

Kaushal Bodh

Vocational Education Activity Book for Grade 6



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NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

0685 – KAUSHAL BODH

Vocational Education Activity Book for Grade 6

ISBN 978-93-5292-632-9

First Edition

July 2024 Ashadha 1946

PD 500T HK

© **National Council of Educational
Research and Training, 2022**

₹ 65.00

*Printed on 80 GSM paper with
NCERT watermark*

Published at the Publication Division
by the Secretary, National Council of
Educational Research and Training,
Sri Aurobindo Marg, New Delhi
110 016 and printed at LPP Print
Packaging Pvt. Ltd., 28/1/10, Site-
IV, Sahibabad Industrial Area,
Sahibabad, District Ghaziabad,
Uttar Pradesh.

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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 Grade 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 6, 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.

New Delhi
July, 2024

DINESH PRASAD SAKLANI
Director
National Council of Educational
Research and Training

ABOUT THE BOOK

Kaushal Bodh, an Activity Book of Vocational Education for Grade 6 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.

The textual material developed for the Middle Stage will take children well beyond the Preparatory Stage. Curricular goals, competencies, and learning outcomes have been the guiding principles while developing the textbook. 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.

A variety of activities have been included in the Activity Book to cover the above curricular goals.

The Activity Book contains six illustrative projects, two for each form of work. One project maybe taken up by students or preferably, the school can design other projects based on local considerations. The illustrative projects are described as follows:

Project 1 is on developing a School Kitchen Garden. Students will engage in creating and maintaining a kitchen garden 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 importance of organic farming.

Project 2 is on preparing a biodiversity register. Students will be studying a variety of life within the school premises or nearby areas and documenting the various living things. They will learn to identify different species of plants, animals, and insects, understanding their roles in the ecosystem. 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 Maker Skills. In the Maker Skills project, students will explore various hands-on activities, such as making toys and maintaining a bicycle. 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, critical thinking, and the practical application of theoretical knowledge, preparing students for potential careers in design, engineering, and manufacturing.

Project 4 is on Animations and Games. It will introduce students to the fundamentals of digital creativity. They will learn to design and develop animations and games, gaining skills in coding, graphic design, and story-telling. This project will enhance their technological proficiency, creativity, and logical thinking.

Project 5 is on School Museum. It will help students to develop the skills of creating and managing exhibits that showcase the history, culture, and achievements of their family and community. They will learn about research, documentation, and presentation skills. 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 and engage with their family and community.

Project 6 is on Cooking without Fire. In this project, students will explore the art of preparing nutritious meals without the use of heat. They will learn about nutrition, food safety, and culinary creativity. This project will teach them practical life skills, the importance of healthy eating, and the ability to prepare meals in emergencies or with limited resources. It will also encourage teamwork and the joy of cooking.

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 as and for learning. Illustrations have been designed depicting the context to enhance learning. In-text questions are also included to assess comprehension of the activities. The end of the project questions given in ‘Think and Answer’ are designed to encourage critical thinking, reasoning, responding, and analysing.

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

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

VINAY SWARUP MEHROTRA
Professor and Member Convener
Curricular Area Group: Vocational Education
NCERT, New Delhi

CONSTITUTION OF INDIA

Part III (Articles 12 – 35)

(Subject to certain conditions, some exceptions
and reasonable restrictions)

guarantees these

Fundamental Rights

Right to Equality

- before law and equal protection of laws;
- irrespective of religion, race, caste, sex or place of birth;
- of opportunity in public employment;
- by abolition of untouchability and titles.

Right to Freedom

- of expression, assembly, association, movement, residence and profession;
- of certain protections in respect of conviction for offences;
- of protection of life and personal liberty;
- of free and compulsory education for children between the age of six and fourteen years;
- of protection against arrest and detention in certain cases.

Right against Exploitation

- for prohibition of traffic in human beings and forced labour;
- for prohibition of employment of children in hazardous jobs.

