and teacher preparation are crucial to establishing conceptual connections both within and across curricular areas. The National Council of Educational Research and Training, on its part, is committed to providing students with such high-quality textbooks. Various Curricular Area Groups, which have been constituted for this purpose, comprising notable subject experts, pedagogues, and practising teachers as their members, have made all possible efforts to develop such textbooks.

*Kaushal Bodh*, the activity book of vocational education for Grade 7, is one of these. Its content comprises projects related to three work forms—life forms, machines and materials, and human services. The projects will help students to develop knowledge, skills, attitude and values alongside ecological sensitivity, gender sensitivity, digital skills, and life skills. For all practical purposes, it has, to my mind, succeeded in its curricular goals: first, to foster natural curiosity among students through a proper selection of project; and second, develop among them the core competencies, such as communication, creativity, critical thinking and green skill and vocational skills, such as application of tools, and procedures for design and developing products by intelligently designing various activities, thereby seamlessly integrating content and pedagogy within meaningful contexts. However, in addition to this textbook, students at this stage should also be encouraged to explore various other learning resources. School libraries, laboratories and workshops play a crucial role in making such resources available. Besides, the role of parents and teachers will also be invaluable in guiding and encouraging students to do so. With this, I express my gratitude to all those who have been involved in the development of this activity book and hope that it will meet the expectations of all stakeholders. At the same time, I also invite suggestions and feedback from all its users for further improvement in the coming years.

Dinesh Prasad Saklani
*Director*
National Council of Educational
Research and Training

New Delhi
*March 2025*

# About the Book

*Kaushal Bodh,* the activity book of vocational education for Grade 7 is developed in alignment with the vision of the National Education Policy (NEP) 2020 and the National Curriculum Framework for School Education (NCF-SE) 2023.

In the National Curriculum Framework 2023 (NCF-SE 2023), work has been categorised under three broad forms: work with life forms, work with machines and materials, and work in human services. The intent at this stage is to provide vocational exposure to the students through a wide range of activities categorised into three forms of work. To achieve this, students are expected to take up nine projects across Grades 6 to 8, i.e., three projects in each grade and one from each form of work.

Curricular goals, competencies, and learning outcomes have been the guiding principles while developing the activity book. The following Curricular Goals (CG) given in the activity book cover a range of competencies.

**CG-1:** Develops in-depth basic skills and allied knowledge of work and their associated materials or procedures;

**CG-2:** Understands the place and usefulness of vocational skills and vocations in the world of work;

**CG-3:** Develops essential values while working across areas; and

**CG-4:** Develops basic skills and allied knowledge to run and contribute to a home.

The activity book contains six illustrative projects, two for each form of work, intended to cover the above curricular goals. The choice of projects is left entirely to schools. One project may be taken up by students or preferably, the school can design other projects based on local considerations. The NCF-SE 2023, and indeed this activity book, encourages schools to select projects based on local considerations and availability of resources. Annexure 1 provides a template for designing a project other than those in the book.

The illustrative projects are as follows:

Project 1 is on developing a Plant Nursery. Students will engage in creating and maintaining a plant nursery on school grounds or in pots.

They will learn about the various agricultural practices through field visits and hands-on learning, with a focus on the conditions essential for the propagation of plants.

Project 2 is on developing a School Habitat Garden. Students will study a variety of life within the school premises or nearby areas and learn about the needs of different groups of animals. They will design a garden, including non-plant elements, to meet these needs. This project will enhance their observational skills, knowledge of biodiversity, and the significance of conservation. It will also instill a sense of environmental stewardship and the importance of protecting natural habitats.

Project 3 is on Tie and Dye. In this project, students will explore various techniques used for tie and dye. They will learn to use tools and materials to create functional or artistic items, fostering creativity, problem-solving, and technical skills. This project will encourage innovation and creative thinking, preparing students for potential careers in design and fashion.

Project 4 is on developing an AI Assistant. It will introduce students to the fundamentals of machine learning. They will learn to train a machine to identify data related to their surroundings. This project will enhance their technological proficiency, creativity, and logical thinking.

Project 5 is on Puppetry. Storytime with Puppets project will help students develop the skills of writing a script, making puppets and putting up a show to narrate a story of their choice or to develop awareness. This project will cultivate an appreciation for heritage, enhance organisational skills, and promote teamwork. It will also provide a platform for students to express their creativity.

Project 6 is on developing a Family Health Handbook. In this project, students will reflect on the components of physical health and mental well-being. They will learn about the needs of people of different age groups. This project will teach them how to respond in case of ill health, the importance of healthy eating, and the importance of physical activity and social interaction.

As the culmination of the work done through the year related to vocational education, a *Kaushal Mela* will be organised by the school at the end of the year to showcase the products students have created and

the services they have learnt. It will also be an opportunity for students to share their experiences and learnings. Community members and key functionaries may be invited to the *Kaushal Mela*.

Finally, annexures include a planning template, competencies and learning outcomes to be achieved in Grade 7, suggestive projects in each of the forms of work in some detail, and time required for each of the illustrative projects.

Cross-cutting themes, such as Indian Knowledge Systems, values, heritage, gender sensitivity, and inclusion have been integrated into all the projects. Reflective and thought-provoking questions included under different activities are engaging and they promote joyful learning along with assessment. Students are provided opportunities to do different things, record small successes, take and give feedback, work with peers, try and re-try tasks, answer questions, reflect, and experience the values related to work. Illustrations have been designed depicting the context and processes to enhance learning. In-text questions are also included to assess comprehension of the idea or the subject. At the end of the project, questions given in 'Think and Answer' are designed to encourage critical thinking, reasoning, and analysing.

Students can access the additional resources provided in the Quick Response (QR) code for each project.

We sincerely hope that students will enjoy doing these projects and they will help develop the desired and intended competencies.

Vinay Swarup Mehrotra
*Professor* and *Member Convener*
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# Note for School Heads and Teachers

Teachers are pivotal to achieving the goals set out in the National Education Policy (NEP) 2020. The National Curriculum Framework for School Education (NCF-SE) 2023 introduces vocational education as a distinct subject starting in Grade 6. The purpose of this subject is to promote 'learning by doing', 'dignity of labour', and the development of vocational capacities through exposure to a wide range of work. Successful implementation will aid in developing responsible and confident adults who value all professions. Vocational education in schools also offers a robust medium for holistic learning by offering students opportunities to apply conceptual learning in other curricular areas to real-life situations.

In Grade 7, students will take up one project in each of the 'Forms of Work'. The sequence of these projects is not important, so long as all the projects are completed within the academic year. These projects can be taken up at the same time or one after the other. Groups of students may also take up different projects, which depends on the nature of the project and other factors, such as the number of students, resources available, and so on. Please note that it is important to identify concepts across curricular areas that students need to know (e.g., seed germination for projects on Life Forms) and ensure that they have been covered before starting the project.

In this activity book, the projects are designed as per the Learning Outcomes for Vocational Education in Grade 7. The focus is on the following:

1. Using physical tools/equipment for carrying out different processes to perform authentic tasks.
2. Gaining clarity about what is to be done and reaching the final outcome through breaking down a task into smaller activities that are easier to complete.
3. Understanding how to prepare materials and use tools and equipment, while following safety measures and protocols.
4. Connecting the activities done in school to the world of work.
5. Assessing work done in terms of quantity and quality.
6. Applying what is learnt in school to daily life.
7. Working collaboratively in groups while ensuring individual participation in each activity.

In doing so, students will be able to develop values related to work, particularly respect for all work. They will realise the importance of the dignity of labour, which means that no work is considered superior and therefore, no work or person should be discriminated against on any basis.

The projects in the Activity Book are illustrative. Schools can choose to take up any one or design their own from each form of work.

Annexure 1 provides guidelines for designing a project in alignment with curricular goals, competencies and learning outcomes.

Annexure 3 has details of five additional projects in each form of work.

Thus, for each form of work, schools may (i) select one project from each form of work; (ii) design their own projects; (iii) further detail out any one of the additional projects given in the Activity Book.

## Pedagogy and Assessment

Projects comprise a set of activities that are generally expected to be completed in a group or individually, as required. Resources for projects (e.g., tools, equipment, materials, use of workspaces, etc.) and resource persons or master instructors (e.g., mechanics, farmers, craftspersons, artisans, persons working in technology, and experts in the field) must be drawn from the community. Exposure visits and interactions with professionals are built into the project to enable students to observe and understand work in real settings.

The total time allotted to vocational education is 110 hours or 165 periods in one academic year, excluding time for assessment, school events, bagless days and similar activities (Section 4.3 of the NCF-SE 2023). These periods may be distributed across the week as two blocks of two periods on week-days and one period on Saturday.

Each project is expected to be completed in about 30 hours (approximately 55 periods of 40 minutes each). This duration is to ensure a long-term engagement that allows students to complete a set of interrelated activities. It also gives them time for trial and error, to try out things differently, and to extend their learning into other activities.

The focus of the projects must be creativity and demonstration of skills, and the process of 'doing' rather than just the 'product' or

outcome. Working in groups and observing people with expertise is important to foster an appreciation for teamwork, creativity, sensitivity, persistence, and other important values related to work.

Students must be active throughout, as they take up activities that are directly connected to real life and the world of work. They must be able to integrate learning from other curricular areas into the projects. Prevalent biases must be addressed, for example, by not assigning specific work roles to a particular gender or to students from a specific social group. All students must participate in the activities. To ensure the participation of students with disabilities, projects can be adapted or an entirely different project may be developed.

The activity book is designed to enable continuous assessment by teachers, as well as self and peer-assessment by students. The questions and formats for recording require students to assess their own progress, share their learning and reflections, and record their answers as they move from one activity to the next.

Students must also maintain a portfolio in order to help them see their own progress, and record the processes and products related to the projects. It may contain any work done by students, including additional notes, presentations, sketches or photographs (besides those in the activity book) related to the project, and products they have created.

Assessing the inculcation of values related to work (e.g., initiative, persistence and focus, responsibility, discipline, eye for detail, curiosity and creativity, empathy and sensitivity, and willingness to do physical work) is particularly important. Students must be observed while at work to assess the same. Checklists and rubrics that outline specific behaviours and attitudes related to work values may be developed by the teachers. Annexure 2 contains the competencies to be developed across the middle stage and the learning outcomes to be achieved in Grade 7.

While this is true for all subjects, the role of feedback is particularly important in vocational education. Students must be encouraged and motivated by recognition of their work and their creativity. This approach ensures that all students are able to complete their work successfully through ongoing guidance, which in turn is motivating.

Summative assessment for Grade 7 can, for example, comprise a viva voce, presentation, role play, simulation, group discussion, presentations, and the review of students' responses to prompts or questions in the activity book. The paper pencil test, could include situational questions, concept maps, flowcharts, questions related to learning from visits, and multiple-choice questions. Each project also has a set of questions in the last section. These questions address key aspects of learning and concepts that are strengthened while doing the activities. To reiterate, the focus must be on assessing capacities and understanding of processes.

A suggested weightage and marking scheme for assessment and evaluation is given below:

| Mode of Assessment | Weightage |
|---|---|
| Written Test | 10% |
| Oral Presentation/Viva Voce | 30% |
| Activity Book | 30% |
| Portfolio | 10% |
| Teachers' Observations during Activities | 20% |

## Criteria for Project Selection

The activity book is meant for students, and therefore speaks to them. There are various components in each project, as indicated by the headings of sections (please refer to Annexure 1). These components are aligned with the competencies defined for vocational education in the NCF-SE 2023 (please refer to Annexure 2). Therefore, any project other than those in the activity book must include the same components. Examples of additional projects are given in Annexure 3.

The projects in this activity book are not mandatory, therefore schools are free to choose any one of these from each form of work or design an entirely different project. Students must also be encouraged to come up with ideas for projects.

If you and the students decide to choose a project other than those in the activity book, the following must be kept in mind for all the forms of work:

1. Is the project appropriate for students in Grade 7?
2. Does the project help students use learning from other subjects?
3. Is the project related to the work the students see around them?
4. Will the students be able to interact with persons who are experts in the work related to the project?
5. Will the students be able to get hands-on experience?
6. Will students be able to take up different kinds of activities within the project?
7. Will students find the activities within the project challenging and interesting?
8. Will students learn something they can use at home?
9. Will it develop the values related to work, particularly the dignity of labour?
10. Will the project help students acquire vocational capacities for their daily living (e.g., using technology, consciousness of environmental concerns and sustainability, taking care of oneself, doing small tasks at home, and the likes)?

The proposed time allocation and connection of each section of the project to the learning outcomes for Grade 7 are given in Annexure 4. This may be referred to while developing a project other than those in the activity book. You must develop the project for a duration of about 30 hours (approximately 55 periods of 40 minutes each).

Please note that suggestions for the use of technology, including Artificial Intelligence (AI) tools, are placed in boxes throughout the activity book. Suggestions for Internet search are also included. Due precautions must be taken to ensure the safety of students. The use of the Internet by the students must be supervised, and they must work in groups.

## Who will teach?

Since the purpose of vocational education in the middle stage is to provide vocational exposure to students, and till such time that teacher education programmes offer specialisation in vocational education, existing teachers will take up the subject in the middle stage, with the support of resource persons/master instructors. In the absence

of a vocational teacher, a teacher of any subject can take the lead in organising activities for projects in which they have some understanding and expertise.

The Head of the School may nominate a "Teacher Coordinator" among the existing teachers to coordinate and schedule the activities of different projects to be undertaken at the Middle Stage.

## Safety Measures

Due care must be taken to ensure safety at all times. Safety measures must be demonstrated to students, who, in turn will also demonstrate their understanding of how to keep themselves and others safe. Where necessary, use of certain tools and materials by students may be supervised in small groups. Due safety during field visits, ranging from transportation to orientation of resource persons must receive necessary attention.

# Note for Students

Dear Students,

This activity book will help you learn about different kinds of work and how to do work yourself.

When you think about work, you must remember two things: (i) all work is important, and (ii) people work not only to make a living, but also to make life more joyful and interesting. In daily life, you see people doing various kinds of work. Some of the work is related to running a household while some is related to earning a living.

Vocational education prepares you to deal with practical things related to daily life and understand the world of work. The projects that you will do in school will give you an opportunity to work with your hands, work in groups with your peers, and learn the skills which help you become self-dependent in life.

## How to use the Activity Book?

Read through the introduction of the project to get an idea of what you will be doing.

## Materials Needed

Gather all the materials listed at the beginning of each activity

**Follow the Steps**

1. Each activity has clear, numbered steps. Follow them to complete each task. Take your time and make sure you understand each step before moving on. Take notes during field visits or interaction with experts.
2. Complete all the questions and tables given in the activity book, which will help you to both learn and check your understanding.

## Check Your Work

After completion of the task, reflect on what you have learnt and what else you want to learn. Questions have been included to help you both think and write about what you are doing. Write in your own words, use simple language, and share your observations and thoughts. After

finishing an activity, review your work. Make sure you have completed all the steps and answered the questions.

If the space in the activity book is not enough, please use a different notebook or loose sheets, which you can add to the portfolio.

## Ask for Help

If you are unsure about any part of an activity, do not hesitate to ask the teacher, parent, or peer for help. Ask as many questions as needed if something is unclear. Collaboration and discussion can make learning fun and effective.

You can also get help from internet searches or using AI tools. AI stands for Artificial Intelligence and AI tools make our tasks easy by helping us find things or do something quickly. Please note that AI is not necessary for your projects; you can use it if you want.

## Take Breaks

Do not rush through the activities. If you start feeling tired, take a short break.

## Be Creative

Some activities may have open-ended questions or ask for your creative inputs. Let your imagination flow.

## Stay Positive

Learning new things can be challenging. Stay positive and remember that practice makes you perfect.

## Reflect

Think about what you have learned from each activity. Share your progress with peers and teachers and ask for their feedback.

## Design Your Projects

Think about how you can continue to build on your learning to do other things.

Try out different things, other than those in the activity book. There may be a new way of doing something or maybe different materials

can be used. If you face any difficulty or want to try out something different, reach out to others or consult library books. But do remember to discuss this with your group and the teacher. You may want to work beyond school hours and do some of the activities at home. You can even help your family and friends with what you learnt.

If you have any ideas for projects other than the ones suggested here, you can share them with your teacher, who will help you design your project.

## Internet Safety

If you use Internet searches or AI tools or both, please do so under supervision of an adult. You need to be careful of what you are accessing on the Internet. Just as there are places in and around your school and home where you will not go without an adult, there are places on the Internet that are not safe for anyone, neither you, nor adults. You must take care, and whenever in doubt, ask someone you trust.

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# Table of Contents

# THE CONSTITUTION OF INDIA

## PREAMBLE

**WE, THE PEOPLE OF INDIA,** having solemnly resolved to constitute India into a [1]**[SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens :

**JUSTICE,** social, economic and political;

**LIBERTY** of thought, expression, belief, faith and worship;

**EQUALITY** of status and of opportunity; and to promote among them all

**FRATERNITY** assuring the dignity of the individual and the [2][unity and integrity of the Nation];

**IN OUR CONSTITUENT ASSEMBLY** this twenty-sixth day of November, 1949 do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

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1. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Sovereign Democratic Republic" (w.e.f. 3.1.1977)
2. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Unity of the Nation" (w.e.f. 3.1.1977)

Part 1

# Work with Life Forms



‘Life forms’ include all living things on earth. They include human beings, mammals, birds, fish, plants, insects, reptiles and even bacteria and viruses. Projects on Work with Life Forms will help you work with living things in different ways. You can take up projects related to growing plants in various ways, recording the biodiversity around you, surveying medicinal plants, learning to care for domestic animals, and maintaining a nature journal. It is up to you to imagine all that you can do in the activities with your peers.

Two examples of projects are given in this section, which are Plant Nursery and School Habitat Garden. You must take up only one project. You can either choose one of these projects or you can design a project of your own choice with the help of your teacher.

Project 1

# Plant Nursery

0785CH01

This project will help you learn how to provide conditions suitable for the growth of plants, and the different methods of plant propagation. You will do this while developing a plant nursery in your school.

***As part of the project, you will be able to:***

- Identify conditions necessary for growth of plants
- Design a plant nursery
- Use different methods of plant propagation
- Observe plant growth

**Figure 1.1:** *Developing a plant nursery in the school*

Plants propagate, that is, they reproduce themselves, through various methods. Tiny seeds germinate and grow into a huge tree or a small flowering plant. However, some plants can be grown directly from the branches of the mother plant or tubers (e.g. potatoes).

Like humans, plants require a suitable environment to survive and grow. In science, you have learned that plants need air, sunlight, nutrients, and water for their growth. These factors are essential, but beyond them, plants also need a favourable environment to thrive, just like we do.

Let us understand this with an example. Do you live in a warm and humid region, a cold and dry region, or a place that experiences different seasons? If you reside in a cold and dry area, you might have heard people say, “It is so dry”, the dryness can cause itchy skin and burning sensation in the nostrils. That is why, when using a heater or *bukhari*, people often place a bowl of water in the room to add moisture to the air.

But what causes humidity or dryness? As you have studied, air contains various components, including water vapour. When there is a high amount of water vapour in the air, the weather feels humid, whereas a lower amount makes the air dry.

Just like too much or too little humidity affects us, it also impacts plants, especially during their growth stages. Similarly, extreme temperatures can be uncomfortable for humans, and plants also require an “optimal temperature” to grow. However, the ideal temperature varies among plants, which is why some plants flourish only in specific seasons.

Have you observed that more plants grow near a water stream, on the edges of ponds or near water sources (e.g., wells, water-tap) than in dry places? This is because they get optimum temperature, humidity, and moisture in the soil.

In the plant nursery (Figure 1.1) you will need to create these conditions for optimum survival and growth of plants.

## Did you know?

*Thimmamma Marimanu*, a banyan tree located in Ananthapuramu district of Andhra Pradesh, is spread over 5 acres. This is the size of a small village.

Imagine! A tree spread so far that it could house an entire village under its branches. Isn't it fascinating that a single seed has grown into such a big tree? The banyan tree provides shade, oxygen and shelter to birds, animals and humans. It teaches us to care for nature and plants.

**Figure 1.2:** *Banyan tree in Ananthapuramu district, Andhra Pradesh*

Plant nurseries are important for various reasons, e.g., preserving original plant species, and creating new varieties of plants, and producing plants on a very large scale. Since nurseries are developed in a smaller space compared to farms, it is easier to prevent pests and provide protection from unsuitable conditions like heavy rain or severe heat.

Since conditions for healthy growth of plants can be created in plant nurseries, plants can be grown whenever required and not only during the seasons that are generally suitable for them. People visit plant nurseries to buy plants for their homes, gardens and agriculture field.

## What will I be able to do?

At the end of project, you will be able to:

1. Describe the needs of germinating seeds and young plants.
2. Cultivate new plants using different plant propagation methods.
3. Provide suitable conditions for initial growth of plants.
4. Develop a plant nursery in the school.

## What will I need?

You will need the following tools, equipment and materials for developing the plant nursery (Figure 1.3):

**Gardening tools:** Garden shovel, spade, hand cultivator, grafting knife, pruning shears (secateurs) or sharp cutter, watering can, and gardening gloves.


**Figure 1.3:** *Tools and materials used to develop plant nursery*

**Nursery materials:** Seedling or plug tray, cocopeat, sphagnum moss or coco husk, compost or manure, seed germination paper or cardboard (45 cm × 28 cm).

**Other materials:** Shade-net, bamboo or wooden pole (8 ft in height), PVC pipe, tarpaulin sheet, and bricks, measuring tape, plant labels, first-aid kit, lime powder, geometry scale, pencil, rubber bands, plastic tray and water.

## How do I keep myself and others safe?

Some key precautions to be followed while working in a plant nursery are as follows:

1. Always use the right tool and equipment for the job.
2. Follow instructions while using gardening tools and materials. Tools like spades, shovels, pickaxes, etc., are heavy and should be handled with caution. Sharp tools like

cutters and knives must be used carefully. You need to take necessary care to ensure your safety and of others too.

3. Use gloves that fit well so you have a good grip on tools and equipment.
4. Always ask for help if you are unsure about how to use a tool.
5. Wash hands carefully after working with soil as it may contain many disease-causing micro-organisms.
6. Use proper lifting techniques— bend your knees not your back while lifting heavy weight.
7. Hang tools on racks or place them in marked places or storage boxes.

**Internet safety:** Ask your teacher for help while using the Internet. Be careful not to upload or download anything without checking. Do not share personal information anywhere.

## What do I need to know before I start?

There are different types of plant nurseries – some may be for growing vegetables, and others for fruit crops, trees, flowering plants, ornamental plants and so on.

Different areas will have different kinds of nurseries. While the process of developing the nursery remains the same, the kind of plants change.

In agricultural areas, you will find nurseries for vegetables like brinjal, tomato, onion, etc., and crops like banana. In urban areas, nurseries provide ornamental and flowering plants such as rose, marigold, etc. that can be kept in homes. Where possible, especially in coastal and hilly areas, horticultural nurseries for plants like mango and coconut are set up.

Nurseries can be on plots of land or on terraces of buildings. They may be large or small ones maintained at homes. Visiting any one of these will help you to prepare your nursery well. In

case there is no nursery close to your school, you can invite a farmer or gardener to your school to guide you.

### Activity 1: Visit to a nearby plant nursery

During your visit to the nursery, observe how essential factors, such as air, sunlight, water, humidity, temperature, and nutrition are maintained.

Write the details of your visit(s) and interaction with the expert in the following format:

1. Date of visit: .....
2. Name of nursery visited: .....
3. Type of nursery (e.g., vegetable, fruit, flowering plants, ornamental plants): .....
4. Types of plants grown (e.g., vegetable, flowering, fruit, etc.):
   .....
5. Nursery tools and equipment used: .....
6. Management practices, such as watering, pest control, nutrient, etc.
   .....

Some questions you can ask are given below. You may also frame your own questions for interaction.

1. Which plants are generally grown in the nursery?
   .....
   .....
2. What methods of plant propagation are used in the nursery?
   .....
   .....
3. Are the same plants grown throughout the year or are there seasonal variations? If yes, which plants are grown in which season?
   .....
   .....

**Figure 1.4:** *A neighbourhood plant nursery*

Observe how the conditions necessary for healthy growth of the plants are provided in the nursery. Some specific questions you can ask the people working in the nursery are as follows:

1. How do you ensure that plants receive the right amount and duration of sunlight?

   .....
   .....
   .....

2. What methods do you use to provide shade for plants?

   .....
   .....
   .....

3. What measures do you take to maintain ideal temperature for plants?

   .....
   .....
   .....

4. How do you make sure that plants receive right amount of water?

   .....
   .....
   .....

5. How is optimal humidity maintained?

   .....
   .....
   .....

6. Is there anything else that plants need for their healthy growth?

.....

.....

.....

7. How do you prevent damage to plants from external factors, like pests, animals or human activity (e.g., are there pathways between plant beds and protective fencing)?

.....

.....

.....

8. How are plants transported from the nursery to home gardens/farms?

.....

.....

On the basis of the expert's advice, decide which plants you will grow in your plant nursery. Note important information related to these plants in table 1.1 with the help of the expert.

**Table 1.1: Information for developing the plant nursery**

| S. No. | Name of plant | Method of plant propagation used in the nursery (seeds, stems, etc.) | How are conditions for healthy growth being provided to the plants? | Any special care required by the plant. (Yes/No) If yes, what is to be done? |
|---|---|---|---|---|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |

## What do I have to do?

Now that you have learnt about what plants need for growth, start planning for setting up the school nursery. You will plant seeds in beds and seedling trays, grow new plants from stem cuttings and use them in the school or give them to others. You will also prepare nursery bags for planting and transferring plants from beds/trays to another part of the school (Figure 1.5).

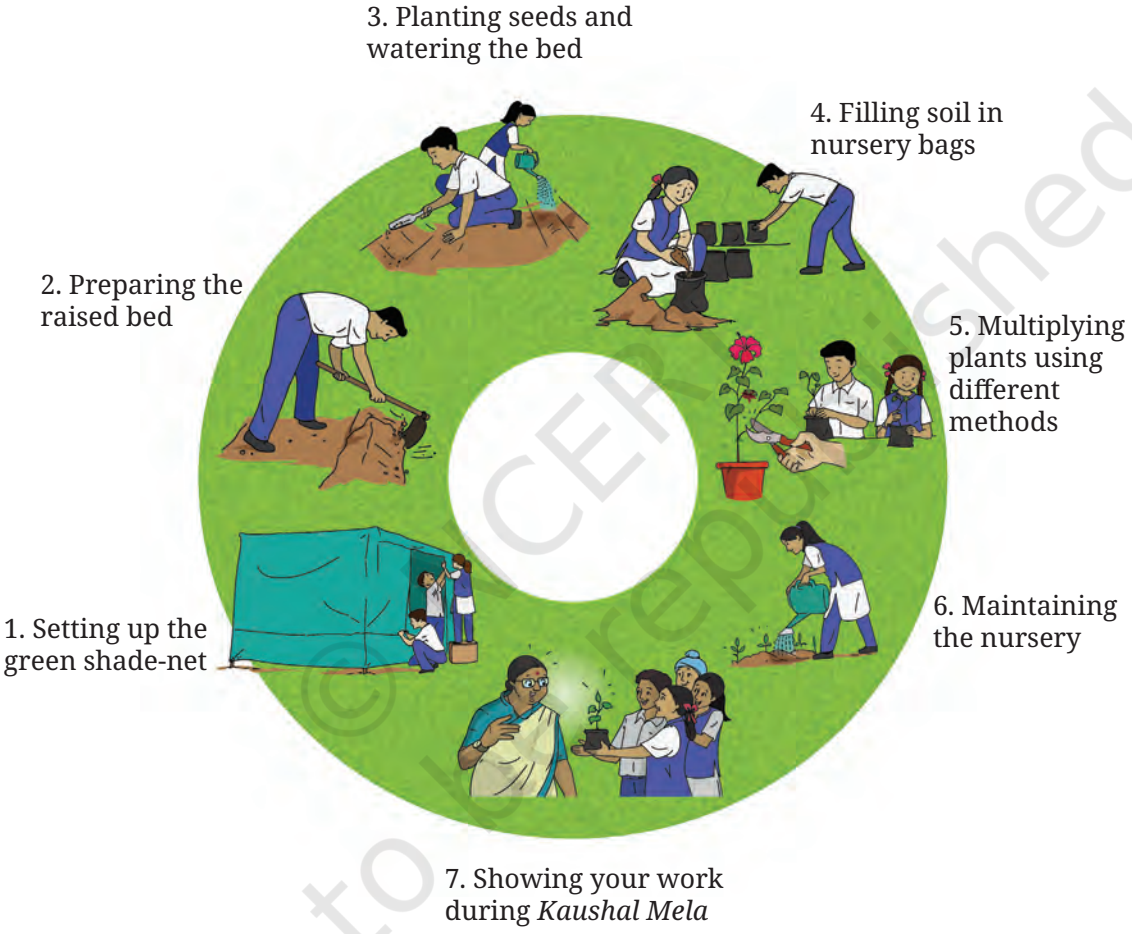



**Figure 1.5:** *Growing plants in a plant nursery*



### Activity 2: Planning and laying out plant nursery

You have identified the plants that you will grow during Activity 1.

Now that you have to plan the plant nursery (Figure 1.6), the first step is

**Figure 1.6:** *Planning the layout of the plant nursery*

finding a suitable place. The selected area should preferably get at least 2–3 hours of sunlight. The place should be such that excess water (waterlogging) can be avoided.

A 150–200 square feet area should be sufficient. If land is not available on the school premises, you can utilise any unused space, pathway or parking lot or you can also create the nursery in pots (Figure 1.7).

**Figure 1.7:** *Different ways of utilising space for raising*

Once land is identified, calculate the area of the plant nursery.

1. What is the available space for the nursery?

   .....

   .....

2. What factors were considered while choosing the particular location?

   .....

   .....

Draw a layout or sketch of the nursery with dimensions (length, width). Show as many details as you can – pathways, source of water, layout of beds, and so on.

## Activity 3: Preparing land and setting up shade-net

You have made the layout of the nursery. Now, you need to prepare the land and install a shade-net to reduce sunlight so that young plants are protected from excessive heat, preventing heat stress.

1. First remove unwanted plants, debris, rocks, etc., to clean the selected area.
2. Mark the nursery boundary with lime powder. Mark important components like pathways, plant beds and so on (Figure 1.8).

**Figure 1.8:** *Marking the nursery boundary with lime powder*

3. On the basis of the area and your design, fix green shade-net on the nursery using bamboo or wooden poles (Figure 1.9).

**Figure 1.9:** *Fixing the poles at the boundary of the plant nursery*

4. Choose a shade-net with appropriate shading percentage (50% or 75%), based on plant need. In case a green shade-net is not available, you can use tree branches or old cloth

(*sarees*) to provide shade (Figure 1.10). If you are building the nursery on a terrace or concrete floor, then you can use metal tin boxes, or a plastic drum filled with sand to fix poles for the shade-net.

**Figure 1.10:** *Installing the green shade-net*

5. Use discarded pipes/rods, bamboo or fallen branches to make a protective fence for your plant nursery. It is required to prevent entry of animals and human beings.

Once the basic structure is ready, respond to the following questions:

1. What kind of shade-net or clothes did you use to provide shade to the plants?

   .....
   .....

2. Which materials did you use to fix the shade-net (e.g., bamboo, wooden pole, mild steel pipe, etc.)?

   .....
   .....

## Activity 4: Germinating seeds

All seeds may not germinate after sowing. The seed germination rate tells you how many seeds are likely to germinate to become plants. It is necessary to know the germination rate to estimate the quantity of seeds required to be planted in a nursery.

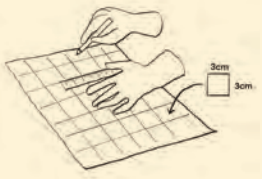
This activity will help you to understand the importance of germination test.

Follow the steps in figure 1.11 to perform the seed germination test.

**Materials required**

(i) Cereal or pulses seeds (ii) Geometry scale
(iii) Pencil (iv) Rubber bands
(v) Plastic tray (vi) Water
(vii) Seed germination paper (45 cm × 28 cm)

Seed germination paper is specially designed for germination tests since it can hold moisture. In case seed germination paper is not available, you can use a cardboard sheet.




***Step 1*:** Mark 3 × 3 cm squares on the paper.

***Step 2*:** Soak the paper in water. Let the extra water drain out.

***Step 3*:** Count 100 seeds and place them on equal distances as per markings.

***Step 4*:** Gently roll the paper. Place rubber bands on the paper and keep it for 3-5 days.

***Step 5*:** Count the germinated seeds.

***Step 6*:** Calculate germination percentage using the formula given below:

$$\text{Germination percentage} = \frac{\text{Number of seeds germinated}}{\text{Total number of seeds placed / sown}} \times 100$$

**Figure 1.11:** *Steps for calculating germination percentage*

## Record your plants' growth

You can create a video of seeds sprouting. You can take photographs (using a smartphone or camera) of seeds at different times. Search on the Internet using a search engine for the keywords "timelapse photo apps". You can upload the photographs to create a video of seeds growing into sprouts and young plants.

Now, you must have understood that the germination rate helps you to estimate how many seeds need to be planted to get the required yield. This ensures that space, effort and time is not wasted. If you look at seed packet labels, you will find that the seed germination rate is mentioned on them.

Please respond to the following questions to learn more about seed germination rate.

1. Which seed did you use for conducting seed germination test?

   .....
   .....

2. How many seeds were used for the germination test?

   .....
   .....

3. How many days did it take for the seeds to germinate?

   .....
   .....

4. How many seeds germinated?

   .....
   .....

5. What was the germination rate?

   .....
   .....

## Activity 5: Raising plants in the nursery

You have learnt about the seed germination rate.

Let us now raise the plants in the nursery. Planting materials like seeds and cuttings contain reserve food in the form of carbohydrates, protein, vitamins, and necessary nutrients. This reserve is used by seedlings during germination and initial growth.

Remember, the number of seeds you use must be greater than the number of plants you wish to grow.

## Did you know?

Rahibai Soma Popere, a recipient of Padma Shri and Nari Shakti Puraskar (Figure 1.12) also known as the 'Seed Mother of India' has developed a seed bank in her small home. She has conserved more than 43 indigenous crop varieties and wild food resources.

Her work is very important as many native plant species are at risk of being lost due to various factors, making their preservation essential.

**Figure 1.12:** *Rahibai ji being honoured with Nari Shakti Puraskar*

Some of the common seed-sowing methods used in plant nurseries are given below. You can use these methods based on discussion with your peer and the teacher.

### Method 1: Sowing seeds on raised-bed nursery

#### *Step 1:* Making raised beds for vegetable or flower seedlings

Nursery beds need to be free from weeds and stones. Raised-beds (Figure 1.13) ensure that extra water drains out from the root zone and roots get air for respiration.

**Figure 1.13:** *A raised-bed with protective fence*

Follow the steps below to prepare raised-bed:

1. Dig and loosen the soil.
2. Remove bigger stones and pebbles.
3. Mix compost and soil (in a ratio of about 40:60) and raise the marked bed area by 15–20 cm above ground level.
4. The length of the bed could be 3–5 m and width 1–1.5 m.
5. You can maintain a distance of 0.30–0.40 m between two beds for human movement required for watering, weeding, and so on (Figure 1.14).

**Figure 1.14:** *Students digging the soil and levelling for raised-bed preparation*

### *Step 2:* Sowing seeds on raised-beds in a nursery

Now sow seeds on the raised-bed in the nursery. For this, follow the steps given below:

1. If seeds are very small, mix them with fine sand or soil. It will help in the easy sowing of seeds.
2. Sow the seeds on the raised-bed gently. Put soil on the seeds and water them using a water can to keep the soil moist.

Respond to the following questions after the activity:

1. Which seeds did you sow in the raised-bed?

   .....
   .....

2. What have you done to provide optimal conditions for growth of seedling?

   .....
   .....



## Method 2: Sowing seeds in plug or seedling trays

**Figure 1.15:** *Seedling tray with saplings growing in them*

An alternative to raised plant beds is using plug/seedlings tray (Figure 1.15). It is very useful if only limited space is available and also if we want to produce seedlings on a large scale. Use trays with appropriate sized cells – small cells for delicate seedling while larger ones for bigger seedlings. Cocopeat is generally used in seedling trays as a growing media.

In case seedling trays are not available, you can use coconut shells, old teacups or similar waste materials.

### Did you know?

Growing media has an advantage over soil in better management of moisture around roots. It also helps in avoiding disease spread and provides nutrients for growth.

Apart from cocopeat, minerals like vermiculite and bentonite are used in plant nurseries as growing media.

For sowing seeds in a seedling tray:

1. Soak cocopeat in water – 1 kg cocopeat can absorb 5–8 litres of water.
2. After all the water is soaked, fill the trays with the soaked cocopeat gently.
3. Sow seeds (1–2 seeds per hole) and cover the tray with tarpaulin sheet or gunny bags. Keep the covered tray(s) aside for 2–3 days.
4. Once the seeds start germinating, the tray should be placed in a shade-net nursery for further growth.

After completing the activity, answer the following questions:

1. Which method did you use for sowing the seeds? (If you have used more than one method, please mention all of them.)

   .....
   .....

2. What steps have you taken to provide optimal conditions for the growth of seedlings?

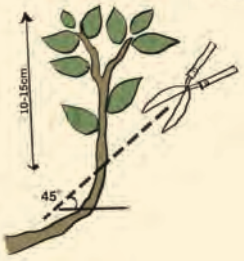
   .....
   .....

## Method 3: Raising plants using stem cuttings

Plants can also be propagated using stem cuttings (Figure 1.16). You can use the stem of hardwood (e.g., rose, bougainvillea), semi-hardwood (e.g., dieffenbachia, croton), or softwood (e.g., duranta, alternanthera) as planting material.

**Materials:** Nursery bags (5 × 4 inches)
You can also use old milk-pouches (500 ml).

***Step 1*:** Make 2–3 small holes at the bottom of the bags for water drainage and fill them with soil-compost mixture (2 parts soil + 1-part compost).




***Step 2*:** Select a mature and healthy parent plant. Cut stem of 10–15 cm. Make a slant cut (45˚ angle) to the base (downside). This will give more surface area for rooting. The cutting should be 4–6 inches long with at least 2–3 nodes.

***Step 3*:** Dip the cut end of the stem cutting into the rooting hormone powder or gel, ensuring it is evenly coated.


***Step 4*:** After proper shooting (30–45 days) the new plant can be shifted to a bigger polybag or field.

**Figure 1.16:** *Raising plant using stem cutting*

## Types of stem cutting used for plant propagation

1. **Softwood cuttings** from shrubs or deciduous trees are cuttings that typically measure 10–15 cm in length. The top two to three leaves are retained, while the rest are removed. Retaining some leaves are crucial, as the cuttings lack sufficient food reserves. Citrus, cherry, apple, peach, plum, pear, and apricot are commonly propagated using softwood cuttings under mist chambers, whereas plants like coleus, chrysanthemum, dahlia, holy basil (*tulsi*) and carnation are propagated through the herbaceous method.

2. **Semi-hardwood** cuttings are taken from partially mature, slightly woody shoots or tissues. These cuttings are still tender and succulent, typically prepared from the current season's growth of trees and shrubs. This method is commonly used for propagating fruit plants such as mango, guava, lemon, jackfruit and flowering plants, such as roses.
3. **Hardwood** cuttings are taken from mature, woody stem material and are typically prepared during the dormant season. They are usually derived from one-year-old shoots that developed in the previous growing season. This method is commonly used for propagating plants such as grape, fig, mulberry, kiwi fruit, pomegranates, chestnut, plum, apple, and gooseberry.

1. Which kind of plants did you use for plant propagation using cuttings? Did you use a cutting of hard, semi-hard or softwood?

   .....
   .....

2. What have you done to ensure conditions for growth?

   .....
   .....

## Activity 6: Watching plants grow

You have used different methods of plant propagation; now maintain a record as shown in table 1.2 for your nursery.

**Table 1.2: Maintaining record for the plant nursery**

| S. No. | Name of plants produced in the nursery | Types of nursery method used | Quantity of seeds or stem cuttings used | Date of planting | Date of germination or emergence of the first leaf | Any other observation |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |

### Digital tools for nursery

There are different apps available to help you keep track of growth of your plants. You can search online with the keywords: plant nursery recording apps, pest identifier, plant watering reminder app, etc.

Planting is not sufficient – you need to take care of the plants till they are mature and ready for transplantation in their beds/ pots. Young plants are very delicate, and you need to take care of them till they are strong enough. You can transplant them in the right season and right place (with suitable environment).

## Activity 7: Calculating the cost

Record the cost incurred on items and materials in table 1.3. This will help you to decide the selling price the plants can fetch.

**Table 1.3: Calculating the cost of items and materials**

| S. No | Items/ Material | Unit cost (cost per gram or piece) | Quantity | Total price | Remark |
|---|---|---|---|---|---|
| 1 | Seed (e.g., Tomato) | ₹10 per g | 5 g | ₹50 | |
| 2. | Seedling tray (50 cell tray) | | | | |
| 3. | Nursery bag | | | | |
| 4. | | | | | |
| 5. | | | | | |
| 6. | | | | | |

## What did I learn from others?

1. Write about three most useful things you learnt from the visit to the plant nursery/interaction with the expert.

   .....
   .....
   .....

2. Describe three things you learned while making the plant nursery with your peer?

   .....
   .....
   .....

## What did I do and how long did it take?

It is important to understand how much time is required for an activity to be completed.

Calculate the approximate amount of time in hours you spent on each activity. Mark them on the timeline below. If you did more than the activities suggested in the book, please add the number and time taken.

| ***Activity*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** |
|---|---|---|---|---|---|---|---|
| ***Time taken (Periods)*** | --- | --- | --- | --- | --- | --- | --- |

## What else can I do?

Things that you can try to expand your learnings are as follows:

1. You can decorate a pot and grow your plants into it. It can be a good gift for visitors.

2. You can conduct a plantation drive on Independence Day/ Republic Day or any other day and plant the saplings that you have prepared in your school or home.
3. You can grow seasonal plants in your school or home.
4. According to you, what is the importance of plant nursery?

## Think and Answer

1. What did you enjoy doing?
2. What were the challenges you faced?
3. What will you do differently next time?
4. Identify few examples of jobs related to the work you did in this project. For example, gardener, botanist, forest officer, farmer, agriculture scientist. Look around, speak to people and write your answer.

Project 2

# School Habitat Garden



This project will help you learn about providing suitable conditions for groups of animals to live and thrive. You will create a habitat garden in your school to attract different groups of animals (birds, mammals, insects, reptiles, etc.) by providing them with shelter, water, food and space.

***As part of the project, you will be able to:***

- Identify needs of animals
- Design and develop the habitat garden
- Make provisions for the needs of animals
- Maintain the habitat garden
- Observe the animals in the habitat garden

**Figure 2.1:** *Creating a habitat for animals in the school*

Many animals coexist peacefully with humans (Figures 2.1, 2.2 and 2.3). Beyond domestic and farm animals, several other animals share our surroundings, including crows, sparrows, pigeons, owls, kites, bats, monkeys, langurs, squirrels, mice, rats, butterflies, and moths. They lead their busy lives alongside us, adapting to the human-dominated environment.

Have you ever wondered where these animals lived before towns and cities replaced farmland and forests? How many of them have managed to adapt to the changes brought about by human expansion? As villages, towns, and cities continue to grow, natural habitats are shrinking, forcing many animals into unfamiliar territories. This habitat loss has led to an increase in sightings of leopards, wolves, and even tigers in urban areas and farmlands. Imagine being suddenly displaced from your home, losing the safety and comfort it provides—this is the challenge these animals are now facing.

**Figure 2.2:** *Bird's nest hanging from the roof of a veranda in a city*

**Figure 2.3:** *White-throated Kingfisher can be seen on wires near water bodies or parks in cities*

Animals that can adapt to changes in their habitat continue to coexist with us, while those that cannot retreat into the remaining untouched areas. Take birds, for example—specifically pigeons. Their natural habitat consists of cliffs and rocky hills, which is why they are commonly seen perched on building ledges. In contrast, house sparrows prefer sheltering in dense trees and bushes. As cities expand and green spaces diminish, the sparrow population gradually declines until they eventually disappear from urban landscapes.

All animals require food and water to survive. Additionally, they need sufficient space to move freely and a safe shelter where they can rest and raise their young ones without fear of predators or exposure to harsh weather conditions. These four essentials—space, shelter, food, and water—form the foundation of every animals's habitat.

However, the specific needs of different animals vary. For instance, in terms of space, carpenter ants can establish a colony within just a few square centimetres, whereas spiders spin webs that are much larger than themselves. Similarly, water sources differ—while butterflies and ants can sip dew droplets from grass, birds often drink from puddles or leaking taps. Shelters also vary; squirrels find safety in trees, while lizards are comfortable on flat concrete surfaces, as few predators can climb walls to reach them.

Near human settlements, a diverse range of food is readily available, including human leftovers, flower nectar, leaves, insects, and small animals (Figure 2.4). Additionally, birds find various materials for nest-building in such areas. They collect twigs, dried vegetation, and grass to construct sturdy nests (Figure 2.5). For the nest lining, sparrows often use feathers or even paper, whereas crows incorporate metal wires and ropes to reinforce their nests.

**Figure 2.4:** *Insect feeding on nectar of a flower, also helps in the pollination*

**Figure 2.5:** *A bird gathering material for its nest*

Once basic needs are fulfilled, habitats must also provide comfort and joy. For example, some birds like bulbul, dove and *munia* love to bathe in shallow water containers to cool down and clean their feathers.

Numerous initiatives have been undertaken in our country to create and maintain suitable habitats for wildlife, ensuring their protection and conservation. These efforts include the establishment of various wildlife sanctuaries and national parks, such as (i) Kaziranga National Park in Assam, renowned for its population of one-horned rhinoceroses, (ii) Bharatpur Bird Sanctuary in Rajasthan, a haven for migratory birds, (iii) Periyar Tiger Reserve in Kerala, dedicated to tiger conservation, (iv) the Butterfly Enclosure within Fambong Lho Wildlife Sanctuary in Sikkim, which provides a safe habitat for diverse butterfly species and (v) Kanha National Park in Madhya Pradesh, which serves as a vital refuge for barasingha (swamp deer) and other wildlife. These are just a few examples among the many protected areas across the country.

The term 'sanctuary' literally means 'a safe place where one's needs are met.' In the context of wildlife conservation, sanctuaries are typically vast, well-maintained areas managed by experts who ensure the protection and well-being of various species. However, the concept of a sanctuary is not limited to large-scale conservation efforts alone. Even a small habitat garden in your backyard or neighbourhood can serve as a miniature sanctuary, providing shelter, food, and a safe space for birds, butterflies, insects, and other small animals. By creating and nurturing such spaces, individuals can contribute to biodiversity conservation and support local wildlife in their own surroundings.

## What will I be able to do?

At the end of the project, you will be able to:

1. Identify groups of animals in and around the school that can be attracted to the habitat garden.
2. Identify the needs of these groups of animals in terms of space, shelter, food, and water.
3. Describe how these needs can be met within the school habitat garden.

4. Design and set up a habitat garden in your school based on the above needs.
5. Observe the groups of animals attracted to the habitat garden.

## What will I need?

You will need tools and materials for setting up the habitat garden, along with what are referred to as non-plant elements that will attract animals.

1. **Gardening tools and materials**
   (a) You will need gardening tools like shovels, spades, trowels, and watering cans and safety gloves.
   (b) You will also need plant seeds or seedlings, including those of flowering plants, and materials like compost to help them grow into healthy plants.
2. **Materials for including non-plant elements to attract animals**
   (a) Gravel, wood chips or bricks to create garden pathways.
   (b) Waste materials like old containers, discarded wood/ plywood, cardboard and old string to create shelters, feeders, and bird baths.
   (c) Stones, rocks, logs, waste cardboard, and compost to create shelters for insects.
   (d) Tools like hammer, and a small saw.
   (e) Nails and fasteners.

## How do I keep myself and others safe?

Some key precautions to be followed while creating the habitat garden are as follows:

1. Be sensitive to the needs of animals. Take care not to disturb them.
2. Do not damage the habitat of animals.
3. Wear gloves when handling tools and materials to protect yourself.

**Internet safety:** Ask your teacher for help while using the Internet. Be careful not to upload or download anything without checking. Do not share personal information anywhere.

## What do I need to know before I start?

In order to develop the habitat garden, you must first identify animals in and around the school. Next, you must understand the needs of these animals in terms of space, shelter, food and water. After all, these animals will be attracted to the garden only if their needs are fulfilled.

### Activity 1: Identifying animals in and around the school

**Figure 2.6:** *Sunbird feeding on nectar also helps in pollination*

**Figure 2.7:** *Caterpillar on the leaves of a flowering nasturtium plant*

Spend some time looking around the school and identify the animals around you.

Next, ask the gardeners in a nearby park or members of the community living close to the school about the animals they have observed in the surroundings.

Depending on where your school is located there will be pigeons, crows, sparrows, kites, peregrine falcon, bulbul, mynah, munia, sunbirds, woodpeckers, owls, and many other birds (Figure 2.6). You may find squirrels, mice, rats, bats, mongoose, and maybe some other small animals, as well as lizards, and frogs. Insects like ants, butterflies, dragonflies, beetles, caterpillars, mosquitoes, and many others are also likely to be around (Figure 2.7).

Make a list of the animals around you that are likely to be attracted to the habitat garden and decide which ones you would like to have in the school and which ones you would like to avoid.

Write your responses in table 2.1.

**Table 2.1: Animals that you want or not want in the school habitat garden**

| We would like these animals in our habitat garden | | We would not like these animals in our habitat garden | |
|---|---|---|---|
| 1. | Butterflies | 1. | Mosquitoes |
| 2. | Sunbirds | 2. | Snakes |
| 3. | | 3. | |
| 4. | | 4. | |
| 5. | | 5. | |

Once this list is ready, the next step would be to identify what these animals need in their habitat.

## Activity 2: Interaction with an expert

To assess the need of the animals identified by you, it will be useful to speak to an expert. The expert can be a farmer, gardener or any other community member who has a garden and an interest in animals. If possible, you can also meet a naturalist (who gains understanding of the natural world through observation over a long period of time), conservationist (who explains the need for protection of animals and give suggestions), zoologist (who studies animal behaviour), entomologist (who concentrates on insects), lepidopterist (who concentrates on butterflies and moths among insects), botanist (who studies plants), and any scientist who studies the natural world.

Think of questions to ask the experts. Some questions are given below, you can think of many more.

1. Which of the animals identified in the surrounding of the school are likely to be attracted to our school habitat garden?
   .....
   .....
2. How can we prevent the entry of animals we do not want in the school habitat garden?
   .....
   .....

3. Where should the habitat garden be developed?

.....

.....

Now fill the tables 2.2 and 2.3 with the help of the experts. Ensure that you have information for at least two types of birds, insects, and small mammals.

**Table 2.2: Needs of animals we would like in our habitat garden**

| Name of animals | Needs | | | | |
|---|---|---|---|---|---|
| | Food they usually eat | How to make provision for water and food | Shelter they need | Space they need | Any other (e.g., specific plants, flowers, etc. to attract them) |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Table 2.3: Preventing animals from the habitat garden**

| Name of animals | Why do we not want them in our garden? (mention reason) | What can we do to prevent them from entering the habitat garden? |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Discuss what you learnt from the expert with your peer. On the basis of this you will take all the decisions related to the habitat garden.

## What do I have to do?

Now you must spend some time observing the animals so you can decide how to closely mimic their habitat.

## Did you know?

Fireflies are a species of insects that emit light. A few decades back, entire trees used to be lit up by small lights in some areas of our country, but this is rare now (Figure 2.8).

Fireflies live in various habitats but are mostly found in humid, warm environments. Many species thrive in forests and fields or the area between them. As forests and fields are replaced by houses and human population, fireflies are no longer found in the area. Also, as light pollution increases, fireflies cannot signal to each other. This disrupts their life cycle, and the population of fireflies decreases.

Thus, fireflies have not been able to adapt into their changed habitat. This poses a serious problem for farmers in these areas. Fireflies are very important for farmers since they feed on insects that harm crops. As their population decreases, farmers have to use chemicals to protect their crop, which in turn has harmful effects on plants and those who consume these plants.

**Figure 2.8:** *Fireflies*



### Identification using apps

You can use mobile applications to identify birds, butterflies and other insects. Some useful applications are:

- **Seek by iNaturalist (App)**: Helps identify insects, butterflies, birds, and animals through image recognition.
- **PlantNet (App):** Helps identify local plant species and understand their importance in conservation.
- **eBird:** Used for logging bird sightings and contributing to a global citizen science database.
- **Merlin Bird ID (App):** Used for identifying bird species by sound or image.
- **Picture Insect (App):** Used for insect identification.

## Activity 3: Identifying natural habitats

Before you start designing your habitat garden, observe the natural habitat around your school. You may have already done nature walks, this time, think of what the experts shared with you and focus on specific aspects.

To observe the behaviour of animals, you can visit nearby farmland or open areas, water bodies, a forest (including a forested area in a city), parks, large gardens, and similar places.

*(a)* *(b)* *(c)*

**Figure 2.9:** *(a) Butterflies get attracted towards brightly coloured flowers (b) Squirrels live in trees but like to come down to grassy patches for food (c) Grasshoppers are found in sunny, grassy, moist gardens and sometimes burrow into soil*

These observations are best done early in the morning, when animals are most active. Use table 2.4 to note your observations.

**Table 2.4: Observations of habitat and behaviour of animals**

| Description of habitat | | | | | |
|---|---|---|---|---|---|
| **Animals** | **Observations related to** | | | | |
| | **Space** | **Water** | **Food** | **Shelter** | **Anything else** |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

These observations can help us understand how animals keep themselves and their young ones safe from predators, the space they thrive in and what they need to sustain themselves.

## Activity 4: Identifying needs of animals

You are now ready to design your school habitat garden based on the needs of animals.

Use table 2.5 to systematically write your learnings based on your interactions with experts and on your observations. This table is meant to help you identify the needs of different animals you want to attract to your habitat garden. If you still have questions, please ask the experts again.

A few examples are given to help guide you.

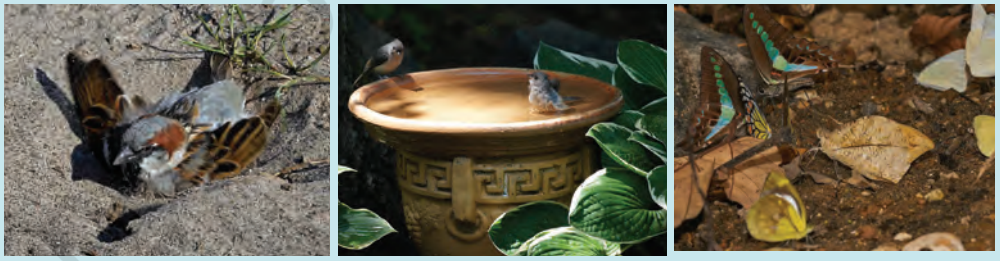
**Table 2.5: Understanding specific needs of animals**

| Space | Food | Water | Shelter |
|---|---|---|---|
| **House Sparrow** | | | |
| Found in trees, bushes, on the ground, on buildings; moves around in flocks | Insects, grains, seeds, small fruits; pecks them from the ground or bark of the tree | Drinks from any water source | Builds nests in dense bushes, hedges or trees; also builds nests in manmade structures like streetlights, below the roof of houses |
| **Anything else:** Likes to take mud baths by digging a hole in the mud and shaking off the mud on its feathers; also likes to bathe in shallow pools; moves in a flock and sometimes sings together in bushes | | | |
| **Spider** | | | |
| Found in sunlight deficit areas; often found in spaces through which other insects pass | Other insects like ants, bees, flies, mosquitoes | From dew; in the early morning, you can see dew on the spider's web | Builds webs out of silk; sometimes leaves and small pieces of rubbish also get trapped in the web |
| **Anything else:** Spiders like to build their webs under dense branches or bushes so that any insect falling off the plants gets trapped in the web | | | |
| **Butterflies** | | | |
| Found in open-sunny areas with lots of flowering plants, water; are delicate and need protection from the wind ('windbreaks' like trees and bushes) | Nectar, sugar syrup, rotten fruit, mashed fruit | Need very little water, can extract from damp soil or fruits; cannot swim but like to drink from the edge of a shallow pool | Butterflies shelter in trees (some like to shelter in narrow cracks in the bark of trees), tall grass, and rocks; they need protection from the wind |
| **Anything else:** Sometimes butterflies cluster together in groups on moist soil | | | |

| Squirrels | | | |
|---|---|---|---|
| Found in open spaces with lots of trees | Fruits, nuts, seeds, other animals, plants | Need a small amount of water | Squirrels make their nests on trees high above the ground, close to the trunk and in the fork of branches for support; also use hollows in the trunk as nests |
| **Anything else:** Squirrels are generally observed alone | | | |

## Did you know?

1. Some birds like the house sparrow rub their feathers with dry earth or sand while vigorously wriggling their bodies and flapping their wings. This causes dust to fly up and then fall through their feathers. Birds do this to remove any tiny insects that may have crept into their feathers and to clean their skin. This is known as *dustbathing* (Figure 2.10a).
2. Birds take water baths in a similar manner, by wriggling their bodies and flapping their feathers. They are happy to do this in rainwater or in a shallow pool. They do this to clean their feathers and to ensure they are well-maintained for flying (Figure 2.10b).
3. Butterflies also gather around puddles, damp soil or animal droppings. This is known as mudpuddling (Figure 2.10c). They do this to absorb nutrients and also water.



(a) (b) (c)

**Figure 2.10:** *(a) Dustbathing, (b) Water bathing (c) Mudpuddling*

## Activity 5: Designing the habitat garden

Having a clear plan is important when creating a habitat garden, as it guides the design of the space, where the garden should be developed, what needs to be added, where should it be added and how it must be maintained.

Some questions that will guide the design of the habitat garden are given below. Please keep what you have entered in table 2.2 in mind while designing your garden.

1. Where will you make the habitat garden (e.g., any open unutilised space on the school grounds or a balcony/ terrace)?

   .....

   .....

   .....

2. How much sunlight does the space receive during the day? (e.g., does the entire area receive full sunlight or are some parts shaded. How many hours of direct sunlight does it receive?)

   .....

   .....

   .....

3. What specific elements do animals need to be attracted to your habitat garden? Consider features like flowering plants, rocks in sunny areas, plants that can 'break' the wind for butterflies, water collecting under a garden tap etc.

   .....

   .....

   .....

Trees or shrubs around the space are preferable as they act as natural windbreaks (row of trees, a fence, wall, or screen, that provides shelter or protection from the wind) and hideouts for animals to use as shelters.

The garden can also be developed in pots on the terrace close to the boundary wall, which will act as a windbreak.

The garden must be in a quiet space, that is, away from much human movement to ensure comfort of animals.

4. Do any of the above already exist in the school? If yes, what are they?

.....

.....

.....

5. Are there any other aspects that need to be covered?

.....

.....

.....

6. What kind of plants will need to be planted to attract animals, birds and insects to your habitat garden (e.g., seasonal flowering plants)?

.....

.....

.....

7. How will you make sure you do not disturb animals while watering and weeding your garden (e.g., a walkway of sand or brick, areas for mudpuddling in a corner of the garden)?

.....

.....

.....

**Figure 2.11:** *A habitat garden in the making*

Create a sketch of the layout of the habitat garden, making sure that all key elements are included in it. Add spaces for mudpuddling, basking, dustbathing, water baths, feeders, and all the plant and non-plant elements in your garden. This visual plan will help you as a guide to actually create the habitat garden (Figure 2.11).



Refer to the Activity 1, where you had identified some animals you would not like in your habitat garden. What can you do to ensure they are not attracted to your garden (e.g., ensure there is no stagnant water to prevent mosquitoes from finding a suitable habitat, keep the area tidy by removing wood stack and unused boxes, which could serve as hiding places for snakes, etc., and use natural deterrents).

**Mimicking Habitats**

1. **Nesting boxes for birds:** You may have seen 'nesting boxes', these are boxes of different shapes that birds can make nests in. You can make these using waste plywood or bamboo with some help from your teacher. The size of the entrance should match the birds you expect (e.g., small for sparrow, large for owl).

   Similarly, you must have seen birds drinking and bathing in shallow containers filled with water placed by humans. You can use any discarded container to provide water to birds. Just remember to keep them at a height so they are safe from cats or dogs.
2. **Waste puddles and feeders for butterflies:** Butterflies, on the other hand, do not like very deep water. For them, you can fill water containers with stones or pebbles, and sand. Add a pinch of salt and compost as well to provide nutrients. Ensure that this puddling area is always kept moist.

   A butterfly feeding area can be created just like feeding areas are created for birds; both need to be at a height but the one for butterflies has to be smaller. For birds, you can put out grains and seeds, while for butterflies you can put out rotting fruit or a sponge soaked in sugar syrup.

   For butterfly shelters you can make narrow and tall wooden boxes with slits instead of holes so that butterflies can enter but birds cannot. These boxes should be placed high above the ground in a place sheltered by winds.
3. **Shelter for beneficial insects:** For insects like ladybugs and beetles, you can create a shelter with natural materials like logs, straw, pinecones, and bricks. Simply stack these materials in layers within a wooden frame or crate. Ensure there are small gaps and crevices for insects to nest. Place these shelters near flowering plants or a compost pit, in case there is one in your school. This shelter should be placed 1–3 feet above the ground.

   Wooden logs, dead tree branches, and compost heap with dry leaves attract beetles, ants and similar insects. These can be placed in the corner of the habitat garden.

## Activity 6: Creating the habitat garden

Now that the design is ready, start planting the habitat garden!

The sequence of steps to be followed are given below:

1. Mark the area in the place you have identified. If land is not available, pots or planting boxes can be used.

2. First remove unwanted plants, debris, rocks, etc. to clean the selected area.
3. Mark the garden boundary with lime powder. Include as many existing trees or shrubs as possible.
4. Mark areas as per the layout.
5. Prepare soil by digging and loosening the soil, making planting furrows, and adding compost (around 20 to 30 Kg compost for every 100 square metre planting bed). If you are using pots, then prepare a potting mix with 2 parts soil, 1 part compost and 1 part dry leaves or cocopeat.

**Figure 2.12:** *Butterfly basking on a flat rock in a sunny area*

6. Create a fence around the habitat garden.

As your garden grows, you can slowly add non-plant elements. Some examples are given in Figures 2.13 to 2.16.

**Figure 2.13:** *Bird houses made of various types of materials such as bamboo sticks, wood, used bottles, etc.*

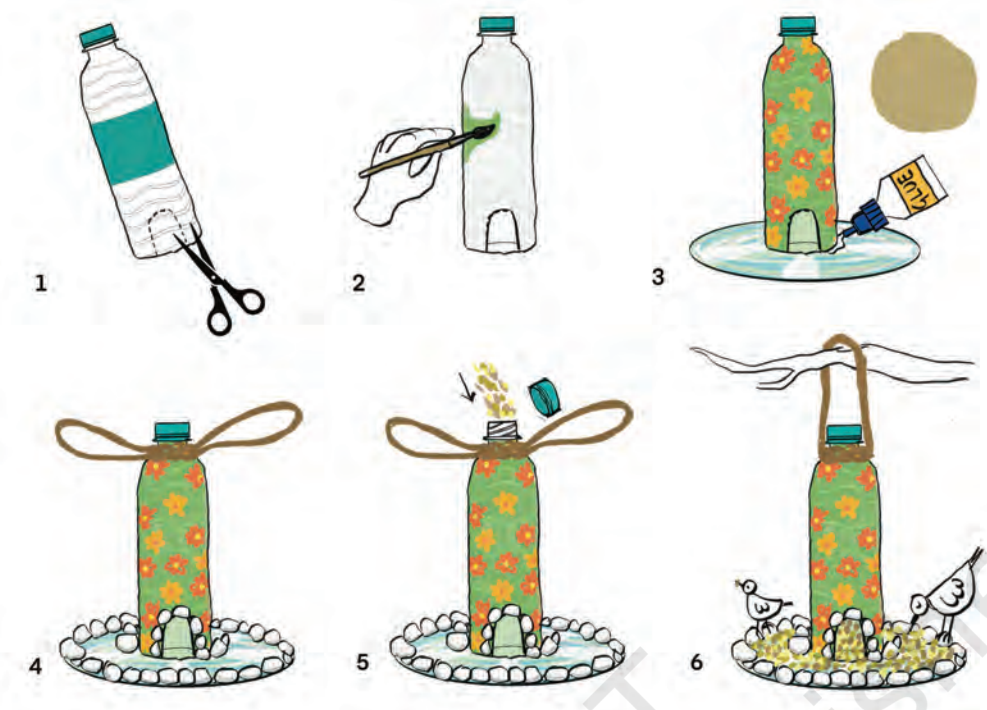



**Figure 2.14:** *Bird feeders made of used bottle and old dish or lid. The bottle is filled with bird feed, which slowly keeps spilling on the tray as birds eat*

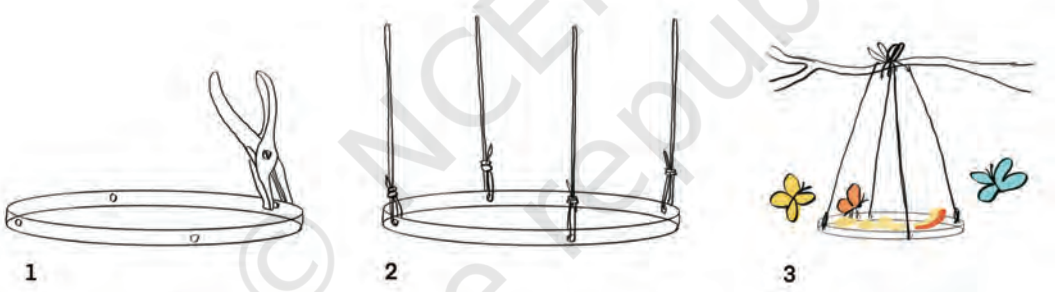



**Figure 2.15:** *Butterfly feeders made of old lids, pieces of fruit and sugar syrup can be placed on the feeders for butterflies*

**Figure 2.16:** *Butterfly house made of long sticks and thick thread*

Your habitat garden is now thriving with life. By carefully designing and nurturing it, you have created a "self-sustaining environment" that mimics a natural habitat. As plants grow and bloom, they naturally attract various insects and animals, creating a balanced ecosystem.

Flowering plants draw butterflies and small birds, while birds help control insect populations by feeding on them. The presence of insects also invites spiders, bats, lizards, and insects, which play their role in the "food chain". Over time, these smaller creatures attract larger birds, which will add to the "biodiversity" of your garden.

Your habitat garden can now become a haven for animals, a beautiful green space, and a step towards ecological conservation.

**Figure 2.17:** *Habitat garden in a school with a nest and a bird house*

## Activity 7: Observing occupants of the habitat garden

Allow your habitat garden time to grow and flourish. Once it has fully developed, observe the various animals that inhabit the school habitat garden, such as butterflies, ants, small birds, lizards, and squirrels. Work in groups to document your observations.

1. Carefully observe and record the behaviour of animals around water sources and feeding areas.
2. Remember that butterflies and birds are most active during sunrise and sunset, so try to arrive at school early for better observations.

3. If possible, take photographs or sound recordings. You can also sketch the animals or include photos in your observation records.

You can note your observations in table 2.6 below.

**Table 2.6: Observation records of visitors to the habitat garden**

| Observation | Date | Remarks |
|---|---|---|
| Insects<br>1. .....<br>2. .....<br>3. .....<br>4. .....<br>5. .....<br>6. ..... | 1. .....<br>2. .....<br>3. .....<br>4. .....<br>5. .....<br>6. ..... | Number observed .....<br>Stage of insect (like egg, larvae, adult, etc.) .....<br>Where did you observe it?<br>.....<br>Insect activity (like feeding, seeking shelter, bathing, mudpuddling)<br>..... |
| Birds<br>1. .....<br>2. .....<br>3. ..... | 1. .....<br>2. .....<br>3. ..... | Number observed .....<br>Where did you observe it?<br>.....<br>Bird activity (like feeding, hunting, seeking shelter, bathing, puddling)<br>..... |
| Small mammals<br>1. .....<br>2. .....<br>3. ..... | 1. .....<br>2. .....<br>3. ..... | Number observed .....<br>Where did you observe it?<br>.....<br>Animal activity (like feeding, hunting, seeking shelter, bathing, puddling)<br>..... |

If you are getting a lot of visitors to your habitat garden, that is wonderful! If not, do not be disappointed. You need to be patient, animals need to be confident that their needs will be met. Some animals may already be living in the school, and they may decide to use the habitat garden. Wait for some time, discuss with experts and make suitable changes.

## Activity 8: Maintaining the habitat garden

The habitat garden will host living things. This includes plants, ants, insects, birds, lizards and many others. To keep your habitat garden a buzzing place, you need to maintain it regularly.

Taking care of the habitat garden is important to ensure it continues to attract animals you want. You also need to take care of plants, and ensure there are no unwelcome occupants. For example, you need to water the plants, ensure there is no stagnant water to prevent mosquitoes, clear fallen leaves and stems from pathways (you can collect them and put them in a compost bed). Therefore, you must prepare a maintenance schedule for the habitat garden. You can divide yourselves into small teams and distribute the work. You must rotate the tasks so that everybody gets a chance to contribute. You can prepare a maintenance chart and keep a checklist to ensure tasks are done on time. Some examples are given in table 2.7; you can add more as per your habitat garden.

**Table 2.7: Maintenance schedule for the habitat garden**

| **Schedule for ..... week of the month of .....** | | | | |
|---|---|---|---|---|
| **Task** | **Responsibility** | **Planned date for the activity** | **Date activity was performed on** | **Remarks** |
| Watering of plants | | Everyday | | |
| Filling of watering and bathing containers | | Everyday | | |
| Feed in the bird feeder | | Once in a week | | |
| Weeding | | Once in a month | | |
| Cleaning of garden | | Everyday | | |
| Composting of agro-waste | | Every day | | |

Every living thing is looking for a comfortable and secure habitat. Your consistent efforts in maintaining your garden will attract more and more living things to your garden.

### Activity 9: Showcasing your work

Plan how you will share your habitat garden with others. To make it informative for visitors, consider labelling key features, such as:

1. Names of flowering plants
2. Animals benefiting from shelters, water containers, and feeders
3. Marked areas for mud-puddling and dust-bathing

You can also create a presentation to explain the process. This could be in the form of a chart or a digital slide presentation. Here are some key points to include:

1. **Purpose:** Why did you create the habitat garden?
2. **Designing and Layout:** How did you plan the layout based on the needs of animals?
3. **Target Species:** Which animals did you aim to attract, and what are their specific needs?
4. **Observed:** What have you noticed since setting up the garden?

This presentation will be valuable during the *Kaushal Mela*, where you can use it to explain your project to visitors.

## What did I learn from others?

1. What are three most fascinating things you have discovered?

   .....
   .....
   .....

2. What key insights did you gain from observing and discussing about the living beings and their habitat?

   .....
   .....
   .....

## What did I do and how long did it take?

It is important to understand how much time is required for an activity to be completed.

Calculate the approximate amount of time in hours you spent on each activity. Mark them on the timeline below. If you did more than the activities suggested in the book, please add the number and time taken.

| *Activity* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* |
|---|---|---|---|---|---|---|---|---|---|
| *Time taken (Periods)* | --- | --- | --- | --- | --- | --- | --- | --- | --- |

## What else can I do?

1. Try to create a small butterfly garden at home. For this, you will have to decide what kind of plants and non-plant elements will attract these insects. Get information from experts (including persons who create habitat gardens as a hobby) about local butterflies, birds and their habitats. You can collect information from local newspapers, magazines Internet, etc. about habitat conservation practices.
2. Write an essay or story about creating your habitat garden and send it for publication in the local newspaper.
3. Make a video of your habitat garden.

**Time lapse video**

You can create a time lapse video, that shows how something is changing. You can take photographs of your garden each time you feel you have added some element or plants have reached certain points in their growth (e.g., germination, appearance of stems and leaves and later of flowers).

Search on the Internet with the keywords – app+time lapse+video.Choose an app that will allow you to upload still photographs and make a video.

## Think and Answer

1. What did you enjoy doing?
2. What were the challenges you faced?
3. What will you do differently next time?
4. According to you, what is the importance of the habitat garden?
5. How do you plan to maintain the habitat garden after completion of project activities?
6. Identify few examples of jobs related to the work you just did. For example, naturalist, conservationist, entomologist, zoologist, botanist, forest officer, environmentalist. Look around, speak to people and write your answer.

Part 2

# Work with Machines and Materials



Machines make our lives easy, and materials are all around us. Projects on Work with Machines and Materials will help you work with different machines and tools to create new things with different kinds of materials, and to repair and maintain things. You can take up projects related to making electronic toys, carpentry products from wood and bamboo, and pottery products (with and without using a wheel), sewing clothes, decorating fabrics, using computers and smartphones to make games and animations, and using waste materials to make toys or even instruments for a school band. It is up to you to imagine all that you can do with your peers.

Two examples of projects are given in this section, which are Tie and Dye and AI Assistant. You must take up only one project. You can either choose one of these projects or you can design a project of your own choice with the help of your teacher.

Project 3

# Tie and Dye

0785CH03

This project will help you learn how to make beautiful patterns on fabric with dye. You will do this using different tie and dye techniques.

***As part of the project, you will be able to:***

- Learn about different techniques of tie and dye
- Prepare natural dye
- Explore tie and dye patterns on fabric
- Design a product using tie and dye


**Figure 3.1:** *Tie and dye in the classroom*

India has a rich history of textiles, with each state having its own traditional ways of weaving cloth and creating beautiful patterns using different methods, like dyeing, embroidery and printing. Some of these weaves and patterns have been used across centuries.

Among these methods is tie and dye, e.g., *Lehariya*, *Bandhani* (Figures 3.1 and 3.2). *Bandhani*, which literally means 'to bind or tie', is a resist dye technique. Resist dye techniques prevent dye from colouring some parts, so that it retains the original colour. Thus, it creates beautiful patterns.

**Figure 3.2:** *Bandhani patterns can be created to create intricate designs*

In the *Bandhani* method, fabric is folded, tied, twisted, and bound to prevent certain portions from being coloured. Artisans practising this method tie the fabric so that circles, spirals, stripes, and even patterns that appear like plants and animals are created. *Bandhani* is also known as *tie* and *dye*, and is generally practised in Rajasthan and Gujarat. Usually done on cotton, silk, and wool, traditional *Bandhani* is created using natural dyes made of plants and spices.

### Did you know?

As communities migrate, they continue their traditional work even as they become part of the local community already living in the area. One such community, which migrated from Gujarat many centuries

ago, lives in Tamil Nadu. While most of these immigrants got involved in weaving silk, those in Madurai introduced what came to be called the *Madurai Sungudi* — cotton tie and dye material, generally used for *sarees*.

Thus, tie and dye came to be associated with Gujarat, Rajasthan, and Tamil Nadu too.

Another popular resist dye method is wax resist where wax or a starchy paste is applied either freehand or using blocks/stencils, which have patterns carved on them. These patterns can be geometric, or in the shape of animals or plants. This is known as *batik*, and has traditionally been practised in Madhya Pradesh, West Bengal and Rajasthan.

**Figure 3.3:** *Dotted cloth draped over the woman's upper body is believed to be Bandhani*

*Bandhani* is among the oldest tie and dye techniques. The earliest evidence of *Bandhani* is found in the Ajanta caves in Maharashtra where paintings show a woman wearing a dotted cloth that is believed to be *Bandhani* (Figure 3.3).

*Bandhani* is not merely an Indian art form, it also reflects the rich culture of our country. Different colours and styles of *Bandhani* are associated with different communities and worn with pride in both Rajasthan and Gujarat (Figure 3.4). In some communities, different types of *Bandhani* are associated with different rituals.

**Figure 3.4:** *Bandhani turban is worn with pride by man in Rajasthan*

Since tie and dye products are created by hand, and no two artisans will tie the fabric in the same way, no two pieces are alike. Thus, each pattern is unique.

This project will help you create your own unique tie and dye product.

## What will I be able to do?

By the end of this project, you will be able to:

1. Prepare natural dyes using vegetables, fruits, spices and plants.
2. Design patterns for tie and dye.
3. Use tie and dye to create colourful patterns on recycled fabrics.
4. Prepare a product using tie and dye.

## What will I need?

You will need different kinds of tools and materials before you start working:

### Tools and Materials required

1. **Fabric:** Fabric used for *Bandhani* must be strong since it has to undergo multiple rounds of tying and dyeing. Hence, fabric made of natural fibres is used, e.g., cotton, silk, wool. You can use light coloured thin cotton fabric cut out of old clothes. If there are light-coloured linen or silk clothes that have been discarded at home, you can use them as well. You must ensure no traces of starch or dirt remain by washing the fabric carefully.
2. **Material for tying:** Thread for tying must be white or very light coloured. This is to avoid the colour from 'bleeding' from the thread, that is, to prevent the colour of the thread itself from dyeing the fabric. Rubber bands and clips can also be used if large portions are to resist the dye. Grains, pulses, seeds, small stones, peppercorns, etc., can be used to ensure that the area that resists the dye is of the desired size.
3. **Material for dyeing and fixing:** Natural dyes can be made using a variety of materials, e.g., beetroot, coffee, turmeric, red cabbage, pomegranate, henna, spinach,

orange peels, onion skin and indigo. To ensure the colour of the dye does not wash out or fade too soon or bleed from your product onto other clothes (e.g., on a shirt you are wearing), you will need fixers. For example, salt/ vinegar is used to fix the dye when flowers or leaves are used.

4. **Tools:** Measuring cup/spoon, containers, burner/stove, stirrers, iron, mug, plates, scissors, tongs, glass, bowl.

**Figure 3.5:** *Nakhli used by artisans*

The *nakhli* or *nakhlo* (Figure 3.5) is a 'ring' made of metal with a protruding blunt edge used by artisans to pick the fabric.

## How do I keep myself and others safe?

The following precautions need to be taken during various tasks involved in tie and dye techniques:

1. Wear gloves to protect your hands from warm dyes, and aprons to protect your clothes while using dyes. Use masks to avoid colour splashing on your mouth and prevent breathing in any vapour from the hot dye. Wear goggles to keep your eyes safe from hot water.
2. Work in a well-ventilated area so that smells and vapours do not irritate you.
3. Handle scissors with care while cutting fabric – never point the scissors towards yourself or anyone else.
4. Carefully dispose off any leftover dye solution in the sink. While using the dye, spread plastic sheets on the surface to prevent splashes and to keep the work area safe and clean.

**Internet safety:** Seek help from your teacher while using the Internet. Be careful not to upload or download anything without checking. Do not share personal information anywhere.

## What do I need to know before I start?

Look at the *Bandhani* samples in figure 3.6 below — patterns are repeated across each sample. What patterns do you see? Draw them in the box below the image.

**Figure 3.6:** *Different samples of Bandhani*

Now, compare the patterns you have drawn with those drawn by your peer. Discuss them with your peer.



### Some other tie and dye techniques

Two examples of popular shaped resist tie and dye techniques besides *Bandhani* are given below:

1. ***Leheriya*:** Made by folding and tying the fabric before dyeing. This results in a wave-like pattern. The word *leher* means 'wave'. It represents the flow of water and greenery, which hold high significance in states like Rajasthan and Gujarat.

2. ***Shibori*:** *Shibori* is an ancient Japanese tie and dye technique. The word *Shibori* means to 'wring, squeeze or press'. Traditional *Shibori* often used natural indigo dye, which changes colour from green to blue as the fabric reacts with air during drying.

Before you start making your own tie and dye patterns, you need to identify which fabric should be used. It will be useful to understand which fabrics and patterns are popular, and likely to sell. You can also compare the cost of tie and dye products with other products.

One way to do this would be to visit a shop selling clothes. You could also interact with a local boutique owner or a fashion designer.

Visiting a tie and dye workshop will help you to gain firsthand knowledge of the process. You could also invite an artisan to your school to give a demonstration. However, if it is not possible to get an artisan, even a person who does tie and dye as a hobby could be invited.

It is quite possible that a tie and dye workshop is not present in the vicinity. In that case, you can visit a dyeing workshop to get an understanding of the process.

## Activity 1: Visit to a shop

You will observe many types of products in the shop, made of different fabrics using different methods, like weaving, embroidery, dyeing, and so on (Figure 3.7).

While in the shop, try to get a feel of different fabrics by touching them. See if you can find *Bandhani*/*Batik*/*Shibori* or any other kind of tie and dye designs.

Before the visit, think of the questions you would like to ask the shopkeeper. Some pointers are given in table 3.1 but please add to these. Get responses for at least five types of fabrics.

**Figure 3.7:** *Range of products made of different fabrics using different methods*

**Table 3.1: Exploring fabrics in a shop**

| S. No. | Type of fabric (e.g., cotton, silk, linen, synthetic, jute) | What technique has been used to make patterns (e.g., tie and dye, block printing, digital printing, embroidery) | Price (rupees per metre or the cost of a *saree*) |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |

1. Is tie and dye available?
   .....
2. If yes, then which type (e.g., *Shibori, Leheriya, Bandhani*, ...)?
   .....
3. What kind of garment is most popular (e.g., *saree*, *dupatta*, scarf, stole, *kurta*)?
   .....
4. Which fabrics and colours are most popular with customers, and sell the most?
   .....

If you want to explore more varieties and patterns, search online with these keywords to find relevant videos: *Bandhani saree* shops in India, *Bandhani* cloth shop or types of design (your choice) + information.

Explore other key words that will help you fill the table. Remember, there will be variations with change of place, so try and search information from your own city or village, or nearby places.

What else do you think tie and dye can be used for besides clothes, like *kurtas*, turbans, shirts, *sarees*, *dupattas*? Think, and write down your ideas.

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## Activity 2: A visit to a tie and dye workshop

While visiting the workshop, observe everything around and ask as many questions as possible (Figure 3.8).

**Figure 3.8:** *Dyeing of fabric*

Ask for a demonstration of the process, and try to do some of the tasks yourself, if possible.

Here are some questions to get you started. Many other questions may come to mind when you are interacting with the experts. Do remember to note the responses to those questions as well.

1. How do you tie the fabric? How do you make sure the patterns are of the same size? How do you make the pattern larger or smaller?

   .....

   .....

   .....

2. Which tools and materials do you use for dyeing? Where do you get the dye from?

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3. What type of fabrics can be dyed easily? Are all these fabrics good for tie and dye as well?

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4. How do you ensure the colour does not bleed after dyeing?

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5. What should be the temperature of the dye when you dip the fabric? Does the temperature have to be the same for all fabrics and all dyes?

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6. How many times is the fabric soaked in the dye?

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7. How is the fabric dyed? How long does it take?

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8. Is it possible to dye different sections of fabric in various colours? If so, could you explain the process?

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Look at the figure 3.9 below – it shows the process of tie and dye.

***Step 1:*** Select the fabric

***Step 2:*** Wash the fabric


***Step 3:*** Select the plant for natural dye

***Step 4:*** Tie the fabric

***Step 5:*** Prepare the dye and add fixer

***Step 6:*** Dye the tied fabric

***Step 7:*** Dry the dyed fabric

***Step 8:*** Untie the fabric and see the design

**Figure 3.9:** *Tie and dye process flow chart*



In case you are not able to visit a workshop or invite an artist, you can watch an online video, using the following search words on Internet to find a relevant video: tie and dye process, tie and dye workshop, *Bandhani* workshop, *Bandhani* artisans India.

In case you observed something else, do add it to figure 3.9.

## What do I have to do?

### Activity 3: Exploring the art of tie and dye

Before you make your product, you must practice and experiment with fabrics, dyes and designs. First, make some samples on a small piece of fabric.

**Step 1: Prepare the sample fabrics**

Get five handkerchief-sized (6 × 6 inches) fabrics. These fabrics could be from an old shirt, *kurta*, *saree* or anything that is not in use any more. You can use different kinds of fabric— thin cotton, thick cotton, silk, linen or any other fabric to see the difference in results. Remember to start with white or light-coloured fabrics so you can see your designs better. Figure 3.10 shows how the fabric is to be prepared.

***Step 1:*** Cut the fabric

***Step 2:*** Wash to remove any starch to dirt

***Step 3:*** Dry the fabric and iron it to remove any crease

**Figure 3.10:** *Preparing fabric for tie and dye*

Write the details of the fabrics you are going to use in table 3.2 below:

**Table 3.2: Checklist of samples**

| Sample number | Fabric used | Preparation of fabric (e.g., cutting to size, washing, drying and ironing) |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

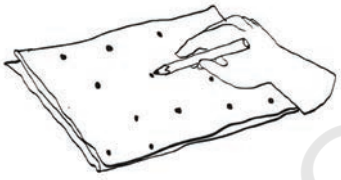
## Step 2: Tying the fabric

You have already read that when we tie the fabric, we prevent the part that has been tied from getting coloured by dye. This resisting of the dye creates patterns due to the difference between the parts that are dyed and not dyed. Tying the fabric in different ways will create different and unique design(s).

Experts can tie and dye the same fabric multiple times to introduce colours in the patterns — this is done by dyeing the fabric multiple times, each time tying different parts of the fabric to get a different colour and pattern. However, we will stick to two colours — the original colour of the fabric and the colour of the dye.

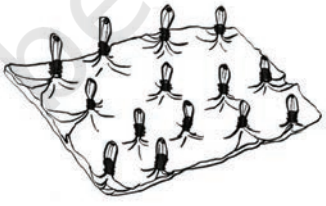
The technique for tying fabric for *Bandhani*, *Shibori* and *Leheriya* is given in figures 3.11 to 3.13, respectively.

***Bandhani* tying technique**



***Step 1:*** Draw a design on the fabric using tiny circles/dots.

***Step 2:*** Place a mustard seed on the fabric where you want the design element to appear. Pinch a small portion of the fabric around the seed using your fingers.

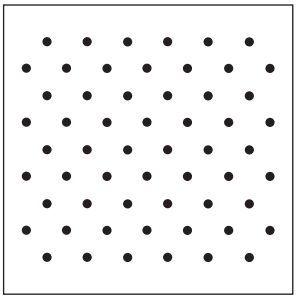
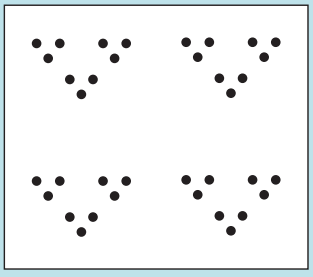
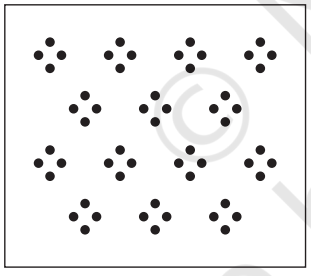
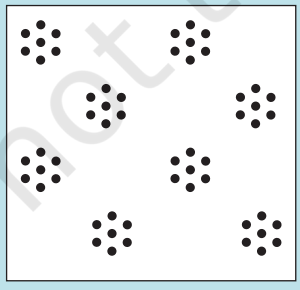


***Step 3:*** Pull the seed up with the fabric and tie it tightly with the thread. Repeat the process for the design you would like to create .

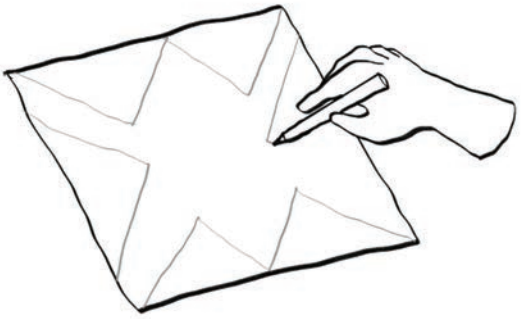
**Figure 3.11:** *Tying technique for Bandhani*

Traditionally, *Bandhani* patterns are given different names depending on the number of knots in the design. Larger designs are made by repeating these patterns. Some examples are given in table 3.3; try to make your own design using any of these.

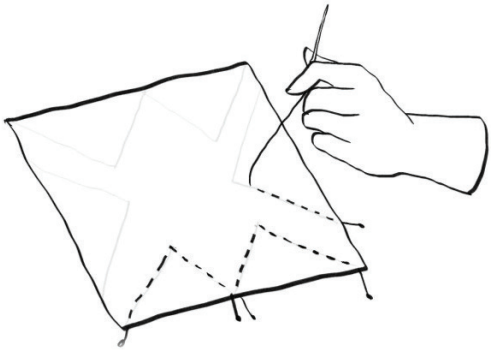
**Table 3.3: Examples of some traditional *Bandhani* patterns**

| Name of the pattern and image | Your design using this pattern |
|---|---|
| *Ekdali*: Single dot  | |
| *Trikunti*: Groups of three  | |
| *Chaubandi/Chaubasi*: Groups of four  | |
| *Satbandi*: Groups of seven  | |

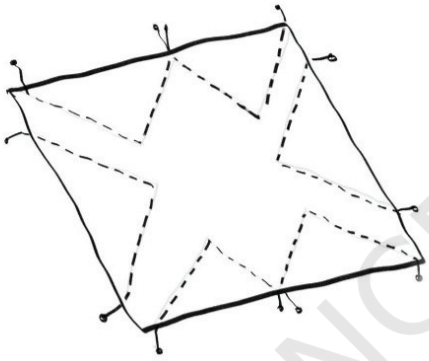
**_Shibori_ tying technique**



***Step 1:*** Draw the design on the fabric. You can draw the design either in a straight or dotted line.



***Step 2:*** Use a needle and thread to sew simple running stitches along the lines of your design. Make sure to keep even spacing for a neat pattern.



***Step 3:*** Continue stitching until your entire pattern is outlined with the running stitches. Keep the stitches loose, as they will be gathered later.

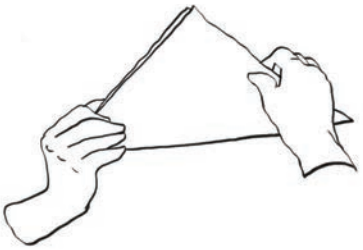
***Step 4:*** Gently pull the loose ends of the thread to gather the fabric, creating folds. The tighter you pull, the more distinct your design will be.

***Step 5:*** Once gathered, tie a firm knot at the end of the thread to hold the folds in place. Make sure it is tight, so the dye does not seep into the folded areas.

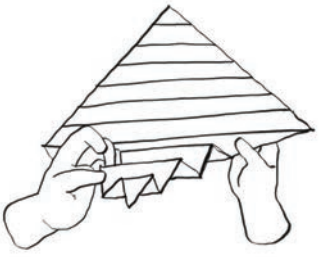
You can vary the pattern by varying the length of the stitches, the angle of the lines, and where and how tightly you tie the thread.

**Figure 3.12:** *Tying technique for Shibori*

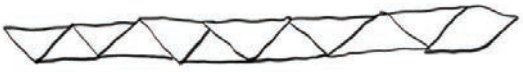
***Leheriya* tying technique**



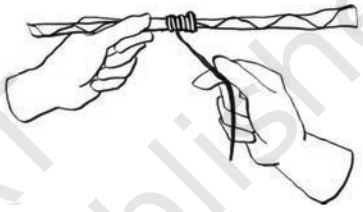
***Step 1:*** Fold the fabric in half and find the centre point. This will help in creating symmetrical pleats.



***Step 2:*** Start making small, even pleats by folding the fabric back and forth like an accordion. Ensure the pleats are neat for a clean pattern.



***Step 3:*** Continue folding until the entire fabric is pleated. Hold the fabric firmly to maintain the folds.



***Step 4:*** Carefully hold the pleats and tie them tightly with thread at the centre. Ensure the knot is secure to keep the pleats in place.

***Step 5 :*** Tie the fabric at equal intervals on both sides of the centre. This will create the *Leheriya* pattern after dyeing.

You can vary the design by decreasing or increasing the number of pleats, as well as the distance at which you tie the thread.

**Figure 3.13:** *Tying technique for Leheriya*

Now, you are ready to tie your first sample. First, think of a design, draw it on the fabric and then tie your first sample fabric. Do not tie and dye all samples together. Doing one sample at a time will help you improve your tying technique. You can decide which technique to use; however, it is recommended you try more than one technique.

On the basis of your experience of tying, fill table 3.4. Draw the design of the sample, and note any challenges you faced and their solutions. You can make additional samples if needed.

**Table 3.4: Making the samples**

| Actions | Details | Challenges and solutions |
|---|---|---|
| Sample number and fabric:<br>Tying technique used: | | |
| Design of the sample | | |
| Sample number and fabric:<br>Tying technique used: | | |
| Design of the sample | | |
| Sample number and fabric:<br>Tying technique used: | | |
| Design of the sample | | |

| | | |
|---|---|---|
| Sample number and fabric:<br>Tying technique used: | | |
| Design of the sample | | |
| Sample number and fabric:<br>Tying technique used: | | |
| Design of the sample | | |
| Sample number and fabric:<br>Tying technique used: | | |
| Design of the sample | | |



**Step 3: Preparation of dye**

Different kinds of dyes, both chemical and natural, are available in the market. Of these, natural dyes are more environment friendly.

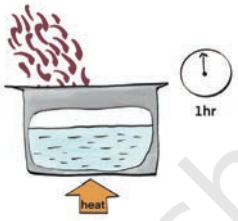
To prepare natural dyes, select the ingredients based on the colour you want (e.g., turmeric/marigold flowers for yellow, beetroot for pink, spinach leaves for green, blue hibiscus/ blueberry/blue pea flower for blue).

You can also search for methods of preparing natural dyes of different colours on the Internet by using keywords: process for making natural dye from plants of ..... colour (mention the colour of your choice).

Figure 3.14 shows the process for making pink/red dye solution using beetroot.

**Making pink/red dye**

***Step 1:*** To create a natural beetroot dye, start by chopping or crushing two medium-sized beetroots. This helps effective release of colour.




***Step 2:*** Add the crushed beetroot to 1 L of water and let it slowly boil for about 1 hour. This process extracts the rich red pigment from the beetroots.

***Step 3:*** Once the mixture has cooled down, strain the liquid using a cotton cloth or a strainer to remove any solid pieces, leaving only the coloured liquid.

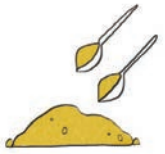
***Step 4:*** Finally, add one to two tablespoons of salt to the dye solution. This acts as a fixer, and helps set the colour, making it more effective for dyeing fabric.

Your natural beetroot dye is now ready to use. The quantity of the plant (vegetable/flower/fruit) and water will depend on the shade of colour needed and the weight of the fabric — the darker the shade and the heavier the fabric, the more quantity is required.

**Figure 3.14:** *Making pink/red dye using beetroot*

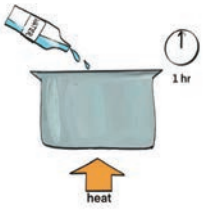
Figure 3.15 shows the process for making yellow dye using turmeric, which is easily available at home.

**Making yellow dye**

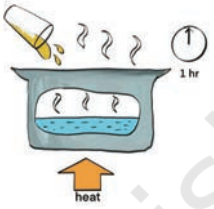


***Step 1:*** Measure 2 tablespoons of turmeric powder and keep it ready for use in a bowl.

***Step 2:*** Take half a glass of cold water and dissolve the turmeric in it using a spoon.




***Step 3:*** Measure 1 L of water in a large container. Place it on heat and let it simmer.




***Step 4:*** Add the cold water and turmeric solution to the warm water, and let it simmer for an hour.

***Step 5:*** Add 1–2 tablespoons of salt/baking powder/vinegar to the dye – this will act as fixer.

Your natural turmeric dye is now ready to use. The darker the shade of yellow and the heavier the fabric, the more quantity of turmeric is required.

**Figure 3.15:** *Making yellow dye using turmeric*

## Did you know?

Heating plays an important role in the dyeing process as it increases the solubility of dye in water, speeds up the dyeing process, and helps fix the dye to the fabric. However, there are some dyes and processes which require no or minimal heating. While there are several techniques, two are mentioned here:

**Passive heating process**

If time is not a constraint, then dye can be prepared using solar energy. This would require putting the dye and fabric in a glass jar and placing it in a sunny spot to slowly extract the dye with minimal heat. This process can take several days to weeks, depending on the shade of colour you want – the darker the shade, the longer it takes.

**Cold water dyes**

Cold water dyes, which use chemicals to fix the dye instead of heat, are available in the market. The dye is mixed in cold water or water at room temperature. Tied fabric is soaked in the dye, and then in a solution made with a fixer before the final rinsing.

Table 3.5 has other examples of preparing dye of different colours from plants.

**Table 3.5: Making dyes from plants**

| Colour | Plant | Image | Steps to prepare dye (the amount of dye needed depends on the shade you want to achieve) |
|---|---|---|---|
| Blue | Blue hibiscus |  | • Mix 100 g blue hibiscus in 1 L of water<br>• Simmer the water to the boiling point<br>• Strain the solution to remove the flowers and add 250 mL vinegar |
| Brown | Tea/Coffee |  | • Mix 100 g coffee powder/tea powder in 1 L of water<br>• Simmer the water to boiling point<br>• Strain the solution to remove any coffee particles and add 250 mL vinegar |
| Green | Spinach |  | • Chop 100 g spinach<br>• Add it to 1 L of water<br>• Simmer the water to boiling point<br>• Strain the solution to remove any vegetable particles and add 2 tablespoon of salt |

| | | | |
|---|---|---|---|
| Yellow | Marigold |  | • Mix 100 g marigold in 1 L of water<br>• Simmer the water to boiling point<br>• Strain the solution to remove the flowers and add 250 mL vinegar solution |
| Red | Pomegranate |  | • Mix 100 g pomegranate seeds in 1 L of water<br>• Simmer the water to boiling point<br>• Strain the solution to remove the seeds and add 2 tablespoons of salt |

Which colours have you chosen to dye the samples? .....

Fill table 3.6 for the dye you prepared for each sample – in case you used the same dye, please mention the details.

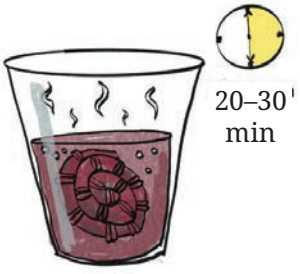
**Table 3.6: Preparing dyes with different plants**

| Steps | Details |
|---|---|
| Materials used to prepare the dye | |
| Quantity of the ingredients | |
| Quantity of water | |
| Materials used to fix dye | |
| Safety precautious taken | |
| Any other material that will give a similar colour | |

Figure 3.16 shows the process for dyeing the tied fabric.

**Dye, dry and untie the fabric**

***Step 1:*** Dip the tied fabric in normal water.

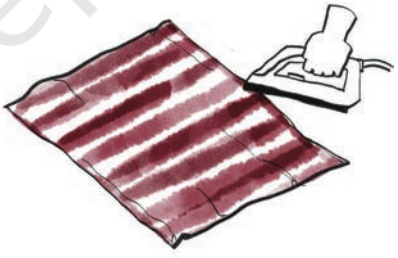



***Step 2:*** Dip the fabric in warm dye solution for 20–30 minutes.

***Step 3:*** Take the fabric out of the dye. Ensure you wear gloves.

***Step 4:*** Wash it with plain water once to remove excess dye.


***Step 5:*** Keep it in a clean space to dry for a day.



***Step 6:*** Next day, you can untie and press the fabric.

Repeat the process from steps 1–6 for all 5 samples.

**Figure 3.16:** *Process of dye, dry and untie the fabric*



Did you face any of the challenges listed in table 3.7? See if you can overcome these challenges with other samples.

**Table 3.7: Common challenges and their solutions**

| Challenge | Try this solution |
|---|---|
| Did the thread break or open during the dyeing process? | Tie the fabric tightly and handle it carefully to ensure that it does not loosen during the process. |
| Did you spill the dye solution during the process? | Ensure that there is enough space where you are working to keep the dye and other material. Use a cloth or gloves to hold the hot container. |
| Did you cut the fabric while untying the fabric by mistake? | Do not use scissors to cut the thread. You can use the needle to find the point of thread and use your hand to further untie it. |

Look at the samples carefully.

What did you learn to do/not to as you moved from samples 1–5?

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### Step 4: Documenting a swatch file

Create a swatch file to display your samples (Figure 3.17). A swatch file is a combination of your creative samples with some details. You will use this file to present your samples. For each sample include the following:

1. Fabric sample
2. Type of fabric
3. Technique used for tying and dyeing
4. Fabrics and dye used
5. Challenges faced while creating the sample
6. Step-by-step process of preparing the samples

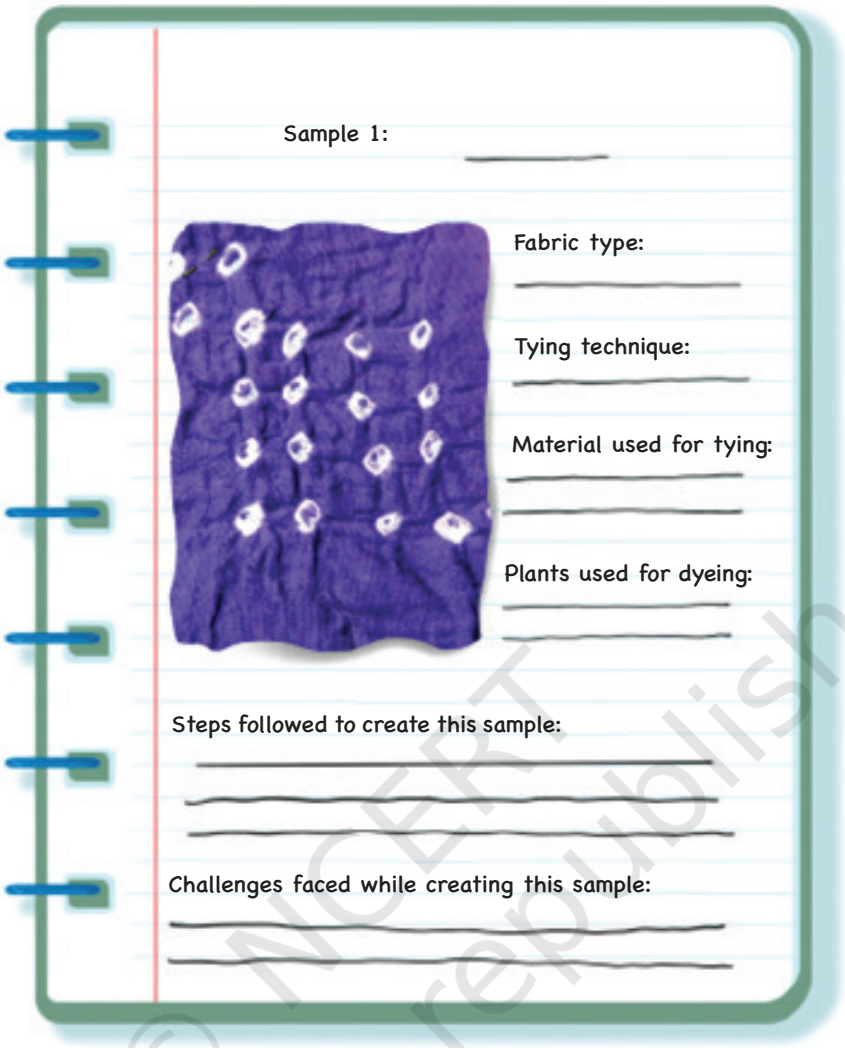



**Figure 3.17:** *Sample of a swatch file*



## Activity 4: Making the final product

After trying your hand at 5 samples, you have learned the stepwise process of tie and dye. Now, you are ready to create a product you can use.

### Step 1: Selection of a product

Select a product that you would like to create, e.g., *dupatta*, pillow cover, scarf, or dress material. First, select the fabric—try and find old clothes at home that are not worn anymore or old bedsheets, and cut them as needed. Figure 3.18 shows a size chart for some of the products.

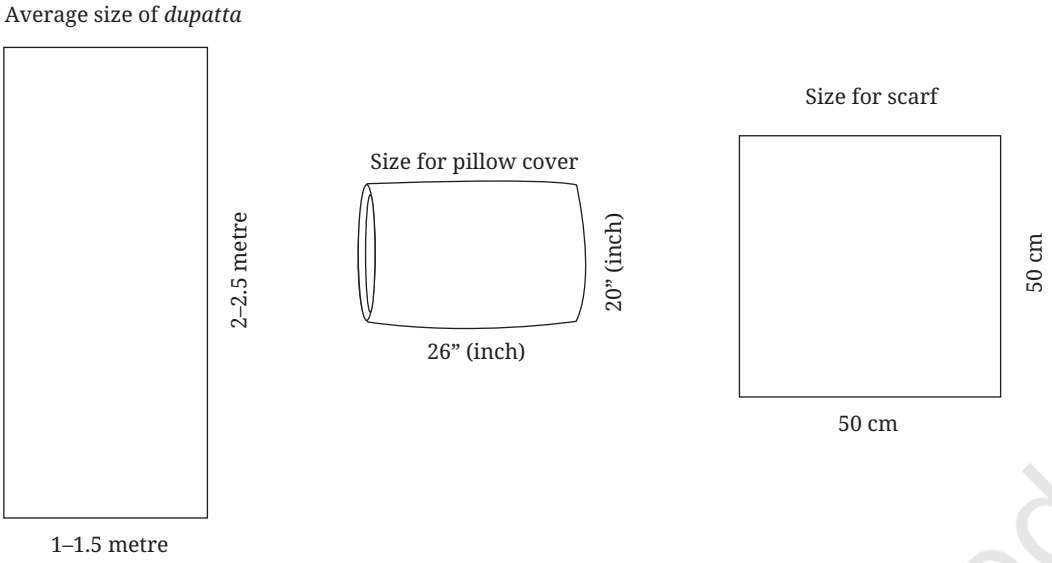



**Figure 3.18:** *Measuring and selecting fabric*

You can take the help of your teacher, a family member, or a tailor from a nearby shop to cut the fabric in the proper size.

1. Which product will you make?

   .....
   .....
   .....

2. Which fabric did you select? Why?

   .....
   .....
   .....

3. Sketch the pattern of your product with dimensions.

## Step 2: Finalise the design, colour and tying technique

You need to come up with a design for using the tie and dye technique. You can take 'design inspiration' from things around you. Figure 3.19 shows some design examples inspired by everyday objects.

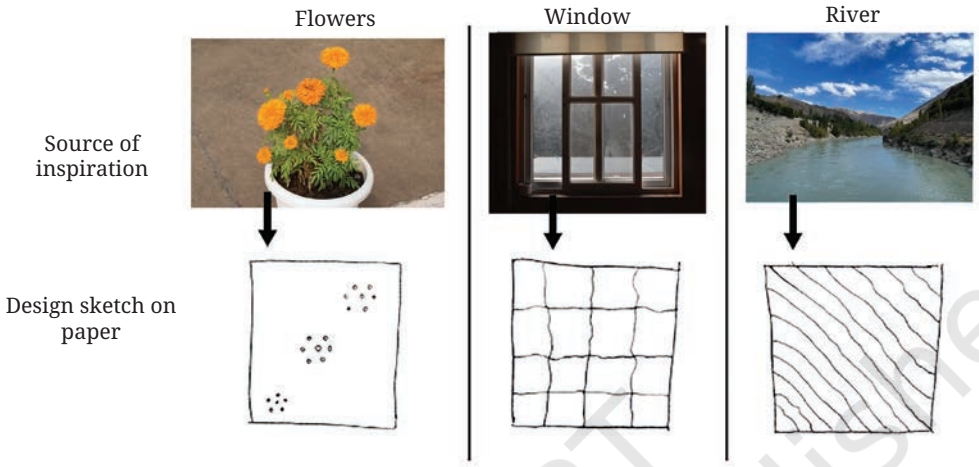



**Figure 3.19:** *Design inspiration and designs for tie and dye*

Now, try and draw a design inspired by the flower in figure 3.20.

**Figure 3.20:** *Design inspired by a flower*

Take a fun walk around and get inspired by the world. Look at nature, art, or even your favourite things to spark ideas for your design. Imagine, nature can inspire patterns of tie and dye techniques. The pattern you finally chose could be based on such a 'design inspiration'.

After you decide your design(s), choose the dye colour and the tie and dye technique.

1. What is your design inspiration?

   .....

   .....

2. Draw the design you want on your product in the box.

3. Which plant (vegetables/flowers/fruits) or other materials (e.g., tea, coffee) will you use to prepare the dye?

   .....

   .....

4. Which tie and dye technique will you use?

   .....

   .....

**Step 3: Tie and dye the product**

It is time to bring your tie and dye dream to life. Prepare your fabric and make it ready for the tying and dyeing process. Follow your design and create patterns by tying the fabric in creative ways.

Make sure you follow all the safety rules. You have a bigger cloth this time than your sample fabrics, therefore use 2–3 L of water to make a larger quantity of plant dye. After dyeing the fabric, leave it to dry for a day.

Describe what you did in table 3.8.

**Table 3.8: Recording the process of making the final product**

| Actions | Steps taken |
|---|---|
| Preparation of the fabric | |
| Tying | |
| Preparation of dye | |
| Dyeing and drying | |

### Step 4: Untying the product

The final step is untying the dried fabric carefully to reveal your unique design. Once the knots are undone, iron your product to smoothen out any wrinkle. The heat of the iron must be selected according to the fabric.

### Did you know?

Some modern tie and dye artists use a technique called *reverse tie and dye*. Instead of adding dye to fabric, they remove colour using bleach or other chemicals to create striking white patterns against a dark background.

1. Did you manage to create the design you wanted? If not, what might be the reason?

   .....

   .....

## Activity 5: What did you invest?

You invested both time and maybe some money was spent to gather material. Tables 3.9 will help you estimate the cost of the product.

**Table 3.9: Product costing**

| List of materials | Quantity of materials | Cost of the material (₹ 0/- if you recycled materials) |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

## What did I learn from others?

1. You learnt during field trips, online and offline interactions with experts, family and friends, community members, and other sources. What did you find most interesting?

   .....
   .....
   .....

2. What did you learn from family/community members (e.g., any information about traditional clothes at home, stories about making clothes or special memories attached to clothes)?

   .....
   .....
   .....

## What did I do and how long did it take?

It is important to understand how much time is required for an activity to be completed.

Calculate the approximate amount of time in hours you spent on each activity. Mark them on the timeline on the next page. If you did more than the activities suggested in the book, please add the number and time taken.

| *Activity* | *1* | *2* | *3* | *4* | *5* |
|---|---|---|---|---|---|
| *Time taken (Periods)* | --- | --- | --- | --- | --- |

## What else can I do?

Ornamentation is about adding that special touch to your creation. You can add your creativity to decorate the product. Look for materials you already have — recycled items, leftover fabrics, buttons, silk or cotton thread, mirrors, etc. Table 3.10 has some examples; you can get more ideas from your teacher, family members, or friends.

**Table 3.10: Ornamentation of your finished product**

| Types of ornamentation | How to do it? |
|---|---|
|  | • Place the lace on the fabric where you want to attach it.<br>• Pin the lace to the fabric so that it does not shift when you sew.<br>• Use a simple running stitch to fix the lace with the fabric. |
|  | • Choose the buttons of your choice.<br>• Plan how you will use them – for example, you may like to add 4 buttons at the corners of your scarf or 5 buttons on each side of your *dupatta*.<br>• Fix the buttons to the fabric using needle and thread. |
|  | • Choose the pom-pom/tassel of your choice.<br>• Plan how you will use them, for example, you may like to add 4 tassels at the corners of your pillow cover/cushion or 7 tassels on each side of your *dupatta*.<br>• Fix the pom-pom/tassels to the fabric using needle and thread. |

You can also explore embroidery, beadwork, and sequins apart from the things mentioned in table 3.10. This will make your product even more unique.

## Think and Answer

1. What did you enjoy doing?
2. What challenges did you face?
3. What will you do differently next time?
4. Write the journey of a tie and dye product from producing raw materials to reaching the market. Which jobs are involved in this process?
5. Identify few examples of jobs related to the work you just did. For example, artisan, dyer, fashion designer, retailer, and textile researcher. Look around, speak to people and write your answer.

Project 4

# AI Assistant

0785CH04

This project will help you learn about using Artificial Intelligence (AI). You will create an AI Assistant to help someone who has recently moved into your locality .

***As part of the project, you will be able to***

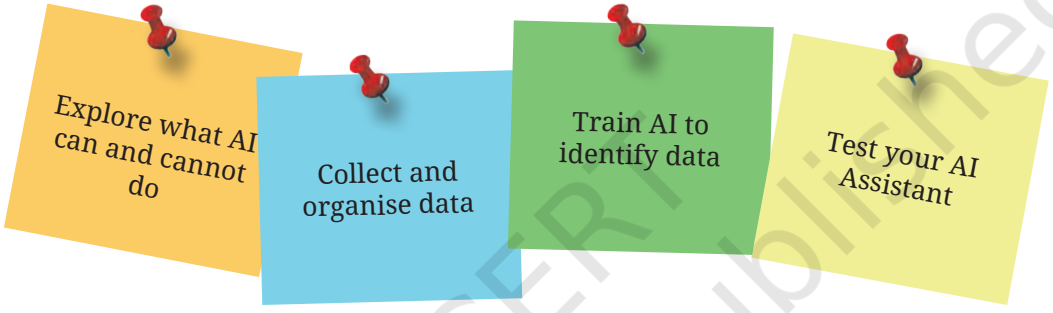




**Figure 4.1:** *A student using AI to interact and learn more about the world around us.*

**What do we mean by intelligence?**

Intelligence is the ability to learn and to use what you have learnt in new situations. Intelligence keeps growing – the more we deal with new situations, the more our intelligence grows.

With advances in technology, machines are also becoming intelligent, just like humans. This is known as *Artificial Intelligence* (AI) and it is progressing very rapidly – what we did not imagine even a few years back is possible now (Figure 4.1).

Before learning about AI, let us discuss how we learn. Imagine that, on the first day of school, you meet many new people. Your brain will try to remember their faces and names, but you may not be able to remember all of them. After few meetings and interactions, your brain will start recognising each person and recalling their names as soon as you see them. After few days of interaction, you will be able to recall many qualities of that person.

AI works in a similar way. For example, if we want a machine to recognise an image, we need to show different images of the same object. We do this by uploading these images with proper instructions. Suppose, we want a machine to recognise a banyan tree. We will upload many different images — banyan tree in the shade, in light, different stages of growth (including many pictures of saplings), from different angles, in different geographies, full photos, partial photos — this will have to be done carefully to ensure the machine has maximum possible data related to how a banyan tree looks.

We also need to teach the machine to associate images with their name — in this case, 'banyan tree'. Slowly, as you upload more data and associate it with the name, the machine will start recognising images, even those it has never seen before and connect them to the correct name. You can even teach the machine to connect to other information related to the banyan tree. In this way, you can keep adding the connections the machine can make — e.g., scientific name, conditions for growth, uses, animals who live in it, and whatever else may be useful for humans. This process is called 'Machine Learning', and AI makes it possible.

Similarly, you can teach the machine to recognise audio recordings of music and sounds — e.g., with a different tone, using different musical instruments — and video recordings — e.g., different backgrounds, different angles.

AI is being used in various ways to help humans. AI can be used to automate repetitive tasks, thus, reducing human efforts and increasing productivity.

As its use increases, and scientists and engineers explore how it can be expanded, it is fast becoming a part of our everyday lives.

Right now, we use AI without even thinking of it. Various apps for navigation while driving, image recognition, translation, and so on are part of our lives. You may have heard of robots that help doctors operate from a city far away from the patient, or robots who can teach students. Till few years back, some of these functions of AI were part of science fiction books and films. And now they are fast becoming a reality.

Even though AI may keep learning by itself, as it gathers more information there are certain things it cannot do. For example, can we teach AI to feel emotions? AI may be able to identify various aspects of nature that make it beautiful, but it will be able to convey that an artwork makes you feel good only when you train it to do so – it will never be able to feel emotions as humans do.

## What will I be able to do?

At the end of the project, you will be able to:

1. Understand how AI can be a useful tool for humans.
2. Collect data that can be used to create an AI Assistant.
3. Train a machine to recognise data based on your instructions.
4. Create an AI Assistant to help someone learn about your locality.

## What will I need?

**Devices:** You will need a computer with a webcam and a microphone/speaker or a tablet with Internet access. You will also need a camera that can take photographs and record audio data. In case you do not have such a device, you can use the smartphone of a parent/teacher.

**AI Tools:** Teachable Machine, Scratch, and any other tool you may find useful to build the AI Assistant.

You can search for more AI tools by using these keywords:

- Machine Learning Website + Image Recognition
- Machine Learning Website + Sound Recognition
- Machine Learning Website + Image and Sound Recognition

## How do I keep myself and others safe?

**Internet safety:** Discuss the safety precautions which should be taken while accessing the Internet with the teacher and your peers. Make a list of 'dos' and 'don'ts'. Make sure you follow this list while working. If in doubt, ask your teacher. Remember to limit your screen time as advised by your teacher and family members (Figure 4.2).

**Sensitivity:** Get permission before collecting data or taking photos. For example, if you are taking a photograph of a shop, ask the shopkeeper for permission. Be respectful to all and try and understand the reasons people do things that may seem strange to you, e.g., a custom that is unfamiliar to you. Take care when taking photographs of plants and animals – ensure they and you are both protected from harm.

**Figure 4.2:** *Excess screen time is not good for your mental and physical health– remember to go out and play.*

## What do I need to know before I start?

Before you start, you should know basic functions on the computer, and how to use the Internet. You should be able to take photographs and upload them.

But, before you begin, the first thing you must do is to understand what AI can and cannot do. Once you understand this, you will be able to make decisions about what the AI Assistant should do.

### Activity 1: Human vs Machine: Who is Better at What?

Start by exploring three tasks related to what makes humans and machines special, and discovering how both work.

1. **The speed with which a machine and you can calculate:** *Speed Test.* You can do this using pen and paper, and a calculator. You can use a watch or borrow your teacher's smartphone to keep track of time.
2. **Check how accurately a machine can guess what you have drawn:** *The Creative Guessing Game.* Use 'Quick Draw' or a similar drawing game. Draw and let the computer guess what it is.
3. **Compare who can better guess the time taken to reach school:** *The Prediction Test*. Think of how long it usually takes to reach school. Pick any date and predict how long you will take to reach school. Now, ask Google Maps how long it will take. Compare the predictions.

You can search for more apps on the Internet with these keywords:

- Apps + drawing recognition
- Apps + navigation

Fill tables 4.1 and 4.2 based on the following tasks:



**The Speed Test:**
- Multiply 5643724 × 2
- Time yourself.
- Then use a calculator.

**Write Down:**
- I took ____ seconds.
- Every student in class had the same answer (Yes/No) _____
- Every calculator gave the same answer. (Yes/No)_____
- Our answers matched (Yes/No) _____

**The Creative Guessing Test (Using AI tool)**
- Play Quick Draw with the computer.
- Draw 5 simple things when asked.
- Keep track of how many times the computer guesses what you have drawn.

**Write Down:**
- What have you drawn? _____
- After giving the prompt did the computer guess correctly? (Yes/No) _____

**The Prediction Test (Using AI tool)**
- Think about your way to school.
- Guess how much time you will take to reach school on the next Monday.
- It will take ____ minutes
- Check Google Maps– what does it say?_____

**Write Down:**
- I guessed ____minutes.
- Google said _____ minutes.
- Are they different? (Yes/No)_____



**Table 4.1: How many times did the computer guess right?**

| I drew | Did the computer guess right? |
|---|---|
| | |
| | |
| | |

**Table 4.2: Did the machines do their work?**

| App used by you | What can the app do? | Do you think the app did its work? Yes/No | Give reasons for your response |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

Machines are faster in terms of computing. They can guess accurately when sufficient information is available but may not be able to guess accurately if they need more information. Do you agree? Discuss among yourselves.

## Activity 2: AI can see, listen and speak

AI can help people see, listen and speak – after it has been taught to do so.

For example, modern hearing aids for people with hearing loss use AI to suppress unwanted noises and amplify other sounds. Thus, a person can hear human speech clearly while the background noise fades into the background. AI can even improve the quality of what is spoken. Some AI tools can distinguish between different speakers, so that the user can follow conversations correctly. Thus, AI can listen.

### Did you know?

**Prof. Stephen William Hawking** was a famous scientist, who made many important discoveries about the universe. But what was unique about him was that he was suffering from an illness from the age of 21 years that led to slow paralysis of his entire body. Gradually, he lost the ability to speak.

However, Prof. Hawking used AI to communicate. Initially, he used a system that helped him select words on a computer screen by tracking movements of his cheek muscles. The words he selected were converted to speech.

**Figure 4.3:** *Prof. Stephen Hawking*

AI can help people with visual impairment through AI enabled glasses with sensors that can detect light and images. Thus, AI can see.

AI can also use recordings of people who have lost their voice to help them speak even if they are unable to do so themselves.

These recordings help AI convert whispers or stuttered speech into clear speech, with modulations and emotions. Thus, AI can speak.

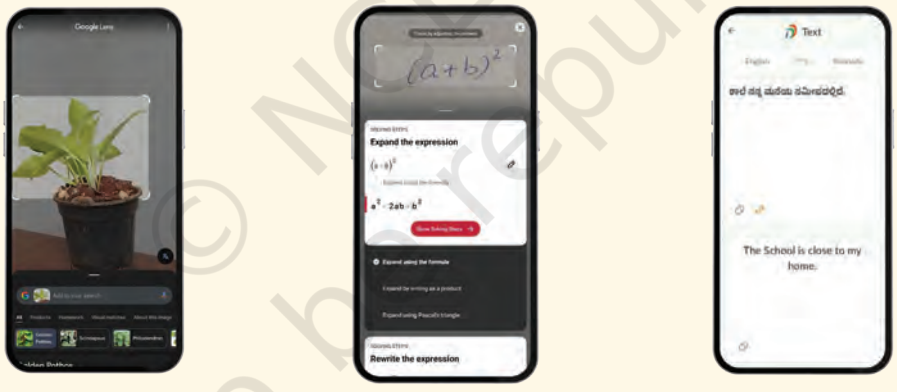
You can do this activity using a smartphone or tablet.

You have explored some capabilities of AI.

Now, experiment with AI tools to see how machines can observe, process, and understand the world (Figure 4.4).

You can use apps to try out what AI can do. You can search with keywords to find suitable apps:

- Apps for image identification; Apps for plant identification; Apps for identification of birds
- Apps for reading text on images; Apps for reading catalogues in different languages; Apps for solving mathematical problems
- Apps for translation; Apps for text to voice and voice to text




(a) (b) (c)

**Figure 4.4:** *Using AI on mobile devices*

| | | |
|---|---|---|
| Use Google Lens to scan an object or plant that is unfamiliar to you. | Write down a mathematics problem or find one from your textbook. Use Photomath to scan the problem and observe how it solves it step by step. | Choose a simple sentence in your native language. The example statement is: The school is close to my home. Now, use *Bhashini* to translate it into a different language. |

Find more tools that can:

Identify birds by their chirping or recognise constellations in the night sky or design and visualise outfits that you can try on?

What tools did you discover and use?

.....

What did you explore using these tools?

.....

**Table 4.3: Exploring AI tools: see, listen and talk**

| The app used by you | What can the app do? | Do you think the app did its job? Yes/No | Give reasons for your response |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

Can you find any other examples of how AI helps humans perform these functions (Figure 4.5)?

Please record your observations in the table 4.3.

Discuss as a group how these capabilities of AI can be helpful for humans. Write the ideas you come up with below.

**Figure 4.5:** *A student using an AI tool to identify a plant*

.....

.....

## Activity 3: Is AI creative?

We have learnt that AI can see, listen and speak. It can differentiate between what is important for the user and what is not, and provide useful information. But can it 'think', 'observe' and 'feel' like humans can?

Suppose, you had to tell someone about your trip to a *mela* or celebration of a festival or visit to a place of historic or tourist interest.

What will your story be about? Write the idea of your story in a single sentence below:

.....

.....

Write about everything that made the visit special for you. Describe what you saw (e.g., colours, interesting things to eat, shops with exciting games), what you heard (e.g., music, games, laughter), about the food and drink you had, and how you felt (e.g., excitement, heat, or wind). Then ask AI to create a similar story using your story idea as a prompt.

.....

.....

.....

To get an AI tool to write or draw something, you need to write a 'prompt' for it to give you the correct result. An 'AI prompt' is usually more detailed than search words. It can be a set of instructions or questions to help AI generate a specific 'reply' to your prompt.

Compare your story with the AI version.
Was AI's story different from yours? Yes/No .....

You can search for AI tools to write a story. One example is the AI tool GenerateStory.io. You can search for other AI tools as well using the keywords, AI to generate a story.

1. What details were similar and different between the story you had written, and the one AI had written?

   .....

   .....

   .....

2. What parts of the story written by AI did you like and why?

   .....

   .....

   .....

Now, let us learn how AI can help to make your story better. Add more details to the prompt you had originally given an AI. Think of what you would have liked the AI to add to the story.

**Figure 4.6:** *Exploring what AI can and cannot do*

1. Write the new prompt in the space below:

   .....

   .....

   .....

2. What is the difference between the story AI had written by itself and the one it wrote with your help? Do you think it is better than the previous one? Yes/No .....

If not, improve the prompt and try again.

Of course, AI will never be able to write a story like you do, but it can do other things to help you (Figure 4.6).

Draw a picture of the place your story is about or anything that is part of your story (e.g., giant wheel, ice cream cart, puppet show). Try to include as many details as you can.

You can ask AI to clean up your rough sketches and make them look neat. Search online with keywords — AI for enhancing your handmade drawing. An example of such a tool is AutoDraw.

For example, the rough sketch of a food cart has been cleaned up using AutoDraw (Figure 4.7).

Compare the pictures.

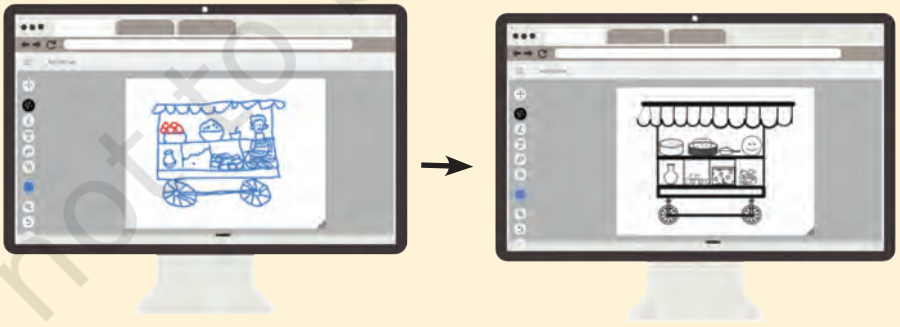


**Figure 4.7:** *Using AutoDraw*

Thus, AI and you can help each other.

## Activity 4: Preparing to design own AI Assistant

Imagine yourself as someone who has moved into a locality with their family. Everything is new, especially if you have moved to another district or state. You need to learn about the places to eat, to buy something you need, local customs, places of historic interest, and so on. Along with useful information, you would also like to know what makes that place special.

So, if you had to help someone who has moved into your locality, what would you tell them?

Discuss among your friends what are the most important things to know about your locality. You could ask someone who recently moved into the neighbourhood, a community elder, your parents and teachers for their views.

Few examples of different categories you can find out about are given below. 'Sub-categories', that is, specific examples of each of the categories are given in the brackets:

1. Popular food in the locality (e.g., different kinds of food, drink, fruits, snacks).
2. Plants that grow in the locality (e.g., trees, flowering plants, bushes, shrubs, vegetables, farm crops).
3. Animals found in the locality (e.g., birds, insects and other animals).
4. Popular music in the locality (e.g., folk music, popular music).
5. Popular dance forms in the locality (e.g., folk, classical, contemporary dance).
6. Places of tourist interest (e.g., historical buildings, old markets, parks).
7. Communication (e.g., greetings like *Juley* in Ladakh and *Johar* in Jharkhand; common queries like "Do you have milk?", "Where can I buy a ticket from?"
8. Any other things you can think of?

Once you have a list of what people should learn about the locality, you still need to decide how you will share this information with them.

You can do this by making your own AI Assistant using a computer/tablet/smartphone. We will use the term 'machine' for all three.

Thus, the next task is to decide what kind of data you will collect to help people.

Data is any type of information that we can see, hear, or record. It can be in many forms, like words, numbers, pictures, sounds, or even videos. For this project, we will focus on Image Data; you can decide to take up Audio Data and Video Data if you wish.

While you can decide whether you want to collect data for all the categories, different groups of students can take responsibility for different categories, so that you collect a lot of information.

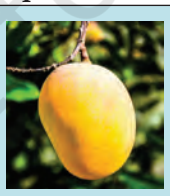
Preferably, you should collect data with the help of a camera, but if for some reason you are unable to do so, search for relevant images on the Internet.

The first step in making the AI Assistant is to collect different kinds of data related to the same object.

To understand how to do so, take the example of Aisha.

Aisha's mother is a fruit seller, and Aisha wants to help her sort the varieties of mangoes while purchasing them from the market. She decides to use AI by training her 'machine' to sort different types of fruits, especially the many varieties of mangoes.

**Table 4.4: Training the machine to sort mangoes**

| **Category** | Mango | | | |
|---|---|---|---|---|
| **Sub-category** | Alphonso | Himsagar | Malgova | Raspuri |
| **Add Image Data** |  |  |  |  |

As a first step Aisha collects data in the form of images of different kinds of mangoes she is interested in.


## Aisha does

Aisha takes photos of mangoes and also searches online for clear images of each variety of mango. She collects at least 12–15 different images for each variety to make sure there is enough data for the AI to learn better. Figure 4.8 shows the variety of images Aisha chooses.

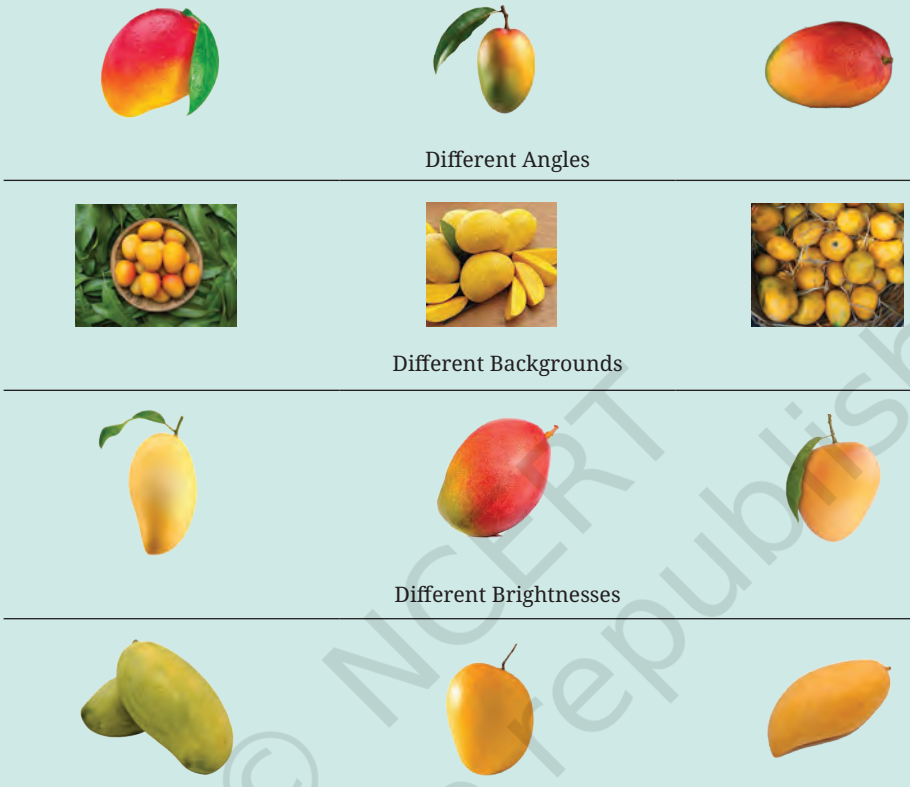



**Figure 4.8:** *Aisha categorises fruits into mangoes and then different varieties of mangoes into sub-categories*


## You do

Now collect image data for your category/categories. Remember, you need to source a variety of photographs like Aisha.

Check each image: Is it clear? Is there a shadow? Will you use all the images, or will you discard some of them?

Fill table 4.5 below – one example is given.

**Table 4.5: Categories, sub-categories and type of data to be collected**

| Category | Sub-category | Type of data | Photograph taken or sourced from the Internet | Where will the photo be taken/where will it be sourced from? | How many images did you source? | How many images did you reject? |
|---|---|---|---|---|---|---|
| Food | Local dishes, snacks, drinks | Images | Taken with camera | Market, home, restaurant, *dhaba* | 20 | 10 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

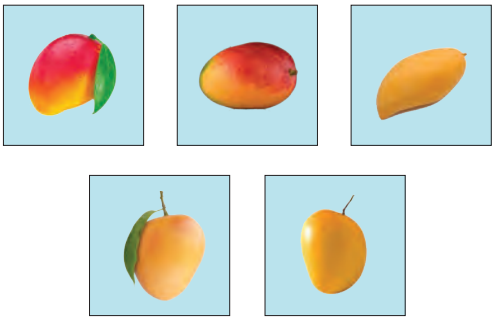


## Activity 5: Teaching the machine to recognise images

Once you have collected the data, you must teach the AI Assistant to respond when a user asks for information. This response will be based on the data you have uploaded (Figure 4.9). So, you must teach the AI Assistant to select the right data when the right prompt is given. For example, if a prompt is related to plants, the AI Assistant must pull out the right data.

You can search online for different 'machine learning models for image recognition'. As an example, we will use Google's Teachable Machine.

If you need additional guidance — you can search online using the keyword: Teachable Machine AI Tutorial.



Showing machine different images

Machine learns to identify image

**Figure 4.9:** *Machine learning to identify images*

Follow Aisha as she proceeds with creating her AI Assistant.


## Aisha does

Aisha creates folders for each sub-category of mangoes (e.g., Alphonso, Ratnagiri).


## You do

You have uploaded your data and placed it in folders with different names that will help you immediately recognise what kind of information is stored.

You can also create more sub-categories (e.g., within plants—vegetable, flowering, fruit).

Please note the details of the data and store the data in different folders as per the categories and sub-categories.

**Table 4.6: Uploading the data in an organised manner**

| **Type of Data** (Aisha searched for photos of mango – what kind of photos did you choose?) | **Name of Folders** (Aisha stores them according to their variety – what did you choose?) | **Number of Images** |
|---|---|---|
| | | |
| | | |
| | | |

## Activity 6: Training for recognition

Now that you have uploaded the data, you have to train the machine to recognise images. Follow Aisha's example (Figure 4.10).


### Aisha does


***Step 1***: Opens a new image project in Teachable Machine. She uploads the images into their respective categories

***Step 2***: Labels sub-categories as Mango_Alphonso; Mango_Langra; Mango_Kesar

***Step 3***: Trains the machine by clicking the Train Model button to start the process

**Figure 4.10:** *Teachable Machine tutorial*


### You do

Open Teachable Machine, start an Image Project, click on Standard Image Model, and upload your categorised images. You can upload images of the project stored by you. Label each sub-category and train the model.

Fill table 4.7 with the labels (names) of sub-categories you chose.

**Table 4.7: Labels for training the model**

| Categories | Labelling (renamed sub-categories) |
|---|---|
| Alphonso | Mango_Alphonso |
| | |
| | |
| | |

Now, the machine has the data you uploaded and organised. You have also trained the machine and created an AI Assistant. Now, it is necessary to test it.

If there are any errors, you need to upload more data and train the model once again.

## Activity 7: Testing and improving

To test your AI Assistant, first try it out yourself and then ask a friend to try it out and give you feedback. Once again, follow Aisha's example.


### Aisha does

Aisha tests her model through 2 approaches:

(i) Uploading new images of mangoes.

(ii) Holding an actual mango in front of the webcam (real-time testing).

When the AI model does not detect images in a category correctly, she adds more images to that category and retrains the model.

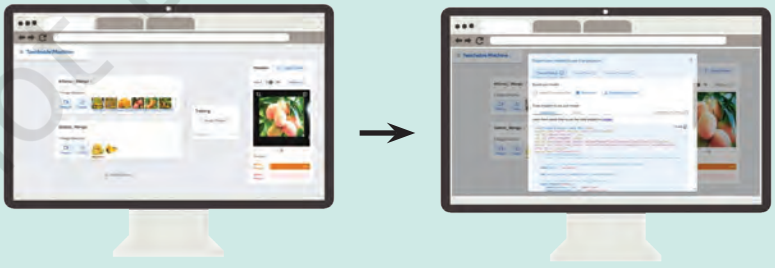


**Figure 4.11:** *Training and exporting the model*

After training the model, Aisha saves her project by clicking on Export Model→Download Model (Figure 4.11).


### You do

Test your trained model by either uploading new images or using real time testing through the webcam. If the model makes errors, gather additional images for the problematic category, upload them, and retrain to improve accuracy.

1. Did you upload a new image or use a webcam to do real time testing?
   .....
   .....
2. Did the AI model recognise the images correctly? Yes/No .....
3. If it did not, it could be because it needs more and different kinds of data belonging to the category you choose. According to you, what kind of data will be needed by the AI model to recognise the image correctly?
   .....
   .....
4. Did you save your project by downloading the model? Yes/No .....

## Activity 8: Making the AI Assistant interactive and sharing it

Now that you have made the AI Assistant, you can make it more interactive and creative by adding characters and animation through Scratch AI (Figure 4.12). Search with the keywords MIT, AI Raise Playground and open the playground.

Using AI Raise Playground you can make your AI model interactive by:

1. Choosing a character for your assistant (e.g., a friendly guide or a historical figure).
2. Plan the questions the assistant will ask, like 'Do you want to learn about our local heritage or wildlife?'.
3. Add a personality to your assistant. Decide how it will talk (fun, serious) and if it will use animation.

You can also explore tutorials and other creative examples of AI projects by going to 'See Examples' section on the MIT AI Raise Playground homepage.

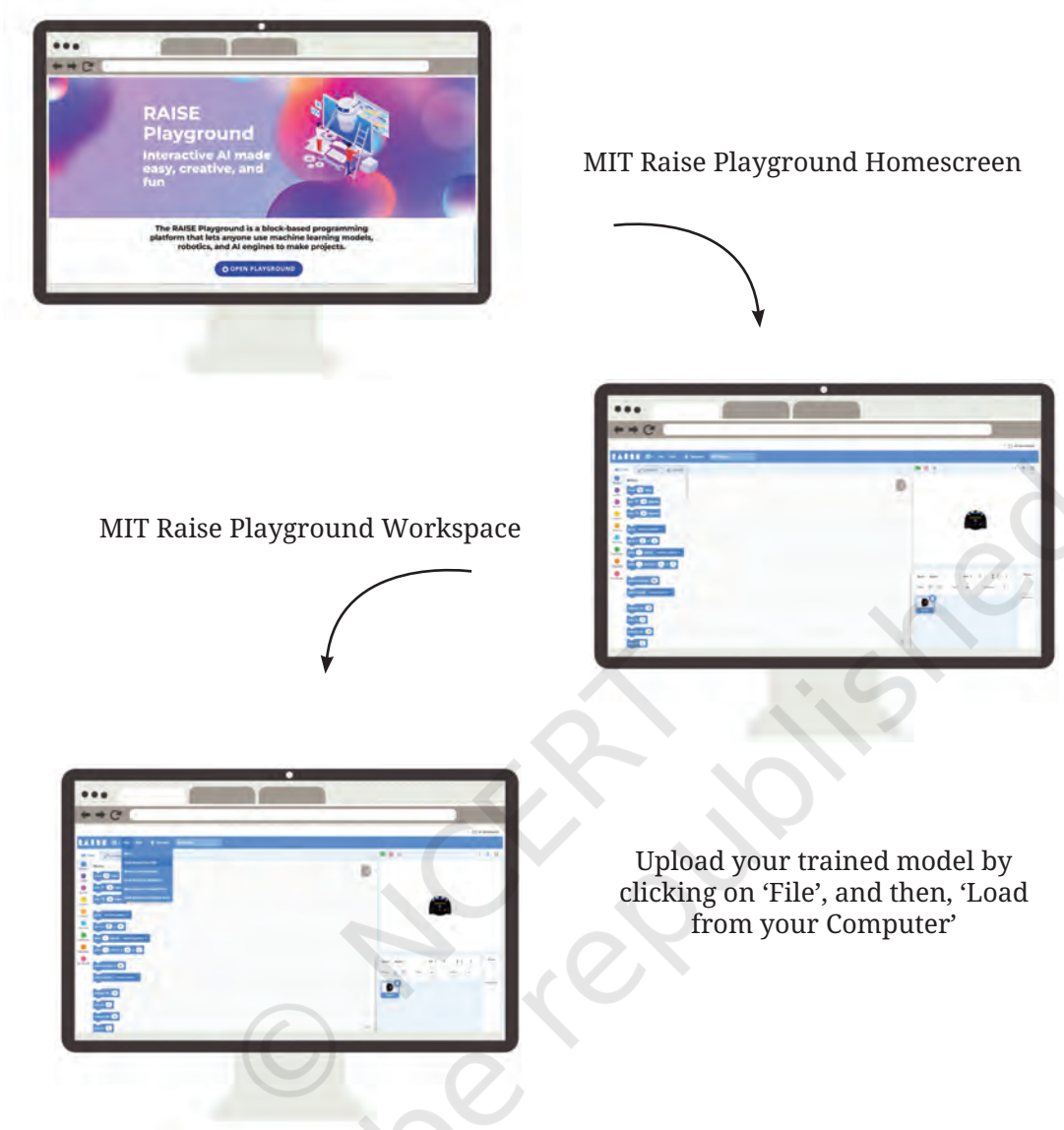



**Figure 4.12:** *MIT Raise Playground tutorial*

## Activity 9: Sharing with others

It's time to share your Scratch/MIT AI Raise project with others and gather their feedback. This is a great chance to see how well your project works for different people, and what can be improved to help make your AI Assistant even better.

1. How many people used the AI Assistant and gave you feedback?

   .....
   .....
   .....

2. What is one thing you would change about your project based on the feedback you received?

.....

.....

.....

## What did I learn from others?

1. Describe any three things you learnt about your locality during this project.

.....

.....

.....

.....

2. Describe the most important things you learnt from your friends about making an AI Assistant while doing the project.

.....

.....

.....

.....

## What did I do and how long did it take?

It is important to understand the time required for an activity to be completed.

Calculate the approximate amount of time in hours you spent on each activity. Mark them on the timeline below. If you did more than the activities suggested in the book, please add the number and time taken.

| ***Activity*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** | ***8*** | ***9*** |
|---|---|---|---|---|---|---|---|---|---|
| ***Time taken (Periods)*** | --- | --- | --- | --- | --- | --- | --- | --- | --- |

## What else can I do?

Did you know that Teachable Machine is not just for recognising images? You can also use it to train AI with audio data.

You can follow the following steps:

1. **Classification:** Select audio types, e.g., different languages, bird sounds.
2. **Data Collection and Training:** Record more than ten sound clips per category, ensuring variety in timing and location. Organise the clips into folders, upload them to Teachable Machine, and train the model.
3. **Testing and Improvement:** Test the AI model with new audio clips. If the AI struggles, add more examples and retrain.

## Think and Answer

1. What did you enjoy doing?
2. What were the challenges you faced?
3. What will you do differently next time?
4. Flowchart (Putting it all together)

   To complete your project, you followed a series of planned steps. Before starting any project, it is useful to estimate the time and resources needed to complete the task (devices, camera, people required to do the work, and anything else you think is important). This will help you complete the task as planned in a timely manner. It is also useful for anyone else who wants to help you with the task.

   Similarly, when you work with machines, it is necessary to make a detailed list of instructions for getting the work done through the machine. Therefore, programmers write down the detailed instructions systematically— this is called an 'algorithm'.

## Planning Your Project

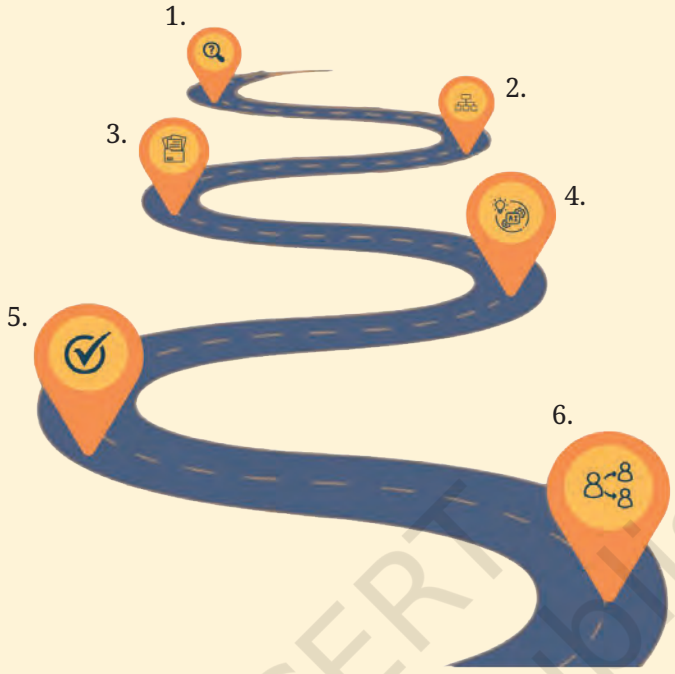



**Figure 4.13:** *Pathway followed to create the AI Assistant*

1. What do I want to do?
   a. Aisha identified types of fruits and bird sound
   b. What do you want the AI assistant to do?
      .....
      .....
2. How will I create the classification tree?
   a. Mango into 5 categories and ..... sub-categories and Gauva into ..... categories ..... sub-categories
   b. What are the categories of data you will train the AI assistant to recognise?
      .....
      .....
3. How will I collect and organise data?
4. How will I train the model?
5. Testing the model.
6. Sharing the model

Figure 4.13 gives the steps you followed. Fill in the empty spaces to indicate what you did in the project— this is the algorithm for your project.

5. Identify a few examples of jobs related to the work you just did. For example, data scientist, machine learning assistant, software engineer, robotics engineer, research scientist. Look around, speak to people and write your answer.

Part 3

# Work in Human Services

Human Services are about serving people and interacting with them in different ways. Projects on Work in Human Services will help you learn how to work with people. You can take up projects related to taking care of your health and that of your family and others, you can make interesting videos and audio clips on various topics, such as making a budget for your family, applying *Mehndi* on people's hands, or developing a comic book; it is up to you to imagine all that you can do with your peers.

Two examples of projects are given in this section, which are Storytime with Puppets and Family Health Handbook. You must take up only one project. You can either choose one of these projects or you can design a project of your own choice with the help of your teacher.

Project 5

# Storytime with Puppets

0785CH05

This project will help you learn about telling stories with puppets. You will learn to write a script, make puppets and put up a puppet show with backdrops, props, sound and light.

***As part of the project, you will be able to:***


**Figure 5.1:** *Students watching a puppet show*

Everyone, young and old, likes to listen to stories. Storytelling has been prevalent from ancient times and different forms of storytelling have evolved over time. The paintings in the Ajanta caves in Chhatrapati Sambhajinagar in Maharashtra, made between the second century BCE and fifth century CE, are one form of storytelling—they depict stories from the *Jataka* tales through paintings.

India also has a tradition of oral storytelling, which has continued until today, through *Baul* songs in Bangla, *Dastangoi* in Urdu, *Katha* in different languages, *Kavad* in Rajasthan, *Yakshagana* in Kerala and Karnataka, and *Ram Leela* across the country. *Kavad* is narrated using a wooden shrine that opens as the story unfolds. *Yakshagana* and *Ram Leela* use music, masks, and costumes, along with dialogues. Traditionally, these performances were done without a written script.

**Figure 5.2:** *Shadow puppet show uses light and the shadow of puppets to tell stories from our ancient epics*

The forms in which stories are told keep changing—for example, in modern times, writing is a popular form of storytelling. Along with writing, photography, cinema, animation, and many other forms are used for storytelling.

Sadly, some of the traditional forms are not as popular as they were till a few decades back — some people prefer more modern forms of storytelling. But one form that has persisted is using puppets to tell stories (Figures 5.1 and 5.2).

Puppets are human or animal figures that can be moved by the puppeteer. Therefore, a clockwork doll will not be considered a puppet but a simple sock with eyes, nose, and mouth stitched

on it will be considered a puppet if it moves with the help of the puppeteer.

Puppetry is the art of moving puppets either by hand, rods or strings to narrate a story. You may have already learnt about puppets in Art Education. You might have also learnt about the different kinds of puppets used in our country.

The advantage of puppetry is that you can put up a show with even one or two humans and a few puppets. This show can be easily taken from place to place and used to narrate a variety of stories.

Puppet shows have been used to share sensitive social messages that people may hesitate to discuss otherwise or even to involve people who may otherwise stay aloof. Since the puppet, and not the human is speaking, the audience will listen and laugh about things that would otherwise make them angry or upset. For example, puppets have been used to discuss addiction, superstition and other ills in society. They have been used to motivate people to act against injustice.



### Did you know?

Between 2012 and 2014, archaeologists excavated a site belonging to the Sindhu–Sarasvati civilisation at Karanpura in Rajasthan, situated along the river Chautang.

Among the many discoveries was what appeared to be a puppet-headed bull (Figure 5.3). Although its head is missing, archaeologists have observed that the shape of the artefact is such that a detachable head could be placed on it. There are also two shallow grooves through which a string could be passed to make the head move.

**Figure 5.3:** *Puppet headed bull*

In this project, you will make different kinds of puppets and perform a puppet show.

## What will I be able to do?

At the end of the project, you will be able to:

1. Write a script based on a story.
2. Make puppets using different types of materials.
3. Use music, sound, light, and voice modulation as per the story.
4. Narrate a story through a puppet show.

## What will I need?

You will need the following materials:

1. **To make puppets:** Slippers, spoons, twigs, leaves, husk, bamboo, old cloth, ribbons, forks, tennis ball or any other ball, colours, brushes, palettes, cutter, scissors, thread, needle, glue, tape, paper tape with a writable surface, or any other available material.
2. **To move puppets:** String, broomsticks, chopsticks, or any other available material.
3. **To make props:** Aluminium, cardboard, chart, or any other available material.
4. **For the performance:** Cardboard, wood (preferably waste), hammer, nails, chart, bedsheet, paint, tablecloth, torch, *diya*, table lamps, musical instruments, sound system, or any other available material.

## How do I keep myself and others safe?

Precautions you need to follow while designing and putting up the puppet show are:

1. Please use the tools as per instructions and follow necessary safety precautions.
2. It is possible that your workspace will have lots of raw materials, and semi-finished work. Sometimes semi-finished work is delicate; you must store it safely to avoid accidental or unintended damage.
3. Work in a properly ventilated and well-lit room.
4. While writing the script and during the performance, be sensitive to others' sentiments and spread positive messages. In case you are drawing inspiration from real life for your story, ensure you get permission from the people concerned.

**Internet safety:** Ask your teacher for help while using the Internet. Be careful and do not upload or download anything. Do not share personal information online.

## What do I need to know before I start?

Before you start thinking of the story you will narrate and the puppets you will make, it is important to think about what will interest people in your puppet show.

### Activity 1: What makes stories work?

Think of the stories you have heard from various people or seen on a stage or in a film.

Remember the story you most enjoyed hearing, the one you wanted to hear again and again. Think of what you liked about that story.

1. Who told the story?

   .....

2. How did they tell the story? Did they recite it, or keep changing their voice? Did they use any props, modulate

their voice, use actions and change expressions as they told the story?

.....

.....

.....

3. What did you like about the way they told the story?

.....

.....

The most important thing for a story is holding the listeners' attention. Discuss your responses with your peers and see if you identified some common elements that made storytelling interesting.

On the basis of this discussion, what would you do to make a story exciting for listeners?

.....

.....

.....

## Activity 2: Watching a puppet show

Check if there is any puppet show taking place near you. If not, you can invite a puppeteer to school to put up a show.

Discuss the types of puppets with the puppeteers. Observe the puppet's mechanism—how the puppeteer moves it, who he/she looks at, their dress, style of holding the puppet and most importantly, voice modulation. If it is a live performance or a play with human actors or a puppet show, observe the stage arrangement, background, sound and light.

After watching the puppet show, please respond to the following questions:

1. What was the name of the puppet show? Where did you watch it?

.....

.....

.....

2. What kind of puppets were used in the show (e.g., king, lion, bird)? What do you think the puppets were made of?

.....

.....

.....

3. What was the puppeteer doing? How was he/she moving the puppet? Did the puppeteer interact with the audience or with the puppet? If yes, how?

.....

.....

.....

4. What was the most interesting scene in the puppet show? Why did you find it interesting?

.....

.....

.....

5. Were elements, like sound, light, backdrop or anything else used that made the show interesting?

.....

.....

.....

In case you are not able to see a live puppet show, you can search for a video of a puppet show online using the keywords 'puppet show + language' (your choice).

## What do I have to do?

The first step towards putting up a puppet show is to identify a story and write a script. Once that is done, you have to make puppets according to the characters in the story and then design the puppet show. Finally, you have to set up the stage and put up a show.

## Activity 3: Selecting/writing a story

Before you start making puppets, you should be clear about the story you want to present.

You can go to the school library and read books to get ideas. Or you can use something you are learning about in other subjects, e.g., a story or poem from language or a historical event in science or social science. You can also select a story your grandparents tell you. Alternatively, you can think about designing a puppet show around social issues, e.g., *Swachh Bharat*, polio vaccination or on the rights and responsibilities of citizens.

Remember, you have to make puppets, write a script and put on a show. Therefore, your story must be short and simple, but with some drama and/or action in it.

Which story did you select and why?

.....

.....

.....

Next, you need to identify the key elements of the story. Table 5.1 will help you in doing so.

**Table 5.1: Key elements of the selected story**

| Questions | Answers based on the story |
|---|---|
| What is the story about? | |
| What is its title? | |
| Who are the characters in the story? Describe them briefly. | |
| Where is the story set? | |

| | |
|---|---|
| Does the setting of the story change as it progresses? | |
| What is the plot of the story? | |
| Write the sequence of the main events. | |
| What is the central message of the story? | |

## Activity 4: Writing a script for the puppet show

When you see a live performance or watch a film, there are dialogues, changes in scenes, music, action, and many other things. It is much more than just narrating a story. Translating a story into a show is done using a script.

A script has the step-by-step flow of scenes, dialogues and emotions of the characters. It also contains details, like the position and movement of the puppet(s) during each scene. Elements like short songs or poems, light and sound effects, and so on must be mentioned in the script. The style of speaking has to be made clear, e.g., natural, casual, formal, authoritative, submissive, and so on depending on the character and the scene.

Try and select a story that has at least 2–3 characters. These characters can be animals, humans, aliens – as per the story.

To help you understand how to write the script, an example of a story called 'Gopal and the *Hilsa* Fish' is given in Table 5.2. This story is about a king who does not like people talking about the *Hilsa* fish in the court. He challenges Gopal, his courtier, to buy a huge *Hilsa* fish and bring it to the palace without anyone talking about it. Gopal accepts the challenge. He shaves half his beard and smears ash on himself. People are so surprised by his appearance that they do not talk about the big *Hilsa* fish in his hand.

**Table 5.2: Script for Gopal and the *Hilsa* Fish**

| S. No. | Character | Dialogue and style | Props required | Special effects (e.g., light and sound) |
|---|---|---|---|---|
| | **Scene 1:** Durbar scene with king on a throne and Gopal standing in front of him.<br>Backdrop showing a beautiful hall with paintings on the wall. | | | |
| 1 | King | (*Complaining*): I am tired of people talking about the *Hilsa* fish. | Throne for king (made of cardboard and painted with gold paint) | |
| 2 | Gopal | (*Patiently*): They will get tired and stop. | | |
| 3 | King | (*Impatiently*): When!! | | |
| 4 | Gopal | (*In a soothing voice*): As soon as anything else comes along. | | |
| 5 | King | (*Angrily*): Gopal! Do not argue with me. I challenge you to bring a big *Hilsa* fish to the *durbar* without anyone talking about it. | | Sound of hand striking a wooden surface |
| 6 | Gopal | (*Bowing low*): I accept the challenge, your majesty. | | Sound of a trumpet (can be a toy trumpet or sound made by a person) |
| **Scene 2** | | | | |
| ***Market place***<br>Backdrop showing a busy market place with lots of people looking towards the stage.<br>Gopal with half his beard shaved and ash smeared on his body, holding a large *Hilsa* fish.<br>Another person from the town standing and looking at him in surprise. | | | | |

Please note that props are objects other than puppets (Figure 5.4) used on stage. They are used to clearly show the setting (e.g., the king's throne) and can easily be moved around (e.g., *Hilsa* fish, sword, ball, car, newspaper). While some of these are placed on the stage, others can be moved around if attached to a string or stick.

**Figure 5.4:** *Puppet for Gopal from 'Gopal and the Hilsa Fish'*

Now, use table 5.3 to write a detailed script for your story.

**Table 5.3: Template to write your own script**

| S. No. | Character | Dialogue and style | Props required | Special effects (e.g., light and sound) |
|---|---|---|---|---|
| **Scene 1** | | | | |
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| **Scene 2** | | | | |
| 1. | | | | |
| 2. | | | | |

## Activity 5: Character sketch

Before you make your puppets, you have to imagine how they would be as people. Would they be tall or short? Would they be cheerful or grumpy? Would they be outgoing or shy? These are known as *characteristics*. Deciding the characteristics of your puppet is known as *making a character sketch*. This is necessary for deciding the face and body of the puppet, its expression, its voice, and mannerisms, for example, jumping up and down when

excited, slumping when sad (Figure 5.5).

You need not make the puppet exactly like an animal or human figure – often, puppets have elongated bodies, arms and hands. However, to get a complete idea of the puppet, you need to imagine both its body and its personality.

**Figure 5.5:** *A scene from a story about a scared lion and his mouse friend. The lion is made of paper and the mouse is a sock puppet.*

### Using graph paper makes drawing easier

Suppose, your story has a rabbit. You can draw a rabbit on paper and paste it on cardboard. You can then attach a stick to the cardboard to move your rabbit puppet.

To draw the rabbit, take a picture of a rabbit, tracing paper and graph paper.

Draw the rabbit on the tracing paper and paste it on the graph paper. Next, draw lines proportionate to the graph on the chart paper you want to draw the rabbit on – this will help you make a larger rabbit. You can now copy each part of the rabbit onto the chart paper. Erase the lines once you are done and colour your rabbit (Figure 5.6). Once the stick is pasted to the body of the rabbit, your puppet is ready.

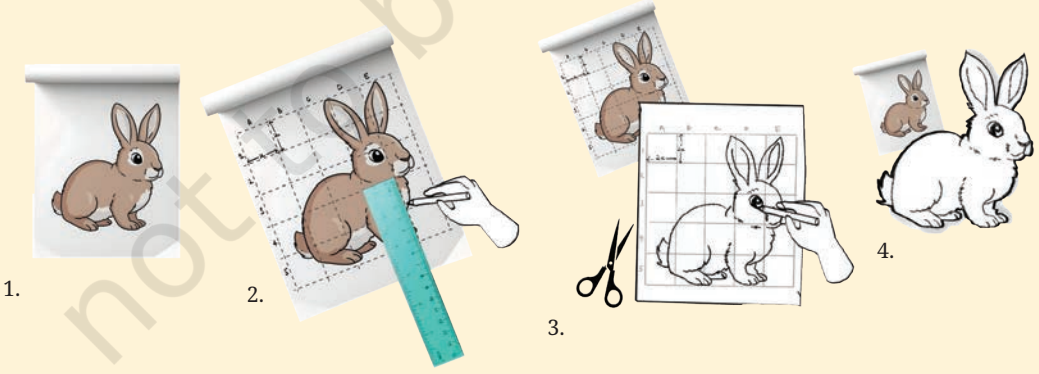



**Figure 5.6:** *Making a rabbit with graph paper*

These questions will help you plan how to make the puppets.

1. Which puppets will you make? Draw them in the space below.

2. What are their main characteristics?

.....

.....

## Activity 6: Making puppets

You can make puppets with materials available around you – clay, soft wood, grass, wastepaper, used bottles, thermocol, cardboard or any other suitable material. For example, you can stick cutouts of fish drawn on chart paper around a broomstick and move them to narrate a simple story set in the sea. You can stick a piece of chart paper around a broomstick and then paste nose, eyes, ears made of chart paper or of materials like wool.

Some examples of materials and objects that you can use to create puppets are given in figures 5.7 to 5.13. Do try out other materials and see what you can do.

## 1. Sock puppets

You can make sock puppets simply by taking old socks and sewing eyes, nose and mouth on them. You can even sew some old wool to the sock to create hair.

You can move sock puppets by wearing them over your hand (Figure 5.7).

**Figure 5.7:** *Sock puppets with hair stitched on with wool*

## 2. Spoon and fork puppets

You can make puppets using steel or wooden spoons and forks (even ice cream spoons and disposable forks). You can simply paint a face on the spoon and wrap some husk on the fork and then paint a face on it (Figure 5.8).

**Figure 5.8:** *Making spoon and fork puppets*

You can also decorate these puppets with clothes made of paper and colour them using sketch pens or pencils.

You can move these puppets using the handles of the spoon and fork.

## 3. Slipper/shoe puppets

You can paint the sole of a shoe or tie/paste wool for hair and moustache. You can stick buttons for eyes or simply paint them (Figure 5.9).

You can move these puppets by holding the sides of the slipper or wearing the shoe on your hand.

(a) (b)

**Figure 5.9:** *(a) Shoe puppet with face painted on the sole. (b) Slipper puppet with eyes made of cork and hair and moustache made of wool attached with glue and string.*

## 4. Ball puppets

You can create faces with balls—just insert a broomstick into the bottom of a ball so that you are able to move it. You can paint a face on the ball puppet or stick pieces of paper cut to resemble noses and ears to the sides of the ball (Figure 5.10).

**Figure 5.10:** *Making ball puppets with nose and eyes made of paper stuck on it and then painted. A broomstick is inserted in the ball for movement.*

## 5. Vegetable puppets

You can also create puppets using vegetables, like potatoes, and toothpicks. You can use other vegetables, like radish and carrot to create a nose, mouth and eyes (Figure 5.11).

You can move these puppets using the sticks.

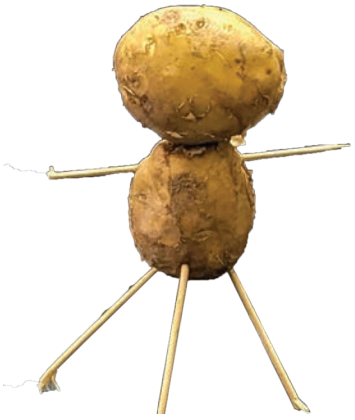


**Figure 5.11:** *Puppet made from potatoes and sticks*

## 6. Leaf puppets

You can create puppets with leaves too. These can either be dried leaves that do not break easily or green leaves. If you are using green leaves, you can use the attached twigs to create hands and arms (Figure 5.12).

You can move these puppets holding them where you want.

*(a)* *(b)*

**Figure 5.12:** *(a) Leaf puppet made of leaves and stems (b) Puppet made of dried leaves.*

## 7. Cardboard puppets

You can create puppets with discarded cardboard too (Figure 5.13). Besides the body, you can cut and stick small pieces of cardboard to resemble eyes, nose, mouth and even a moustache.

**Figure 5.13:** *Puppet made of discarded cardboard; eyes, nose, mouth, ears and hair cutout of cardboard and pasted on the body. Multiple broomsticks taped together and inserted into the cardboard section of the puppet to make it move.*

## 8. Making puppet heads

You can try and make a puppet with a head and dress. Figure 5.14 shows how you can make the head. Gather the materials as shown in the figure and get started.

**Materials:** Twigs, husks, newspapers, thread, cloth, and water-glue solution.

***Step 1***

Take two small twigs and tie them in a plus sign.

***Step 2***

Take straw or husk, whichever is available and make a ball. Tie it with a thread around the plus sign to make a round or an oval shape (alternatively, if you cannot find husk or straw, you can use newspaper).

***Step 3***

Wrap newspaper around the ball.

***Step 4***

Now take a bowl with some water and add glue to it (3 : 1 :: water : glue). Mix it well and keep it aside.

***Step 5***

Tear scraps of paper into small pieces.

***Step 6***

Take a torn piece of paper. Dip it in the water-glue solution and paste it on the round ball (from Step 3). Continue this process till the entire surface is covered in water-glue solution dipped paper.

***Step 7***

Let the ball dry.

***Step 8***

Add nose and eyes to the head using newspaper or other material.

***Step 9***

Paint the head.

**Figure 5.14:** *Making a ball puppet*

**Learning from Online Resources**

You can also make the head with papier-mâché. Search online to learn making papier-mâché using the keywords 'how to make papier mâché (Figure 5.15).

**Figure 5.15:** *Making a papier-mâché head*

## Painting the face

There are various ways in which you can finalise your puppet head. You must imagine a combination of eyes, nose, lips and ears that express the emotion (Figure 5.16). For example, smiling face, frowning face, laughing face, and so on.

Once you decide the expression, paste paper on the head – you can use paper tape to do this. Draw the expressions of the puppets on the paper tape. Draw/paste a photo of the puppet head in the box.

*(a)* *(b)*

**Figure 5.16:** *(a) Different kinds of faces; (b) Painted puppet face*

It is not necessary to paint the skin colour exactly the same as our skin colour. As a puppet is an imaginary character, the colours can also be imaginary. You can use different colours to paint the face.

## Making the body

There are different ways in which a puppet's body can be built. Figure 5.17 shows one way to make a human puppet.

***Step 1***

Take an old fabric and cut it in the shape of a long dress. The dimensions should be such that the rod or stick attached to the puppet head is covered.

***Step 2***

Stitch the cloth using thread and needle.

***Step 3***

You can also make a shirt and long skirt or pants and attach it to the puppet if you wish.

***Step 4***

You can draw hands on a piece of cardboard on the paper. Then you can cut the cardboard appropriately. Attach the hands to the sleeves of the puppet's dress.

Now have fun with your puppets.

**Figure 5.17:** *Completing the puppet*

You can make as many puppets as you need with different kinds of clothes (Figure 5.18).

**Figure 5.18:** *Your puppets are ready for the show*

## Movement

While performing, movement of the puppets will make the story come alive. You need to be creative to give movements to the puppet. For example, you can attach string to the back of the neck of the puppet and/or its hands. You can make the puppet laugh by opening its jaw using your hands, you can make the puppet fly using the stick attached to its body, you can 'wear' the puppet over your hand (Figures 5.19 and 5.20).

**Figure 5.19:** *Sticks will be used to move these puppets.*

*(a)*

*(b)*

**Figure 5.20:** *(a) and (b) Puppets moved using a string and made with different parts joined together so that they can move.*

How will you make your puppet move?

.....

.....

According to the script, you may need to change the expression on the puppet's face (e.g., smiling face, frowning face, sad face) or the way its body is positioned (e.g., standing tiger, lying down tiger). This is possible by making more than one puppet for each character with different expressions and positions.

## Finalising your puppets

You have experimented with various puppets. Now, start working towards making the puppets for your show.

Please fill table 5.4 as this will help you plan your puppets. An example is given in the table to help you add details about your puppets.

**Table 5.4: Planning your puppets**

| Types of puppet (e.g., human or animal) and their names | What materials did you use? | What did you do? | How will the puppets move? | How will you use these puppets? |
|---|---|---|---|---|
| Two human heads made of balls, named Rajesh and Geeta | Ball, broomstick, sketch pen | Ball gives the shape of a head.<br>I drew the eyes and mouth using a sketch pen.<br>Its smiling face is like an 'emoji'. | A broomstick is attached to the ball to move the head around. | These puppets can be used to narrate a story of two people talking to each other about something.<br>The dialogue can be funny and ridiculous. |
| | | | | |
| | | | | |
| | | | | |

Did you get the puppets right the first time or did you need to make any improvement in the puppets/remake any puppet? If yes, explain why and what you did.

.....

.....

Now you are ready to prepare for the show.

## Activity 7: Puppet show

Start rehearsing with the puppets. Make sure everyone is clear about their responsibilities to ensure a great show. Some of you can be puppeteers, others can give light and sound effects, and can change the backdrop as the scenes change. There might be other things that need to be done based on your story.

It is extremely important to have the following elements to have a great puppet show:

**a. Stage**

The space where the show is performed, is very important. First, there must be scope to create a 'stage' so that the audience can clearly see the puppets. Second, there must be space for the audience to sit. There are different ways to set a stage (Figures 5.21 to 5.23).

**Figure 5.21:** *A bedsheet covering a table is used as a stage. The bedsheet will hide the puppeteer, who can move the puppets using their hands or sticks attached to the puppets' bodies.*

**Figure 5.22:** *A bedsheet can also be used as a curtain to cover the puppeteer. In case the puppeteer uses strings, the sheet can be tied to a string behind the table like a curtain.*

**Figure 5.23:** *A frame used as a stage for a puppet show. The frame should ideally be a rectangle (just like watching a film in the theatre). It can be made with different materials, but take care that the size of the 'window' is large enough for the puppets and their movement to be clearly visible.*

Remember, you need to keep the puppets which you will use for the show, close to the stage where the audience cannot see them. For example, you can keep the puppets behind the cloth used to cover the table.

1. Where will you do the puppet show?

   .....

   .....

2. Where will you keep puppets during the show?

   .....

   .....

### b. Backdrop

**Figure 5.24:** *Background showing a jungle with animals*

The backdrop is very important since it shows the setting of the story. The setting may change as the story progresses from one scene to the next, and therefore, the backdrop may change. You can draw or paint these different settings on a chart paper

or an old bedsheet (Figure 5.24). As the scene changes, the backdrop changes as well. You can even draw the backdrops on a curtain and slide them using hooks or hoops.

1. Briefly describe the backdrop(s) you have prepared.

.....

.....

### c. Props

The kind of props will depend on how they are to be used. For example, we can use thick cardboard to create a chair, bed, or a throne, and so on.

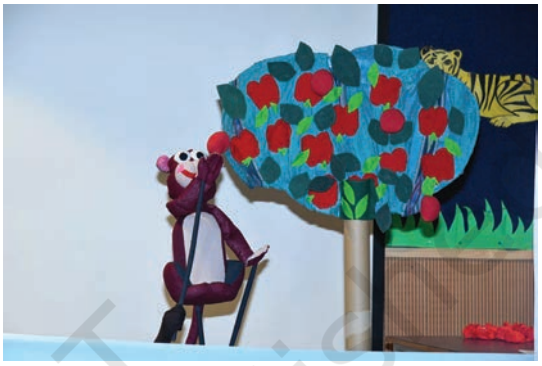


**Figure 5.25:** *A tree used as a prop to show that a monkey is plucking an apple from the tree. The monkey's hand is moved using the stick attached to it.*

However, if the prop is being used or held by the puppeteer, it must be very light. Props can be made using simple materials, such as paper (e.g., newspaper, *chapati*), aluminium (e.g., sword, knife), cardboard or disposable containers (e.g., gas stove, plates) (Figure 5.25).

1. Briefly describe the props you have prepared.

.....

.....

### d. Voice

Voice modulation plays an extremely powerful role in puppetry; the puppeteer acts through her or his voice. You must assign distinct voices to each puppet to differentiate the characters. For example, a lion puppet could have a deep, commanding voice, while a rabbit could have a high-pitched, playful voice.

To make sure the audience understands what you are saying, speak clearly and loudly. Practice showing emotions, like happiness, fear, or excitement using voice

modulation. For example, sound fearful during a chase scene, or whisper during a suspenseful moment.

Refer the script you wrote. Try to do voice acting with puppets for dialogues. Practice playing sound or singing together wherever required. Practice is key for the success of your efforts.

### e. Sound and music

You should have different types of sounds in the puppet show depending on the script – background music or sounds effects, like thundering of clouds before rain. You can use musical instruments or create sounds by tapping on the floor or the desk using a pencil, scale or your fingers. You can tap on a glass or bottle with different levels of water to create music for your show. You can experiment with different sound effect using the sound system; for example, whistling into a microphone creates the sound of the wind (Figure 5.26).

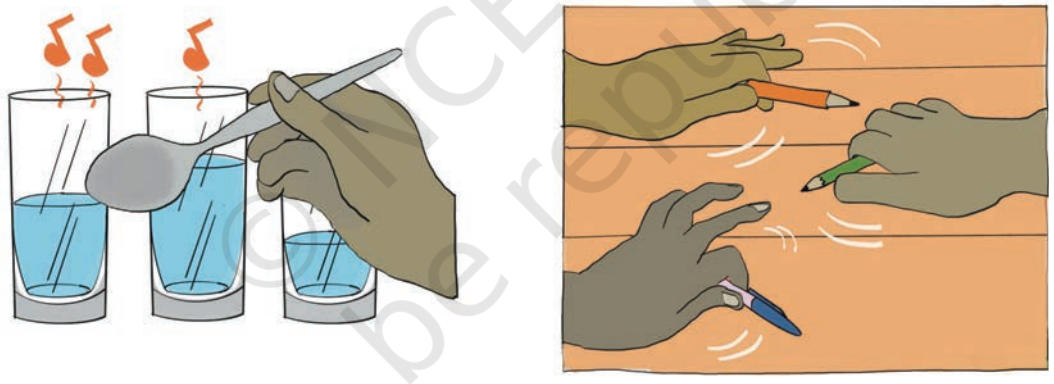


**Figure 5.26:** *Making music*

Refer to your script (Table 5.3) to decide the music and sound effects and how you will generate them.

You can search for music online using the keywords: exciting + celebration + music + no copyright

### f. Light

Light is needed in puppetry both to ensure the audience can see the puppets and for effects. If the show is outdoor

in the daytime, light does not play a role. However, if the show is in a dark space, you need to plan the placement of lights. For example, you can use a torch behind curtains to show the moon, sun or a magic lamp. You can also use fairy lights, table lamps, earthen pots (*diya*), etc.

Refer to your script (Table 5.3) to decide lighting effects and how you will generate them.

**g. Puppeteer**

The puppeteer needs to rehearse the dialogues well. Remember, the puppet is speaking, not you. You should also know when the puppet will enter the stage— 'in' and when to exit the stage — 'out'.

Secondly, the puppeteer should look at the puppet while the puppet talks to the audience. This means that as a puppeteer your face needs to be flat without emotions, so that the audience looks at the puppet and not at you.

## Activity 8: Putting up a puppet show

Now, it is time for the show. Do not forget to take a look at the checklist in table 5.5 before the show:

**Table 5.5: Pre-show checklist**

| S. No. | Questions | Yes/No |
|---|---|---|
| 1. | Is your script ready? | |
| 2. | Have you made the puppets for each character? | |
| 3. | Is the costume for the puppets ready? | |
| 4. | Can you move the puppets? | |
| 5. | Have you finalised the sequence and dialogue? | |
| 6. | Is the stage ready? | |
| 7. | Are the props ready? | |
| 8. | Have you finalised the background music, sound and light effects? | |
| 9. | Have you done a rehearsal? | |
| 10. | Have you decided who will introduce the show and who will introduce the cast post the show? | |

Draw a sketch of the stage and seating area in the space below.

After everything is set in place, you can organise a show during the *Kaushal Mela*.

Post the show, the performers should bow and a team member should introduce the cast. Do remember to acknowledge the author of the story and mention the names of all those who helped you to put up the show.

You can list the cast members in table 5.6. Their roles could be as a puppeteer, script writer, music, artwork, puppet-making, lights, and so on.

**Table 5.6: Cast of the puppet show**

| S. No. | Name of the Artist | Role |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |

After the show, get feedback from the audience about the performance.

You can ask the audience the following questions:

1. Which part of the show did they like the most?

   .....

   .....

2. What are their suggestions to make it better?

   .....

   .....

## What did I learn from others?

You might have taken help and guidance from your community or friends. It could be for making puppets, sound and light show, for costumes or for setting up the stage. Please write down the three most important things you learnt.

.....

.....

.....

## What did I do and how long did it take?

It is important to understand how much time is required for an activity to be completed.

Calculate the approximate amount of time in hours you spent on each activity. Mark them on the timeline below. If you did more than the activities suggested in the book, please add the number and time taken.

| ***Activity*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** | ***8*** |
|---|---|---|---|---|---|---|---|---|
| ***Time taken (Periods)*** | --- | --- | --- | --- | --- | --- | --- | --- |

## What else can I do?

1. Include more movement in your puppets. You can add movements in the hands, legs, or neck depending on the requirements of the show.
2. Explore using light, mirror and reflection to create light effects.
3. Can you use puppets and computer software for creating animations?
   **Hint**: You can make paper-cutouts and create movements using stop-motion application.

## Think and Answer

1. What did you enjoy doing?
2. What challenges did you face?
3. What will you do differently next time?
4. Compare your script and puppet show with a film, TV show, cartoons or animation, or any other performance. What are the similarities and differences between them?
5. Identify a few examples of jobs related to the work you just did. For example, script writing, puppet maker, costume designer, voice modulation, light and sound technician. Look around, speak to people and write your answer.

Project 6

# Family Health Handbook

0785CH06

This project will help you learn about maintaining the health and well-being of your family. You will create a family health handbook and identify actions to improve the health of your family.

***As part of the project, you will be able to:***


**Figure 6.1:** *Maintaining health and well-being is essential for all of us*

Family health refers to the overall physical, mental, and emotional well-being of all members within a family. The health of individuals and the family as a whole are interconnected with each other.

Good health results from many factors, including diet, physical fitness, sleep, mental well-being, and environmental factors (Figure 6.1). While all these factors are important for people of different ages, the needs of people from various age groups are different. This project is about understanding the needs of different members of the family and creating a family health handbook.

You have learnt about the importance of health both in school, and from family and friends. You are also aware that good health, a positive attitude and mental well-being are very important for your happiness. You may have been practicing Yoga and found that it helps you not only to be physically fit but also to be calm and energised throughout the day. You become more flexible and stronger while being able to concentrate on whatever you are doing.

You have also learnt that a nutritious and well-balanced diet is necessary to meet the body's needs. Different components of food are necessary to fulfil different needs of the body, and give us energy to work and play.

In addition to this, rest is very important. Our body repairs itself when we sleep, and we wake up refreshed and ready for another day. Depending on age, sleeping for a certain number of hours daily is, therefore, very important for health.

Positive attitude and mental well-being are equally important. A well-balanced diet, regular exercise, personal hygiene, positive thoughts, and kindness are important for mental well-being. Along with these, it is important to do things you enjoy and to spend time with loved ones.

Still, despite all these efforts, people fall ill due to various reasons, including environmental factors. Therefore, you need to take care to protect yourself and your family. For example, timely vaccination, taking precautions to prevent spread of infections, keeping the surroundings clean, and ensuring there is no stagnant

water where mosquitoes can breed. Knowing whom to ask for help and when to see the doctor is also important.

Thus, essential factors for assuring health are – well-balanced and nutritious diet, physical fitness, sleep, positive attitude and mental well-being, and environmental factors.

In this project, you will learn more about these factors and what can be done to maintain your health and that of your family. You will develop and maintain records and write your action plan in the family health handbook.

## What will I be able to do?

By the end of this project, you will be able to:

1. Identify the specific needs of individuals of different age groups.
2. Respond to any health issue in the family.
3. Create a first-aid kit for use in school and at home.
4. Develop a plan to support good health and well-being in the family.

## What will I need?

1. Notebook/sheets and binder for the handbook and stationery
2. First-aid materials (small bandages, cotton balls or swabs, medical tape, hand sanitiser/disinfectant, masks and gloves, antiseptic ointments, basic medicines as per advice of doctor, salt, sugar, ORS, thermometer, tweezers, scissors, safety pins, and others as per the advice of the expert).

## How do I keep myself and others safe?

1. You must follow all safety instructions, and use tools and equipment as directed.

2. During visits to the hospital/ Primary Health Centre (PHC)/ Community Health Centre (CHC), maintain your distance and wear a mask to protect yourself and the patients. Remember to wash your hands thoroughly after the visit.
3. Dispose of used gloves, masks and bandages as directed by the expert and/or your Teacher to prevent the spread of infection.
4. Be sensitive and empathetic to the injured, young children and the old.
5. Accept diversity—do not judge people by body shapes, sizes, or food habits.

**Internet safety:** Ask your teacher for help while using the Internet. Be careful not to upload or download anything without checking. Do not share personal information anywhere.

## What do I need to know before I start?

You know some of the common factors affecting health.

Discuss the factors affecting health with others in your group, your parents and teachers.

### Activity 1: Factors Affecting Health

Some factors that affect our health are given below. Please give examples of how they impact us. Add any factors that you feel are important:

1. Lack of personal hygiene.....
2. Pollution (e.g., noise, air, soil, water).....
3. Unclean environment.....
4. Lack of nutritious and balanced diet.....
5. Loneliness.....
6. Lack of sleep.....
7. Lack of exercise.....
8. Excessive use of TV/mobile phone,.....
9. Any other factors you can think of.....

Which factors can you do something about, and which are out of your control?

.....

.....

## Did you know?

These are some recommendations by health experts.

**Diet and Nutrition**

1. **Meal Frequency:** Eating three main meals and 1–2 healthy snacks at consistent intervals prevents overeating or dips in energy.
2. **Hydration:** Drinking at least 6–8 glasses of water daily is essential for digestion, temperature regulation, and mental focus.
3. **Eat home cooked food and limit eating processed food:** Even a 'simple meal' like dal fry and rice ordered from outside may not be healthy since you are unsure of the amount of oil added or whether the dal is freshly cooked or stale. Therefore, limiting food ordered from outside, processed snacks (e.g., chips), sugary drinks, and fried foods is good for health.

**Sleep Pattern**

1. Sleep duration varies by age. Ideally, about 9–11 hours of sleep is ideal for students aged 6-13, while about 8–9 hours of sleep is sufficient for adults. Children below the age of 5 require more than 11 hours of sleep.
2. Healthy body functioning is also determined by a regular sleep schedule (going to bed and waking up at the same time daily); this helps regulate the body's internal clock.
3. Disruptions like noise, bright lights, or uncomfortable bedding can affect sleep patterns.
4. To go to sleep easily, avoid stimulating activities, like screen time, loud music, or heavy meals an hour before sleep.

**Physical Fitness**

1. Lack of physical activity and a sedentary lifestyle can have a very harmful effect on body functions in the long run.
2. Consistency is key, so you should choose a physical activity that you like. It can be yoga, sports or a simple walk.

**Mental Well-being**

Just as our physical well-being can be affected by many factors, our mental well-being is also prone to being affected. For example, due to a fight with a friend, examination stress, concerns about family, or any other reason. Mental and physical well-being are interconnected, and both are equally important. Spending time with friends and family, and on productive activities, including games and sports, helps maintain mental well-being.

## What do I have to do?

You have identified factors that affect health and may have noted some questions. As you continue to work on your project, you will try and find answers to these questions. You will understand the needs of persons of different age groups and identify environmental factors around you that may affect health. You will also learn how to provide first-aid, and how to avail medical care. Finally, you will come up with an action plan to improve and maintain your and your family's health. All this will be part of your family health handbook.

You can learn more about family health and first-aid techniques by searching on the Internet.

You can search using keywords, like family health, basic first-aid and steps, tips for family health and wellness, first-aid for common injuries, etc.

### Activity 2: Framing questions related to your and your family's health

Think about your and your family members' health. What questions come to your mind?

Write these questions or even any relevant thoughts in your handbook. Some examples are given on the next page. Add to these sample questions – do remember to leave space for answers.

1. My younger sister is 4 years old. Why does she catch a cold so often?
2. What can I do if someone at home gets a fever?
3. My parents often say, “Don’t watch TV before sleeping”. Why is that so?
4. Why does my grandmother refuse to eat?
5. .....
   .....
6. .....
   .....
7. .....
   .....
8. .....
   .....

The answers to some of these questions may be available with family members, other community members and teachers. But you may have to speak to experts, like doctors, nurses, Accredited Social Health Activists (ASHA workers), and Anganwadi teachers/ workers to get answers to others. You may also be able to answer some of these questions yourself as you take up the different activities in the project.

## Activity 3: Visit to a hospital/Primary Health Centre (PHC)/ Community Health Centre (CHC)

Visiting a hospital/PHC/CHC will help you develop a deeper understanding of health-related factors. You will be able to observe a day in the life of a health expert. Observe them, how they treat a patient, what equipment they use, and how the comfort of patients is taken care of (Figure 6.2).

**Figure 6.2:** *Interaction with healthcare professionals*

Request the experts you meet to demonstrate the use of the first-aid

kit, and to help you put together a list of materials and medicines to keep in the kit. Also, gather helpful information that could help you in the future (e.g., emergency numbers, number for ambulance).

In addition to the questions you have already identified, examples of specific questions to ask the doctors and nurses you meet are given. Add other questions that come to your mind.

Remember, even if some other questions come up during the project, you can request permission from the expert(s) to connect with them later.

Date and time of visit:
Location:
Type of centre (hospital/CHC/PHC/other)
Name of centre:
Name of expert(s) you interacted with:
Emergency contacts:
Emergency contact number:
Phone number for ambulance:
National emergency number (police, ambulance, fire): 112
National number for ambulance: 108
Any other observations:

For your health handbook: Write down the following information after you visit the hospital.

1. What are the different facilities available in your centre?

   .....
   .....

2. What services are provided to patients (e.g., vaccination, outpatient treatment, diagnosis, in-hospital treatment, and specialised treatments)?

   .....
   .....

3. What are the most common illnesses in our area? How can we prevent them?

   .....
   .....

4. What should we do in an emergency? What should we do if an accident happens?

   .....
   .....

5. What are the fees charged to the patient? How is billing done? How is the payment to be done? Are there any concessions given (e.g., for senior citizens and military personnel)?

   .....
   .....

6. How do we decide if someone needs medical help or we can manage at home?

   .....
   .....

7. What should we do if someone falls sick during the night or on a holiday?

   .....
   .....

8. What precautions are to be taken while taking medicines?

   .....
   .....

## Activity 4: Creating a first-aid kit

Once you have observed and understood the use of the first-aid kit at the centre, you can create it on your own in school.

In our daily lives, we often experience minor cuts, accidents, wounds, and minor illness. A first-aid kit can provide medical assistance. It is equipped with basic medicines for emergencies. You should also have a first-aid kit at home as a part of your safety readiness plan.

The first-aid activities you could focus on are:

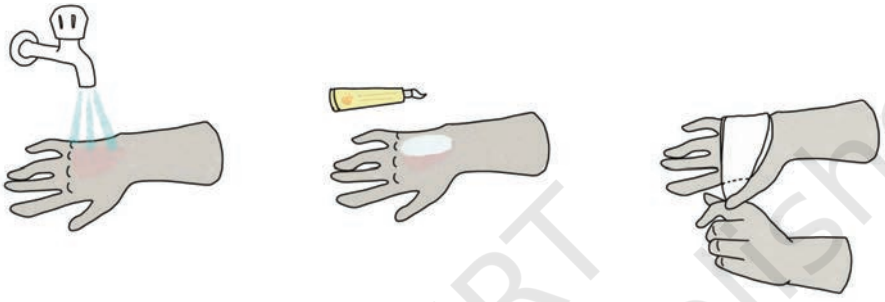
1. Tying bandages for minor cuts (Figure 6.3).
2. First-aid for minor burns (Figure 6.4).
3. Preparing ORS during dehydration (Figure 6.5).

Remember, first-aid is only emergency treatment before you take the patient to the doctor.

You can organise a workshop in school to create a first-aid kit. The workshop must be conducted by an expert, who could either be a health professional or a teacher or parent.

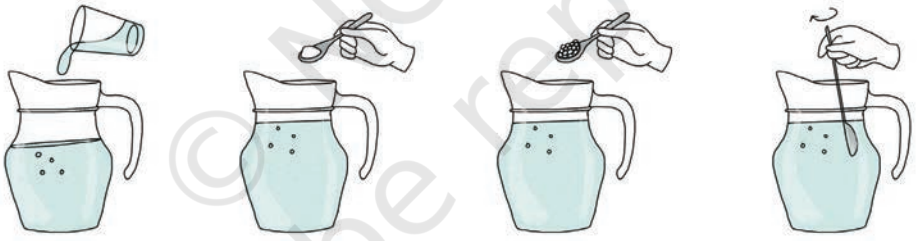

(a) Clean the wounded area (b) Place gauze over the wound (c) Tie bandage around the wound

**Figure 6.3:** *First-aid for minor wounds*



(a) Wash under running tap water (b) Apply ointment (c) Cover with loose bandage ensuring no pressure on burn

**Figure 6.4:** *First-aid for burn*



(a) Take one litre of water (b) Add half tea spoon of salt (c) Add 8 tea spoons of sugar (d) Stir well

**Figure 6.5:** *Preparing an ORS solution*

**Creating a First-aid Kit Workshop**

This format will help you organise the workshop.

Duration of the workshop: _____

Participants: _____

Facilitator (Expert can be anyone with an understanding of first-aid): ____

_____

Materials Required: _____

**Content of the Workshop**

1. Discussion on the importance of a first-aid kit to treat basic ailments.
2. *Exploring components of the first-aid kit*: Decide the contents that can be incorporated into the school first-aid kit. Brainstorm on possible injuries and health issues which might occur on school premises and what components will be required.
3. Organising and labelling the components of the first-aid kit.
4. *Making the first-aid kit*: The components you have selected must be placed in a wide metal container or a small bag with pockets. You may make separators using cardboard or place the components in smaller boxes or bags to ensure you can find them easily, if needed. The box or bag must have the label 'first-aid kit'.
5. *Demonstration and practice of use*: Make notes while experts demonstrate basic procedures, such as applying bandages for cuts, treating minor burns, dehydration, fever, etc.
   Practice once with the support of the expert.
6. *Deciding where to place the first-aid kit*: The first-aid kit should be kept in an easily accessible place on the school premises, but out of reach of the younger students.

Figure 6.6 shows the components of the first-aid kit. What else do you think could be required?

While emergencies can happen despite our best efforts, some illnesses can be avoided by taking what is called '*preventive action*'. This means that care must be taken to ensure nutrition and diet, sleep, physical fitness, mental well-being, and environment so that people stay as healthy as possible. To do this, you must understand the needs of people at different ages.


**Figure 6.6:** *Components of the first-aid kit*

## Activity 5: Factors affecting health at different ages

People have different needs at different ages. You may have noticed that babies eat and sleep a lot, and elderly people like to rest in the afternoon. To identify specific needs of your family members, you must understand the factors affecting health at different ages.

Each family is different, e.g., some families have parents and one or more children, some are joint families with many generations living in the same house, some are only made up of one parent and a child – many variations are possible. However, most of us will have people of all ages in our extended families, or family friends of different ages.

With this in mind, collect and document basic health data and some observations related to daily routine for the following age groups: (i) Below 5 years, (ii) 6–18 years, (iii) 19–30 years, (iv) 31–45 years, (v) 46–60 years, (vi) above 60 years. Even if you do not have a family member from any of these age groups, you can collect information from a relative/neighbour/friend. You can make separate sections for every age group using 3–4 sheets, or as required, for each member in your handbook.

Few examples of questions you can ask are given in table 6.1. Add to these questions as per your need.

All questions may not be relevant for particular persons; you may skip those. For children in the age group under 5 years, fill the information after speaking to their parents.

**Table 6.1: Tabulation of basic health data**

| | |
|---|---|
| **Name** | |
| **Relation with the student** | |
| **Gender** | |
| **Age** | |

| Category | Questions | Responses |
|---|---|---|
| Diet and Nutrition | How many meals do you eat in a day? | 1/2/3/More |
| | How often do you eat fruits and vegetables? | Daily/3–4 times in a week/0–2 times in a week |
| | Do you include lentils and grains in your food? | Yes/No |
| | Do you include dairy products/ meat in your food? | Yes/No |
| | How often do you eat junk food (e.g., chips) and have sugary or soft drinks? | Daily/Weekly/Rarely |
| | What is the daily intake of water (approximate amount in glasses)? | |
| Physical Fitness | Do you engage in any physical activity or exercise? | Yes/No |
| | If yes, what type of exercise do you do? (e.g., walking, yoga, sports) | |
| | How many days a week do you exercise? | |
| Sleep Pattern | How many hours of sleep on an average do you get daily? | |
| | What time do you usually go to bed and wake up? | |
| | Do you take naps during the day? If yes, for how long? | |
| | Do you use electronic devices (TV, phone, computer) before sleeping? If yes, how long before bedtime? | |
| | Is your sleeping area quiet and comfortable? | |

| | | |
|---|---|---|
| Mental Well-being | How often do you feel stressed or anxious? | Always/Sometimes/Never |
| | What do you do to relax? (e.g., talk to someone, listen to music, exercise, hobbies)? | |
| | Do you have hobbies or activities that you enjoy? If yes, please mention. | |
| | Do you ask your family and friends for help? | Always/Sometimes/Rarely |
| | How often do you take time to relax or meditate? | Daily/Occasionally/Never |
| Any special needs related to health (e.g., vaccination requirements, any condition that requires regular medication, any special advice from the doctor)? | | |
| | | |
| Any other relevant information? | | |
| | | |

These questions were related to diet and nutrition, physical fitness, sleep and mental well-being. However, environmental factors also play an important role related to health and mental well-being.

Observe the environment around you, and respond to the questions in table 6.2.

**Table 6.2: Queries related to environmental factors**

| | | |
|---|---|---|
| **Environment** | Is there an open drain in the area around your home? Are there places where water gets clogged? | |
| | Is there any place with stagnant water with potential for becoming a breeding ground for mosquitoes? | |

| | | |
|---|---|---|
| | Is there timely garbage collection near your home? | |
| | What is the condition of any river or other water body in your neighbourhood? | |
| | Is there a plastic /industry waste dump nearly? | |
| | What is the quality of air in your home (pollution/ smoke/exhaust of industry, etc.)? | |
| | Is there a source of noise pollution near your home? | |

**Using tablet/smartphone to collect data on pollution**

Noise is measured in *decibels* (db). Sound above 85 db is considered harmful for humans.

You can measure noise pollution using apps on a tablet/smartphone.

Search with the keywords: noise measuring app

You can also find the Air Quality Index (AQI) at your geotag location on the MAUSAM website of the Environmental Monitoring Service managed by the India Meteorological Department (IMD).

You now have data from the survey of family members, as well as your observations of your environment. Analysing this data will help you develop an action plan for improving and maintaining your and your family's health.

## Did you know?

**Testing quality of potable water**

Clean drinking water is essential for good health. Contaminated water can lead to diseases, like diarrhoea, cholera, typhoid, and other long-term health problems. Testing the quality of water helps

to ensure that it is safe to drink; this can protect your family from harmful illnesses.

It is very easy to test if water is potable. The $H_2S$ Strip Test Kit is a simple method used to check for bacterial contamination in water.

**Using $H_2S$ strip test kit**

1. Pour the water sample into the bottle up to the given mark (20 ml).
2. Cap the bottle and mix well. The colour of the water will change to golden brown.
3. Keep this bottle at room temperature (about 25–35˚C ). In case of low temperatures, the bottle should be wrapped in a warm cloth and kept in a warm place.
4. Do not disturb the bottle for 24–28 hours.
5. Now observe the colour of the sample (Figure 6.7).

**Interpreting test**

1. If the colour does not change and remains golden brown: Water is safe for drinking.
2. If the colour turns black: Water is contaminated with harmful bacteria and is not safe for drinking.

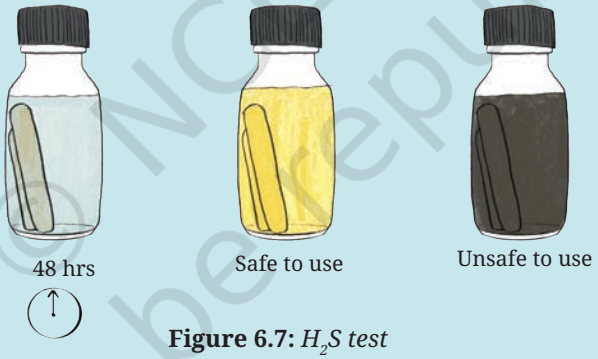



**Figure 6.7:** *$H_2S$ test*

Source of water sample: _____
Date of testing: _____
Date of results (24–48 hours after testing): _____
Colour of water in the bottle: _____
Water is safe for drinking: Yes / No

If you find water is not safe for drinking, inform those using this water about potential danger, e.g., you can paint a poster and put it near the water source.

Discuss the results with your Teacher and elder members of the family and learn how to clean water before drinking.

## Activity 6: Analysing data from the survey of family members

Analyse the data you have from each family member for each factor. This will help you to get an idea of what their needs are. You can fill the table 6.3 based on this analysis.

**Table 6.3: Family member health data**

| Healthy Analysis Summary | | | |
|---|---|---|---|
| **Name** | | **Age** | |
| **Factor** | **Is there anything that is a cause of concern?** | **Who can address this issue?** | **Who is responsible for taking action (society, self, doctor, family members, others)?** |
| Diet and Nutrition | | | |
| | | | |
| Physical Fitness | | | |
| Sleep Pattern | | | |
| | | | |
| Mental Well-being | | | |
| | | | |
| Environment | | | |
| | | | |

When you do the analysis, keep in mind the specific needs of elders (e.g., lack of sleep due to noise pollution), babies (e.g., special type of food preparation), and of persons with disabilities (*Divyang*).

## Activity 7: Making a plan to improve your and family's health

You noted the absence and presence of certain things in the environment. Identify what actions are needed to be taken, and who needs to take the action. For example, what can you do to eliminate mosquitoes in surrounding areas – will you start a cleanliness drive? Or take support from elders to raise the issue to the relevant municipal authority?

Fill table 6.4 based on your analysis.

**Table 6.4: Preventive healthcare action**

| S. No. | Which observations cause you concern? | Who is responsible for ensuring that the matter is taken care of? | How will you inform them? | Is there something you can do? If yes, then what is it? |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

### Taking action: Making a soak pit

**Figure 6.8:** *Students making a soakpit*

*Soak Pit*

Stagnant water is a breeding ground for mosquitoes. Therefore, soak pits are made to soak excess water around the kitchen or washing areas. A soak pit must be made at least 5 metres away from borewell/well/ other water source, and also 5 metres away from buildings (Figure 6.8).

Follow the following step to make soak pit (Figure 6.9):

1. Dig a 1 m × 1 m × 1 m pit where excess water is to be released.
2. Make 20 cm alternating layers of sand and brick, respectively.
3. Next, create a 10 cm thick layer of sand on top of the layers.
4. Make an arrangement to carry the excess water to the soak pit.

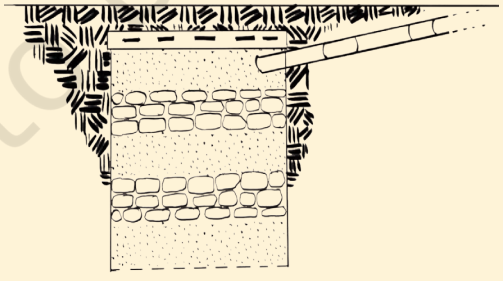


**Figure 6.9:** *A drum placed in a soakpit and connected with pipe (cross sectional view)*

You can also place an old drum in the pit. Make holes in it and make the layers inside the drum as instructed above (Figure 6.9).

This soak pit will prevent stagnant water and therefore breeding of mosquitoes.

Discuss the analysis of data amongst your group. On the basis of this discussion, write down the most important action that your class will take to prevent ill health due to environmental factors in and around the school.

.....

.....

.....

## Activity 8: Preventing action related to environmental

Prevention is always better than cure. So, based on the activities so far, what kind of action would you take related to each factor in order to maintain health?

Think of the key actions you will implement with your family.

1. Nutrient-rich diet (e.g., home cooked food, avoid junk food, like chips and packaged snacks)
   (a) .....
   (b) .....
   (c) .....
2. Sleep (e.g., sleeping at the same time, avoiding electronic devices before sleep)
   (a) .....
   (b) .....
   (c) .....
3. Physical fitness (e.g., doing yoga with friends and family)
   (a) .....
   (b) .....
   (c) .....
4. Mental well-being (e.g., eating together at night, playing games with family and friends)
   (a) .....
   (b) .....
   (c) .....

5. Environment (e.g., using mosquito nets, disposing waste)
   (a) .....
   (b) .....
   (c) .....
6. Any special needs to be met
   (a) .....
   (b) .....
   (c) .....

**Did you know?**

Malaria is one of the major health problems in our country. It is caused by the bite of an infected female *Anopheles* mosquito. However, there is a simple solution to preventing Malaria – using mosquito nets reduces the cases of Malaria by preventing mosquito bites.

Consistently practising the identified actions will help you see results. Identify five key actions you will take. Track them monthly using the template given in the table 6.5.

**Table 6.5: Tracker of actions taken for healthy life**

| Action Tracker (Month:.....) | | | | |
|---|---|---|---|---|
| Key Actions / Date | Go to bed at 9:30 p.m. | Eat dinner together | Practice Yoga | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Our ancestors were deeply aware of the importance of health. A *shloka* from the *Brihadaranyaka Upanishad* says:

ॐ सर्वे भवन्तु सुखिनः सर्वे सन्तु निरामयाः।
सर्वे भद्राणि पश्यन्तु मा कश्चिद्दुःखभाग्भवेत।।

This translates to:

May all sentient beings be at peace,
May no one suffer from illness,
May all see what is auspicious, may no one suffer.

Use your family health handbook wisely to keep yourself and your family safe.

## What did I learn from others?

1. According to you, what were the two most important things you learnt during the visit to the health centre and from interaction with health professionals?

   .....
   .....

2. Often, we are well aware of what we have to do and yet we do not practise it. For example, we all know exercise is important, but we often skip it. What do you think is the reason for this? What can be done to change this?

   .....
   .....

## What did I do and how long did it take?

It is important to understand how much time is required for an activity to be completed.

Calculate the approximate amount of time in hours you spent on each activity. Mark them on the timeline on the following page.

If you did more than the activities suggested in the book, please add the the number and time taken.

| *Activity* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* |
|---|---|---|---|---|---|---|---|---|
| *Time taken (Periods)* | --- | --- | --- | --- | --- | --- | --- | --- |

## What else can I do?

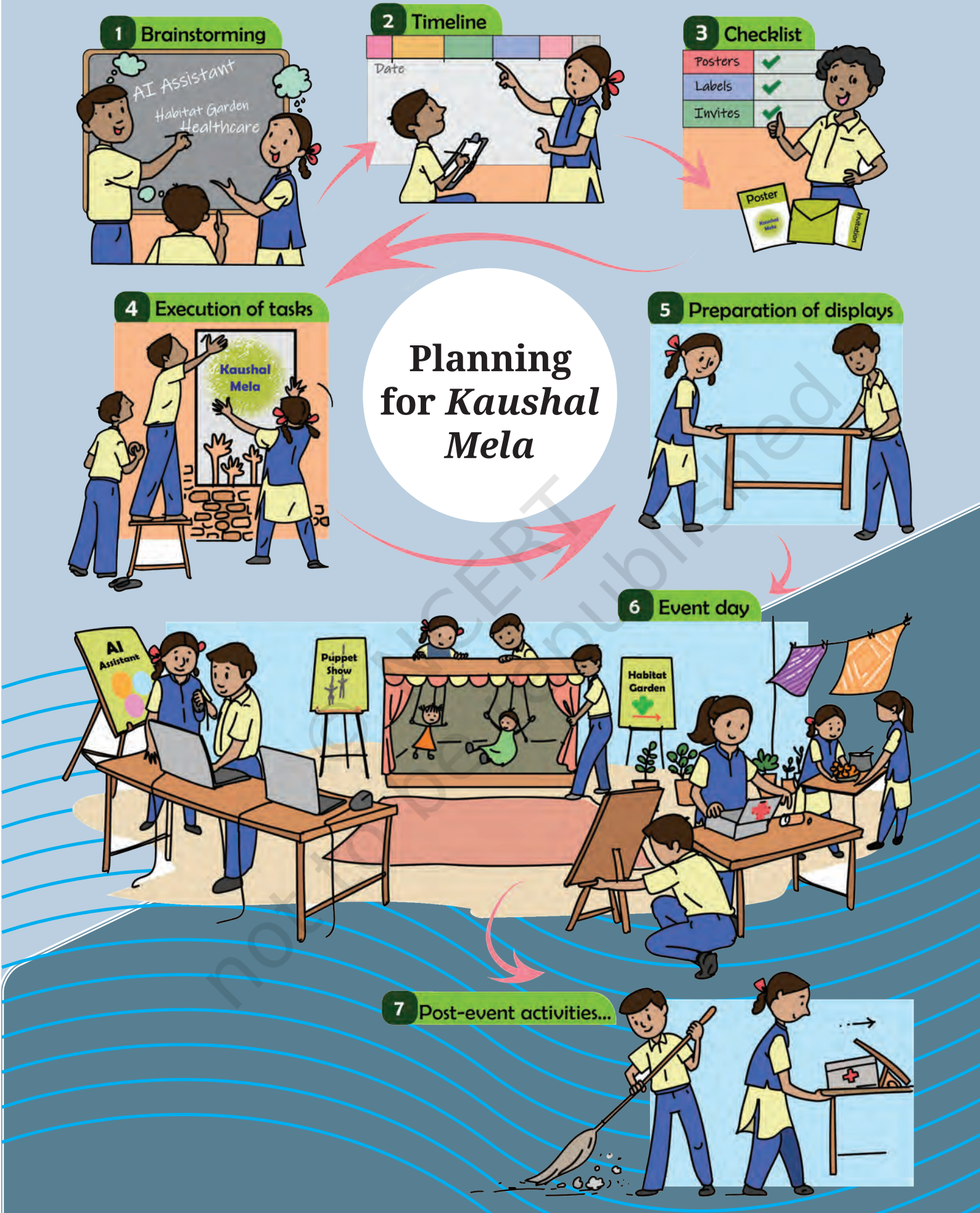
1. A lot of waste is produced related to health needs. For example, baby diapers, diapers for the elderly, medicines that have expired/not been used, and so on. Have you ever thought about how this waste is disposed? Find out and write a plan to dispose off similar waste at your home and school.
2. Draw up a plan for vaccination of children of different ages in your community, with the help of local health professionals. Participate in a polio vaccination campaign.
3. Explore the telemedicine facility of the online portal e-Sanjeevani managed by the Ministry of Health and Family Welfare (Figure 6.10). Find out how it can be used to consult a doctor.


**Figure 6.10:** *e-Sanjeevani portal managed by the Ministry of Health and Family Welfare*

## Think and Answer

1. What did you enjoy doing?
2. What were the challenges you faced?
3. What will you do differently next time?
4. According to you, how does drinking water get polluted and how will you ensure it is safe for drinking?
5. Identify few examples of jobs related to the work you just did. For example, doctor, nurse, ASHA worker, *Anganwadi* worker, counseller. Can you think of any other kind of work related to health? Look around, speak to people and write your answer.

# Planning for *Kaushal Mela*



# PLANNING FOR *KAUSHAL MELA*


You have worked on your projects and are now ready to share what you did and how you did it with others.

You may have shared something with other students and teachers during classroom presentations or during school assembly. You can also invite your family and other people to come and see your work. You can do this through the *Kaushal Mela*. But first, you must plan each detail carefully.

Planning is important since it helps you decide how to reach your goal. You must think about what need to be done and when it needs to be done so that everything goes smoothly. For example, if you are putting up a puppet show, you need to decide when and where keeping in mind that the maximum number of people watch it. Planning also helps to prevent wastage of time and resources. For example, if you want to demonstrate the tie and dye process, you must ensure all the materials are available in one place in the right quantity.

Since the *Kaushal Mela* will involve a lot of planning and coordination, you must plan each detail carefully. Responsibilities must be assigned for each activity, and the process for each activity discussed in detail. You must also develop a plan to work together as a team.

Table 7.1 below will help you plan for the *Kaushal Mela*. Do add more details based on your discussions.

**Table 7.1: Planning the *Kaushal Mela***

| **Basic details** | | | | |
|---|---|---|---|---|
| 1. Date and Time:<br>2. Venue:<br>3. Who will attend:<br>4. What will you present in the *Kaushal Mela*?<br>5. Additional support required (e.g., electricity / table / chairs / carpet/ computer / open space, etc.): | | | | |
| **S. No.** | **Component of planning** | **Details** | **To be completed by _____ date** | **In-charge/ Coordinator (if any)** |
| **Preparation** | | | | |
| 1. | Presentation of the work you did (e.g., project documentation, project poster, project journey video) | | | |

| | | | | |
|---|---|---|---|---|
| 2. | Setting up stall and decoration | | | |
| 3. | Seating arrangements (if needed) | | | |
| 4. | Setting up displays (e.g., in stalls, labelling components in the garden) | | | |
| 5. | Signboards: list of signboards (toilet, entry, etc.) | | | |
| 6. | Inviting guests (e.g., designing an invitation, list of guests, how the invite will be sent) | | | |
| 7. | Any safety precautions | | | |
| 8. | Cleanliness and waste management | | | |
| 9. | First aid station (e.g., location, what kind of first aid will be available) | | | |
| 10. | Anchoring (e.g., script, anchor(s)) | | | |
| 11. | Preparation of the stage (setting up, decoration, sound equipment) | | | |
| 12. | Preparing the schedule for the entire duration of the *Kaushal Mela* | | | |
| 13. | Information about the *Kaushal Mela* (e.g., layout, information pamphlets) | | | |
| 14. | Registration of guests (how, when, details to be collected) | | | |
| 15. | Feedback from guests (questions to take feedback, collection of feedback) | | | |
| 16. | Cleaning up after the *Kaushal Mela* (e.g., returning equipment, removing waste) | | | |

# ANNEXURE 1

## Project Template

Developing effective projects in schools require careful planning, clear objectives, and engaging activities that align with educational goals.

The diagram given below summarises the key questions that need to be addressed while developing the project.


## Name and brief introduction of the project

Choose a title that is descriptive and engaging, and gives a clear idea of the broad purpose of the project.

1. Explain why the project is important.
2. Highlight its relevance to the students' lives, education, or the community.
3. Discuss the benefits of the project.
4. Describe how the project relates to real-world scenarios, tasks or problems.
5. Explain the practical implications and potential impact of the project.

## What will I be able to do?

Achievable and measurable objectives aligned with the curricular goal, competencies and grade-wise learning outcomes have to be defined for each project. Activities must be designed for the fulfilment of these objectives.

Define two or three simple objectives in words that students can understand. These objectives indicate what students will be able to do at the end of the project. Students must be able to respond to the following questions:

1. What will you be able to do by the end of the project?
2. What will you learn?

## What will I need?

Ensure that the required resources are accessible and locally available, and help students identify what is required for the project.

Students must be able to:

1. Provide a brief overview of the tools, equipment, materials, and other resources needed for the project.

## How do I keep myself and others safe?

This section should include all the safety precautions to be taken during the project, including Internet safety measures. Students should also wear appropriate clothing, such as long sleeves, pants, and sturdy shoes, while doing activities in the field.

Safety precautions related to tools, materials, equipment, and internet use must be explained and demonstrated. Students must be able to respond to the following questions:

1. How will you ensure your safety and that of others during the project?
2. What will you do to ensure no one is physically or emotionally hurt?
3. How will you ensure the safety of plants and animals, if relevant?
4. How will you maintain confidentiality (that is, you will not share information about anyone without checking with them first)?
5. What will you do to keep yourself safe on the Internet?

## What do I need to know before I start?

Prepare students to begin work by recalling prior knowledge, introducing concepts through activities that require them to work with tools and materials, exploring the environment and basic skills related to the project, and so on. Clearly define roles and responsibilities for all participants, and ensure everyone understands their tasks and how they contribute to the project.

Students must be able to respond to the following questions:

1. Is there anything you need to learn before starting your project?
2. Do you need to meet an expert who can teach you how to do the activities related to the project?
3. Is there anything in your locality that you need to find out about?
4. Do you need to conduct a survey, take up field visits, or something similar before you start?

## What do I have to do?

Students need to take up various activities required for the completion of the project. Frame questions that will help them to think about what is to be done, and subsequently, record data or information related to the project. Students must be able to do the following:

1. Follow the project plan and execute tasks according to the timelines.
2. Observe others to learn practical skills and techniques, such as proper tool usage, effective planting methods, and maintenance practices.
3. Monitor progress regularly and adjust as necessary.
4. Keep records of all activities and challenges faced during the activities.
5. Document what they have learnt, their successes and challenges for future reference.

As they complete each activity, students can be asked the following:

1. The materials you used and how you used them.
2. The tools you used and how you used them.
3. The process you followed, such as the selection of materials/tools, sequence of tasks, and how you completed each one.
4. If you collected information/data/objects, describe them and explain why they are useful.
5. If you made something, include a photograph or a sketch.
6. If you grew a plant, record its growth.
7. What safety precautions did you take while doing the activities?
8. Did you use any AI tool? If yes, which ones did you use and how did you use them?
9. Did you share the outcome of your project with others outside the school? Describe your plan and how you executed it.
10. Did you do something to keep the environment clean or to recycle waste? Record the details.

## What did I learn from others?

Learning from others is a crucial aspect of any project. Therefore, students should reflect on what they have learnt from others. It can help improve their soft skills, deepen their understanding, and enhance the project's overall success.

Engaging with others enables students to communicate effectively, share ideas, and collaborate on tasks. Diverse perspectives and ideas are introduced, which help students learn from the viewpoints of others. This can help them approach problems in new ways, and enhance their creativity and problem-solving skills. Listening to others, such as workers in the world of work, experts, professionals, and the like provides valuable insights that can help improve learner's practices.

Students must be able to identify what they learnt during field trips, online and offline interactions with experts, from family and friends, community members, and other sources. They must be able to respond to the following questions:

1. What did you learn from field trips, interactions, video lectures, or experts?
2. What did you learn from your friends? Did you help them with something?
3. What did you learn from family members, siblings, and community elders?
4. What did you learn from people in the community?

## What did I do and how long did it take?

In order to develop the capacity for time-based planning, students must record the entire process followed, the sequence of activities, and the time taken for each activity. This can be done as they proceed or at the end of the project. Students must be able to respond or think back on what they did and how long it took them to plan and execute the activities.

## What else can I do?

Students need to think of other setting, in which they can apply their learning from the projects, especially outside the school. For example, students can participate in workshops, coding classes, and exhibitions or fairs. They can

also apply their learnings from the projects at home, and in various other places. They can celebrate cultural heritage months, international days, or multicultural festivals, and organise cultural events, culinary events, skill exhibitions, etc. They can integrate subjects through interdisciplinary projects, like historical re-enactments, science and art collaborations, or literary functions through performances.

Students must be able to respond to the following questions:

1. What else can you do to apply your learning from the project?
2. Do you see any scope to expand the current project? How?

## Think and Answer

Students must reflect on what they have learned from their recent experiences. A set of questions must be designed to assess learning of key aspects of the project and related concepts across curricular areas.

Some of the questions that can be asked include the following:

1. What did you enjoy doing?
2. What were the challenges you faced?
3. Question(s) related to the project itself.
4. What are some examples of jobs related to the activities you just did? What other jobs are related to the project?

## Planning

Since planning is an important part of all work, all projects contain components of planning. However, to ensure students are able to detail out the steps required in planning, the planning section can be used as it is given in the Activity Book. In case the school plans an alternative approach to meet this outcome, it must be ensured that students are able to respond to the following questions:

1. What is the final event you are planning?
2. When and where will it be held?
3. Who will be the invitees?
4. What will the final event involve?
5. What are the steps required to ensure the final event goes as per the plan, and when do they have to be fulfilled?
6. What are the resources involved and who will be responsible for each step?

# ANNEXURE 2

## Curricular Goals and Learning Outcomes for Grade 7

The table below details the Competencies (C) for the Middle Stage and Learning Outcomes defined for Grade 7 for the attainment of each Curricular Goal (CG).

| Competency | Learning Outcomes |
|---|---|
| **CG-1 Develop in-depth basic skills and allied knowledge of work and their associated materials/procedures** | |
| C-1.1 Perform procedures competently through required tools/equipment | LO 1—Select tools appropriate for specific task<br>LO 2—Use tools correctly to complete given task |
| C-1.2 Approach tasks in a planned and a systematic manner | LO 3—Demonstrate appropriate stepwise process for completing the given task<br>LO 4—Develop time-based plan for completion of task |
| C-1.3 Maintain and handle materials/equipment for the required activity | LO 5—Describe the steps necessary to keep materials and equipment ready for use<br>LO 6—Follow the safety protocol while handling tools/materials |
| **CG-2 Understand the place and usefulness of vocational skills and vocations in the world of work** | |
| C-2.1 Describe the contribution of vocation in the world of work | LO 7—Describe the importance of vocation in the world around them |
| C-2.2 Apply skills and knowledge learned in the area | LO 8—Explain how prior knowledge and skills have been used to complete the task |

| | |
|---|---|
| C-2.3 Evaluate and quantify the associated products and materials | LO 9—Identify criteria for evaluating quality of products<br>LO 10—Identify criteria for evaluating quantity of products |
| **CG-3 Develop essential values while working across areas** | |
| C-3.1 Develop the following values while engaging in work:<br>• Attention to detail<br>• Persistence and focus<br>• Curiosity and creativity<br>• Empathy and sensitivity<br>• Collaboration and teamwork<br>• Willingness to do physical work | LO 11—Keenly observe the usage of tools and materials during the demonstration and ask relevant questions<br>LO 12—Demonstrate care and respect towards people doing physical labour, irrespective of gender<br>LO 13—Plan tasks with peers and helps others during difficulties at work<br>LO 14—Re-work/redo the task for improved efficiency<br>LO 15—Ask questions about the functioning of tools and machines, and gives suggestions for alternative use<br>LO 16—Willingness to do physical work while enjoying working with tools and materials |
| **CG-4 Develop basic skills and allied knowledge to run and contribute to a home** | |
| C-4.1 Apply the acquired vocational skills and knowledge in home setting | LO 17—Identify where skills and knowledge are relevant at home |

# ANNEXURE 3

# Additional Projects

## Work with Life Forms

### Hydroponics – Growing Plants in Water

Related vocational area(s)—Urban agriculture

Subject Teacher most suitable for this project: Science

| Activity | Required periods: 52 |
|---|---|
| ***What will I be able to do?*** | 4 |
| Create and maintain a hydroponic system | |
| ***What will I need?*** | |
| Pen/Pencil, notebook, seeds: *methi*, any pulses, tomato or green chilli (*mirchi*), box (small), seedling tray, large bottle, bubbler, air tube, net pots, growing media, nutrients for hydroponics | |
| ***How do I keep myself and others safe?*** | |
| Safe handling of tools, protective clothing, gloves | |
| ***What will I need to know before I start?*** | 15 |
| Learn about the types of hydroponics<br>Discuss nutrients essential for plant growth<br>Interact with experts/watch online videos | |
| ***What do I have to do?*** | 22 |
| Build the system using bottles and containers<br>Maintain the system and record plant growth<br>Regularly monitor and document the health of plants<br>Check on quantity and quality of produce | |
| ***What did I learn from others and how did I use it?*** | 3 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 2 |
| As per the project template | |

| | |
|---|---|
| ***What else can I do?*** | 5 |
| Explore home-based applications of hydroponics | |

## Make your own Terrarium

Related vocational area(s)—Gardening, nursery
Subject Teacher most suitable for this project: Science

| **Activity** | **Required periods: 30** |
|---|---|
| ***What will I be able to do?*** | 4 |
| Plant a terrarium | |
| ***What will I need?*** | |
| Glass containers or jars with lids, pebbles or small rocks, activated charcoal, soil, small plants (succulents, small ferns), moss, small decorations (optional), coloured markers or labels, magnifying glasses for closer observation (optional)<br>***Tools*** — Scissors, pencil, long spoon | |
| ***How do I keep myself and others safe?*** | |
| Safe handling of tools, maintaining cleanliness | |
| ***What will I need to know before I start?*** | 8 |
| Ecosystems, terrarium types (open/closed/bioactive), role of components (drainage, soil, plants, insects, etc.), and historical significance | |
| ***What do I have to do?*** | 11 |
| Build the terrarium, including gathering materials, creating drainage, planting, observing and recording changes in the terrarium | |
| ***What did I learn from others and how did I use it?*** | 3 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 1 |
| As per the project template | |
| ***What else can I do?*** | 2 |
| Explore the application of terrarium-making skills at home, such as creating gifts or making terrarium at home | |

## Identification of Plant Diseases and Pests using Artificial Intelligence (AI)

Related vocational area(s)—Artificial Intelligence
Subject Teacher most suitable for this project: Science

| Activity | Required periods: 55 |
|---|---|
| ***What will I be able to do?*** | 6 |
| Identify plant diseases and pests using AI | |
| ***What will I need?*** | |
| Pen, notebook<br>***Tools*** — Computer/PC, Internet, Free AI platform — Google's Teachable Machine | |
| ***How do I keep myself and others safe?*** | 12 |
| Learn safety protocols while handling equipment and collecting data<br>Follow ethical guidelines for data usage | |
| ***What will I need to know before I start?*** | |
| Basics of AI, machine learning<br>Understanding of pest/disease characteristics | |
| ***What do I have to do?*** | 20 |
| Collect plant images<br>Sort and label data<br>Split data into categories<br>Train the data using AI tools, like Google Teachable Machine<br>Test and refine the model<br>Use the model for pest/disease detection | |
| ***What did I learn from others and how did I use it?*** | 3 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 2 |
| As per the project template | |
| ***Think and Answer*** | 2 |
| As per the project template | |
| ***What else can I do?*** | 5 |
| Explore how to deal with plant diseases and pests using organic methods | |

## Observing and taking care of domestic animals

Related vocational area(s)—Animal husbandry, veterinary services
Subject Teacher most suitable for this project: Science

| Activity | Required periods: 48 |
|---|---|
| ***What will I be able to do?*** | 5 |
| Understand needs of domestic animals and take care of them | |
| ***What will I need?*** | |
| Pen, notebook | |
| ***How do I keep myself and others safe?*** | |
| Discussing safety precautions for self and animals<br>Preparing a list of do's and don'ts for handling animals | |
| ***What will I need to know before I start?*** | 10 |
| Research animal behaviour, habitats and social structures.<br>Brainstorm observation methods and aspects of behaviour to observe | |
| ***What do I have to do?*** | 24 |
| Conduct field observations and record behaviours<br>Prepare feed and watering schedule<br>Make a schedule for cleaning, feed requirements, daily exercise schedule<br>Participate in activities under guidance of animal owner<br>Analyse data and identify patterns or trends | |
| ***What did I learn from others and how did I use it?*** | 3 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 1 |
| As per the project template | |
| ***What else can I do?*** | 4 |
| Find out about animal rights | |

## Medicinal Plants, Herbs and Spices

Related vocational area(s)—Pharmaceuticals, Botany
Subject Teacher most suitable for this project: Science

| Activity | Required periods: 50 |
|---|---|
| ***What will I be able to do?*** | 6 |
| Grow and know about the medicinal plants, herbs and spices | |
| ***What will I need?*** | |
| Pen, notebook, pots, saplings, water, gardening tools | |
| ***How do I keep myself and others safe?*** | |
| Follow safety protocols when handling seeds, soil, and plants<br>Learn about potential risks of incorrect plant use and how to avoid them<br>Use gardening tools carefully to prevent injuries | |
| ***What will I need to know before I start?*** | 12 |
| Research the cultural significance and therapeutic properties of locally available medicinal plants<br>Make a list of plants for further study<br>Explore key resources (books, websites, experts) for gathering information | |
| ***What do I have to do?*** | 20 |
| Visit botanical gardens and pharmacies<br>Plant and care for medicinal plants<br>Collect data on traditional uses of plants, their uses in medicine and limitations<br>Prepare simple recipe (*kadha*, tablets, tea etc.) using *tulsi*, turmeric, ginger, lemon grass, etc., and taste with friends<br>Conduct surveys and interact with experts to validate information | |
| ***What did I learn from others and how did I use it?*** | 4 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 2 |
| As per the project template | |
| ***What else can I do?*** | 5 |
| Explore other uses for medicinal plants (e.g., masks, balms) | |

# Work with Machines and Materials

## Making Bamboo Products

Related vocational area(s)—Sustainable agriculture and handicrafts
Subject Teacher most suitable for this project: Art/Home Science

| Activity | Required periods: 52 |
|---|---|
| ***What will I be able to do?*** | 6 |
| Design and create products from bamboo | |
| ***What will I need?*** | |
| Bamboo, knife, carving tools and sandpaper | |
| ***How do I keep myself and others safe?*** | |
| Proper handling of materials, demonstrating safely using sharp tools | |
| ***What will I need to know before I start?*** | 12 |
| Understand the properties of bamboo and techniques for working with it<br>Practice using tools on sample bamboo pieces<br>Discuss the stepwise process for making bamboo products | |
| ***What do I have to do?*** | 20 |
| Create multiple bamboo products, such as pen stand, fencing, ladder, bench, stool<br>Refine techniques (polishing, varnishing, painting) for better quality and quantity | |
| ***What did I learn from others and how did I use it?*** | 5 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 1 |
| As per the project template | |
| ***What else can I do?*** | 5 |
| What else can I do?<br>Create small bamboo utensils or decorative items for home use | |

## Make your own Robot

Related vocational area(s)—Robotics
Subject Teacher most suitable for this project: Science, Atal Tinkering Labs (ATL) in-charge

| Activity | Required periods: 55 |
|---|---|
| ***What will I be able to do?*** | 6 |
| Develop skills in robotics, Arduino programming, sensor-based robotics and building robot prototypes | |
| ***What will I need?*** | |
| Arduino, LED, motor, breadboard, jumper wires, battery, adapter, soldering material, flux, Arduino cable, ultrasonic sensor, motion sensor, IR sensor, Wi-Fi-module, motor drivers, chassis, wheels, Bluetooth module ***Tools*** — Multimeter, soldering gun, wire stripper, cutter, computer/PC, Scratch online platform | |
| ***How do I keep myself and others safe?*** | |
| Understand safety protocols for handling equipment, maintaining materials, and working responsibly in a collaborative environment | |
| ***What will I need to know before I start?*** | 17 |
| Learn the basics of robotics, Arduino programming, types of robots, main components (sensors, actuators, power sources) and tools usage | |
| ***What do I have to do?*** | 20 |
| Execute tasks, such as building a hydraulic hand, Arduino-based robot and sensor-based robots<br>Compare task times and improve designs iteratively | |
| ***What did I learn from others and how did I use it?*** | 5 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 1 |
| As per the project template | |
| ***What else can I do?*** | 5 |
| Explore advanced robotics (e.g., Bluetooth/Wi-Fi-controlled robots) and opportunities to apply robotics skills at home | |

## Weaving on a Loom — Table Mat with a Motif

Related vocational area(s)—Textile art, designing
Subject Teacher most suitable for this project: Art

| Activity | Required periods: 34 |
|---|---|
| ***What will I be able to do?*** | 2 |
| Create a woven hand band/*rakhi*/key chain using a self-made cardboard loom | |
| ***What will I need?*** | |
| Pen/Pencil, notebook, yarn/thick wool (various colours), cardboard pieces, ice-cream sticks, grid paper<br>***Tools*** — Scissors, tape, plastic or blunt-pointed needles | |
| ***How do I keep myself and others safe?*** | |
| Handle scissors and other tools carefully to avoid injury<br>Follow proper sitting postures while weaving to prevent strain<br>Maintain a clean and clutter-free workspace to avoid accidents | |
| ***What will I need to know before I start?*** | 10 |
| Types of yarn and their properties<br>Types of looms and their uses<br>Basic weaving terminology: warp, weft, tension, etc.<br>Historical and cultural significance of weaving in local traditions | |
| ***What do I have to do?*** | 10 |
| Visit a museum, visit a shop and interact with a local weaving artisan<br>Make a loom using cardboard and thread it correctly<br>Practice weaving lines, then create a final product following the planned design | |
| ***What did I learn from others and how did I use it?*** | 5 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 1 |
| As per the project template | |
| ***What else can I do?*** | 5 |
| Explore advanced weaving techniques | |

### 3D Printing – From Sketch to Reality

Related vocational area(s)—Automotive, Medical tools, Electronics
Subject Teacher most suitable for this project: Any subject, Atal Tinkering Lab (ATL) in-charge

| Activity | Required periods: 40 |
|---|---|
| ***What will I be able to do?*** | 6 |
| Create objects using a 3D printer | |
| ***What will I need?*** | |
| 3D printer, computers, modelling software to design products (e.g., open-source software, like Blender, Thingiverse), materials for printing | |
| ***How do I keep myself and others safe?*** | 10 |
| Study safety precautions for handling the printer and materials<br>Discuss strategies for waste disposal and equipment care | |
| ***What will I need to know before I start?*** | |
| Create rough designs for selected objects using modelling software<br>Conduct a survey or internet search on potential 3D printed objects and gather ideas | |
| ***What do I have to do?*** | 17 |
| Experiment with small designs in modelling software<br>Print selected objects in group<br>Evaluate printed objects for quality and usability | |
| ***What did I learn from others and how did I use it?*** | 1 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 1 |
| As per the project template | |
| ***What else can I do?*** | 2 |
| Make 3D-printed objects for your home or school requirements | |

## School Band from Waste Materials

Related vocational area(s)—Music, entertainment
Subject Teacher most suitable for this project: Any subject

| Activity | Required periods: 47 |
|---|---|
| ***What will I be able to do?*** | 6 |
| Create musical instruments using recycled materials | |
| ***What will I need?*** | |
| PVC pipes of different diameters, duct tape, glasses and/or different kinds of bottles with varying water levels, cardboard boxes, thin wires, rubber bands, pieces of steel, long wood pieces, wooden metre scale, steel pipes, metal container, cutting and drilling instruments, and any other material the teacher and students can think of, for example, tuning forks; wood, nuts, bolts and screws to create a basic guitar. | |
| ***How do I keep myself and others safe?*** | |
| Discuss safety precautions for handling tools and materials, like PVC pipes, glass bottles and sharp tools. | |
| ***What will I need to know before I start?*** | 15 |
| Learn about musical notes, melodies, and basic composing techniques from a music teacher or online resources<br>Research types of musical instruments and explore ideas for DIY instrument creation<br>Discuss with peers to finalise instruments | |
| ***What do I have to do?*** | 17 |
| Identify recyclable materials and gather them<br>Create instruments using the materials, ensuring safety and quality<br>Practice and refine melodies, adjusting for the best sound output<br>Finalise music for presentation at the school assembly or *Kaushal Mela* | |
| ***What did I learn from others and how did I use it?*** | 4 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 1 |
| As per the project template | |
| ***What else can I do?*** | 3 |
| Discuss other ways to use the instruments at home or in community events<br>You can also make musical instruments using electronics and micro-controllers | |

# Work in Human Services

## Creating a Comic Book

Related vocational area(s)—Media, Publishing
Subject Teacher most suitable for this project: Art/Language

| Activity | Required periods: 52 |
|---|---|
| ***What will I be able to do?*** | 3 |
| Prepare a comic book | |
| ***What will I need?*** | |
| Stationery, examples of comic strips (printed and digital), graphic novels (Optional: Computer, Canva or similar graphic designer), scanner, printer, binding material | |
| ***How do I keep myself and others safe?*** | |
| Safety precautions related to the use of tools; copyright and privacy issues (in case you use photographs or someone else's drawings) | |
| ***What will I need to know before I start?*** | 12 |
| Visit a bookstore with comics/graphic novels and a printing press; interview the owner(s)<br>Workshop with a graphic artist/exploring online tools or sketching figures<br>Similarities and differences among different examples<br>Discussion on what is required in a 'good' comic book | |
| ***What do I have to do?*** | 11 + 8 + 7 |
| Developing ideas<br>A broad idea of the comic book, followed by the development of a detailed story<br>Discussing sensitivity issues (e.g., how a character looks, speaks)<br>Writing the script<br>Decisions on how the characters will be represented<br>Storyboard and preparation of the comic book | |
| Storyboard; drawing the comic strips, fine-tuning the dialogues<br>For next step, choose one of the following options:<br>• Option 1: If drawn by hand, strips to be pasted on chart papers<br>• Option 2: If printed, then bind using a punching machine and thread<br>Review and incorporate feedback<br>Feedback from peers, making possible changes<br>Exhibition of the comic book<br>Modes for sharing with others; *Kaushal Mela* | |
| ***What did I learn from others and how did I use it?*** | 3 |
| Incorporating inputs from observation, interaction,<br>discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |

| | |
|---|---|
| ***Think and Answer*** | 1 |
| As per the project template | |
| ***What else can I do?*** | 1 |
| Make other comic books depicting family history or family events, etc. | |

## Family Budget Navigator

Related vocational area(s)—Finance and Accounting
Subject Teacher most suitable for this project: Any subject

| **Activity** | **Required periods: 38** |
|---|---|
| ***What will I be able to do?*** | 3 |
| Create a family budget spreadsheet in Excel | |
| ***What will I need?*** | |
| Computer with Excel, Internet, sample data | |
| ***How do I keep myself and others safe?*** | |
| Avoid physical strain while working on computers<br>Do not share any personal information or sensitive financial data | |
| ***What will I need to know before I start?*** | 12 |
| Basic understanding of Excel including formulae, sorting, cell operations, etc.<br>Understanding of finance-related terminologies, such as income, expenditure, savings, budget, etc. | |
| ***What do I have to do?*** | 14 |
| Design the budget tracker, and create sheets for income, expenses and summaries<br>Add and test formulae for calculations<br>Fix errors and refine the tracker for accuracy | |
| ***What did I learn from others and how did I use it?*** | 4 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 1 |
| As per the project template | |
| ***What else can I do?*** | 3 |
| Explore advanced features to create a family budget (e.g., using charts, pivot, Power BI) | |

## Ancient History Broadcasts

Related vocational area(s)—Journalism and Social Media
Subject Teacher most suitable for this project: Any subject

| Activity | Required periods: 50 |
|---|---|
| ***What will I be able to do?*** | 1 + 2 + 3 |
| Create videos focusing on different aspects of history, such as architecture, culture, daily life, etc. | |
| ***What will I need?*** | |
| Computer lab, mobile phone with a video recorder, headphones, phone microphone or video recording equipment | |
| ***How do I keep myself and others safe?*** | |
| Safety protocols for using equipment (e.g., cameras, lighting).<br>Guidelines for ensuring cultural and historical sensitivity in video content | |
| ***What will I need to know before I start?*** | 12 |
| Watch sample historical videos and identify elements that make them interesting and relevant<br>Explore features of video editing software<br>Learn how to write effective scripts and plan video backdrops | |
| ***What do I have to do?*** | 20 |
| Research historical themes through surveys, local interactions and media<br>Write scripts, create backdrops and rehearse roles<br>Record and edit videos using learned techniques | |
| ***What did I learn from others and how did I use it?*** | 5 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 1 |
| As per the project template | |
| ***What else can I do?*** | 5 |
| Make videos related to family history | |

## Podcast – Learning Through Listening

Related vocational area(s)—Social Media
Subject Teacher most suitable for this project:  Any subject

| Activity | Required periods: 50 |
|---|---|
| ***What will I be able to do?*** | 1 + 2 + 3 |
| Create a quality podcast | |
| ***What will I need?*** | |
| Mobile phone, headphones, phone mic and suitable app, or equipment for recording podcasts (computer, mic with stand, pop filters and windscreens, audio interface, headphones, portable digital recorder, mixer, and editing software) | |
| ***How do I keep myself and others safe?*** | |
| Safety protocols for handling audio recording equipment<br>Ethical considerations: maintaining sensitivity, confidentiality, and responsible content creation | |
| ***What will I need to know before I start?*** | 12 |
| Listen to various podcasts and identify what makes them engaging or ineffective<br>Watch tutorials or videos on podcast creation to understand technical aspects, like recording and editing<br>Develop criteria for assessing podcast quality: clarity, engagement, content depth and technical excellence | |
| ***What do I have to do?*** | 20 |
| Write scripts and plan formats for podcasts, including discussions or interviews<br>Practice recording techniques in small groups, experiment with voice modulation and sound quality<br>Record and edit podcasts using basic or advanced tools<br>Perform trial runs, review feedback and make necessary changes | |
| ***What did I learn from others and how did I use it?*** | 5 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 1 |
| As per the project template | |
| ***What else can I do?*** | 5 |
| Extend podcasting skills to create family news or personal audio content | |

## Advertisements — Communicating a Message

Related vocational area—Media and Communication, Marketing
Subject Teacher most suitable for this project: Language/Social Science

| Activity | Required periods: 55 |
|---|---|
| ***What will I be able to do?*** | 1 + 1 + 3 |
| Create advertisements to communicate a message | |
| ***What will I need?*** | |
| Stationery (colours, chart papers, pencil, eraser, sharpener, white sheets)<br>***Tools*** — Digital photo/motion graphic designer tools, like Canva, Animaker, etc. (Optional: camera/mobile phone) | |
| ***How do I keep myself and others safe?*** | |
| Discuss safety protocols for handling tools and equipment<br>Address ethical advertising practices to avoid harm (fake ads, copyright issues) | |
| ***What will I need to know before I start?*** | 14 |
| Introduction to advertisements (history, purpose, copywriting, marketing basics)<br>Research themes and understand the audience's needs | |
| ***What do I have to do?*** | 20 |
| Scriptwriting and creating storyboards<br>Conducting surveys to understand the audience's need<br>Create advertisements without technology (handmade posters, comic strips, jingles, plays)<br>Developing advertisements using technology (animations, video editing, voiceovers)<br>Developing a final advertisement for presentation | |
| ***What did I learn from others and how did I use it?*** | 5 |
| Incorporating inputs from observation, interaction, discussion and feedback | |
| ***What did I do and how long did it take?*** | 1 |
| As per the project template | |
| ***Think and Answer*** | 5 |
| As per the project template | |
| ***What else can I do?*** | 5 |
| Extend advertisement development skills based on home needs | |

# ANNEXURE 4

## Time Allocation and Mapping of Learning Outcomes

The tables given ahead indicate Time Allocation and Mapping of Learning Outcomes for the activities included in the projects for Grade 7.

**Time Allocation:** The time allocated for each activity is a suggestion, and teachers can adjust it based on their class size and complexity of the project.

**Cross-curricular Connections:** The projects can be drawn from other subjects in the Middle Stage—Language, Mathematics, Science, Social Science, Art Education, and Physical Education and Well-being. This allows for a more holistic learning experience. Connection to other curricular areas is also indicated in the upcoming tables.

**Student Reflection:** Reflection prompts are included ("What did I learn?", "What else can I do?") to encourage students to think critically about their work.

**Safety:** The tables emphasise safety precautions (LO 6) for activities involving tools or potential hazards.

**Open-ended Learning:** The "What else can I do?" section (LO 16) encourages students to explore connect to home and extend their learning.

**Learning Outcomes:** Each project focuses on developing specific skills and knowledge (LO 1–9) along with essential values related to work (LO 10–15).

Please note that LO 10 to LO 15, which refer to the essential values while working across areas, are applicable across all activities.

# Project 1: Plant Nursery

## Connection with other curricular areas: Science

| Activity | Required Periods: 53 | Related Learning Outcomes | |
|---|---|---|---|
| ***What will I be able to do?*** | 4 | LO 1, LO 7 | LO 11, LO 12, LO 13, LO 14, LO 15, LO 16 to be observed throughout the project |
| ***What will I need?*** | | | |
| ***How do I keep myself and others safe?*** | | LO 6 | |
| ***What will I need to know before I start?*** | | | |
| ***Field visit – farm/park/nursery*** | 5 | LO 1, LO 3, LO 5, LO 7 | |
| ***What do I have to do?*** | | | |
| ***Planning nursery layout*** | 4 | LO 1, LO 2, LO 3, LO 4, LO 5, LO 6, LO 8, LO 9, LO 10 | |
| ***Developing plant nursery in the school*** | 10 | | |
| ***Germinating seeds*** | 6 | | |
| ***Preparing plants in the nursery*** | 7 | | |
| ***Observing plants grow*** | 5 | | |
| ***Costing and time required*** | 3 | | |
| ***What did I learn from others*** | 3 | LO 1, LO 5, LO 7, LO 8 | |
| ***What did I do and how long did it take?*** | 2 | LO 4 | |
| ***What else can I do?*** | 2 | LO 7, LO 8, LO 9, LO 10, LO 11 | |
| ***Think and Answer*** | 2 | LO 17 | |

# Project 2: School Habitat Garden

**Connection with other curricular areas: Science**

| Activity | Required periods: 54 | Related Learning Outcomes | |
|---|---|---|---|
| ***What will I be able to do?*** | 4 | LO 1, LO 7 | LO 11, LO 12, LO 13, LO 14, LO 15, LO 16 to be observed throughout the project |
| ***What will I need?*** | | | |
| ***How do I keep myself and others safe?*** | | LO 6 | |
| ***What will I need to know before I start?*** | | | |
| ***Identifying animals in and around the school*** | 4 | LO 1, LO 3, LO 5, LO 7 | |
| ***Interaction with an expert*** | 3 | | |
| ***What do I have to do?*** | | | |
| ***Identifying natural habitats*** | 4 | LO 1, LO 2, LO 3, LO 4, LO 5, LO 6, LO 8, LO 9, LO 10 | |
| ***Identifying the needs of animals*** | 4 | | |
| ***Designing the habitat garden*** | 5 | | |
| ***Creating the habitat garden*** | 7 | | |
| ***Observing occupants of the habitat garden*** | 6 | | |
| ***Maintaining the habitat garden*** | 6 | | |
| ***Sharing what you have done*** | 3 | | |
| ***What did I learn from others?*** | 2 | LO 1, LO 5, LO 7, LO 8 | |
| ***What did I do and how long did it take?*** | 2 | LO 4 | |
| ***What else can I do?*** | 2 | LO 7, LO 8, LO 9, LO 10 | |
| ***Think and Answer*** | 2 | LO 17 | |

# Project 3: Tie and Dye

**Connection with other curricular areas: Arts, Science**

| Activity | Required Periods: 54 | Related Learning Outcomes | |
|---|---|---|---|
| ***What will I be able to do?*** | 4 | LO 1, LO 7 | LO 11, LO 12, LO 13, LO 14, LO 15, LO 16 to be observed throughout the project |
| ***What will I need?*** | | | |
| ***How do I keep myself and others safe?*** | | LO 6 | |
| ***What will I need to know before I start?*** | | | |
| ***Visit to a shop*** | 3 | LO 1, LO 3, LO 5, LO 7 | |
| ***Visit to a tie and dye workshop*** | 3 | | |
| ***What do I have to do?*** | | | |
| ***Exploring the art of tie and dye (everything about dyes, fabric and techniques)*** | 20 | LO 1, LO 2, LO 3, LO 4, LO 5, LO 6, LO 8, LO 9, LO 10 | |
| ***Making the final product*** | 15 | | |
| ***What did you invest*** | 2 | | |
| ***What did I learn from others?*** | 1 | LO 1, LO 5, LO 7, LO 8 | |
| ***What did I do and how long did it take?*** | 2 | LO 4 | |
| ***What else can I do?*** | 2 | LO 7, LO 8, LO 9, LO 10, LO 11 | |
| ***Think and Answer*** | 2 | LO 17 | |

# Project 4: AI Assistant

**Connection with other curricular areas: Computer Science**

| Activity | Required Periods: 55 | Related Learning Outcomes | |
|---|---|---|---|
| ***What will I be able to do?*** | 5 | LO 1, LO 7 | LO 11, LO 12, LO 13, LO 14, LO 15, LO 16 to be observed throughout the project |
| ***What will I need?*** | | | |
| ***How do I keep myself and others safe?*** | | LO 6 | |
| ***What will I need to know before I start?*** | | | |
| ***Understanding who is better at what (Humans vs Machines)*** | 4 | LO 1, LO 3, LO 5, LO 7 | |
| ***AI can see, listen and speak*** | 4 | | |
| ***Is AI creative?*** | 4 | | |
| ***What do I have to do?*** | | | |
| ***Preparing to design own AI assistant*** | 6 | LO 1, LO 2, LO 3, LO 4, LO 5, LO 6, LO 8, LO 9, LO 10 | |
| ***Teaching the machine to recognise images*** | 6 | | |
| ***Training for recognition*** | 6 | | |
| ***Testing and improving*** | 5 | | |
| ***Making the AI assistant interactive*** | 5 | | |
| ***Sharing with others*** | 2 | | |
| ***What did I learn from others and how did I use it?*** | 2 | LO 1, LO 5, LO 7, LO 8 | |
| ***What did I do and how long did it take?*** | 2 | LO 4 | |
| ***What else can I do?*** | 2 | LO 7, LO 8, LO 9, LO 10 | |
| ***Think and Answer*** | 2 | LO 17 | |

# Project 5: Storytime with Puppets

## Connection with other curricular areas: Arts

| Activity | Required periods: 55 | Related Learning Outcomes | |
|---|---|---|---|
| ***What will I be able to do?*** | 4 | LO 1, LO 7 | LO 11, LO 12, LO 13, LO 14, LO 15, LO 16 to be observed throughout the project |
| ***What will I need?*** | | | |
| ***How do I keep myself and others safe?*** | | LO 6 | |
| ***What will I need to know before I start?*** | | | |
| ***What makes stories work*** | 4 | LO 1, LO 3, LO 5, LO 7 | |
| ***Watching a puppet show*** | 4 | | |
| ***What do I have to do?*** | | | |
| ***Selecting/Writing a story*** | 4 | LO 1, LO 2, LO 3, LO 4, LO 5, LO 6, LO 8, LO 9, LO 10 | |
| ***Writing a script for the puppet show*** | 8 | | |
| ***Character sketch*** | 4 | | |
| ***Making puppets*** | 10 | | |
| ***Show*** | 8 | | |
| ***What did I learn from others and how did I use it?*** | 3 | LO 1, LO 5, LO 7, LO 8 | |
| ***What did I do and how long did it take?*** | 2 | LO 4 | |
| ***What else can I do?*** | 2 | LO 7, LO 8, LO 9, LO 10 | |
| ***Think and Answer*** | 2 | LO 17 | |

# Project 6: Family Health Handbook

## Connection with other curricular areas: Science

| Activity | Required periods: 44 | Related Learning Outcomes | |
|---|---|---|---|
| ***What will I be able to do?*** | 4 | LO 1, LO 7 | LO 11, LO 12, LO 13, LO 14, LO 15, LO 16 to be observed throughout the project |
| ***What will I need?*** | | | |
| ***How do I keep myself and others safe?*** | | LO 6 | |
| ***What will I need to know before I start?*** | | | |
| ***Factors affecting health*** | 5 | LO 1, LO 3, LO 5, LO 7 | |
| ***What do I have to do?*** | | | |
| ***Framing questions about you and your family's health*** | 5 | LO 1, LO 2, LO 3, LO 4, LO 5, LO 6, LO 8, LO 9, LO 10 | |
| ***Visit to a PHC/Hospital*** | 3 | | |
| ***Creating a kit*** | 4 | | |
| ***Factors affecting health at different ages*** | 4 | | |
| ***Analysing data from the survey of family members*** | 4 | | |
| ***Analysing data from observations of the environment*** | 4 | | |
| ***Making a plan to improve your family's health*** | 4 | | |
| ***What did I learn from others and how did I use it?*** | 2 | LO 1, LO 5, LO 7, LO 8 | |
| ***What did I do and how long did it take?*** | 1 | LO 4 | |
| ***What else can I do?*** | 2 | LO 7, LO 8, LO 9, LO 10 | |
| ***Think and Answer*** | 2 | LO 17 | |

# Notes

# Notes