Right to Freedom of Religion

- freedom of conscience and free profession, practice and propagation of religion;
- freedom to manage religious affairs;
- freedom as to payment of taxes for promotion of any particular religion;
- freedom as to attendance at religious instruction or religious worship in educational institutions wholly maintained by the State.

Cultural and Educational Rights

- for protection of interests of minorities to conserve their language, script and culture;
- for minorities to establish and administer educational institutions of their choice.

Right to Constitutional Remedies

- by issuance of directions or orders or writs by the Supreme Court and High Courts for enforcement of these Fundamental Rights.



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Constitution of India

Part IV A (Article 51 A)

Fundamental Duties

It shall be the duty of every citizen of India —

- (a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;
- (b) to cherish and follow the noble ideals which inspired our national struggle for freedom;
- (c) to uphold and protect the sovereignty, unity and integrity of India;
- (d) to defend the country and render national service when called upon to do so;
- (e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;
- (f) to value and preserve the rich heritage of our composite culture;
- (g) to protect and improve the natural environment including forests, lakes, rivers, wildlife and to have compassion for living creatures;
- (h) to develop the scientific temper, humanism and the spirit of inquiry and reform;
- (i) to safeguard public property and to abjure violence;
- (j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement;
- * (k) who is a parent or guardian, to provide opportunities for education to his child or, as the case may be, ward between the age of six and fourteen years.

Note: The Article 51A containing Fundamental Duties was inserted by the Constitution (42nd Amendment) Act, 1976 (with effect from 3 January 1977).

* (k) was inserted by the Constitution (86th Amendment) Act, 2002 (with effect from 1 April 2010).

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ACKNOWLEDGEMENTS

The National Council of Educational Research and Training (NCERT) acknowledges the guidance provided by chairperson, co-chairperson and members of the National Syllabus and Textbook Committee (NSTC) and the members of the National Oversight Committee.

The Activity Book has been enriched by content and suggestions provided by members of Vigyan Ashram, Pabal; Azim Premji Foundation, Bengaluru; and Lend A Hand India, Pune.

The generosity of Professor Michel Danino in sharing photographs from his personal collection is acknowledged with gratitude. Thanks are due to the Directorate of Information and Public Relations, Government of Nagaland for sharing the photographs.

Support from Binay Pattanayak and Suparna Diwakar, *Chief Consultants* as well as Tarun Choubisa and Bhawna Paliwal, *Consultants* from the Programme Office, NSTC is also acknowledged. The support and guidance of Deepak Paliwal, *Joint Director*, PSSCIVE are also acknowledged. The contributions of Akansha Dubey, *Assistant Editor* (English) and Deepankar Kavathekar, *Assistant Editor* (English) are highly appreciated.

The following schools from across the country are acknowledged for contributing photographs that have either been used in the Activity Book or have provided guidance for illustrations: Rashtrotthana Vidya Kendra, Bengaluru; Sou. Laxmibai Baburao Bangar Vidyalaya, Khadaki, Pune; Pt. Jawaharlal Nehru Madyamik Vidyalay, Nirgudsar, Pune; Composite School Naibasti, Jhansi; Basic School Naubasta, Lucknow; Composite School Alipur Gijauri, Bulandshahr; and Upper Primary School, District Institute of Educational Training Parisar, Bulandshahr.

The NCERT acknowledges the contribution of Silja Bansriyar, Prateeti Prasad, P. J. S. Khandpur, Gaurav Sharma, Rima Kaur, Roseline Richa, and Purosottam Singh Thakur for the photographs.

The Council also acknowledges the valuable contribution of Alpana Saha, *Assistant Editor* (Contractual) for copy-editing and giving final shape to the book. The efforts of Surender Kumar, *Incharge*, DTP Cell, NCERT, and *DTP Operators* (Contractual) Upasana, Anita, Rajshree Saini, Bittu Kumar Mahato and Amjad Hussain towards flawless layout and design are acknowledged along with contributions of *Proofreaders* (Contractual), Sneha Jha, Lomesh Giri, Praveen Kumar and Maya.

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APPROACH AND PRINCIPLES

This Activity Book is designed to align with the approach to Vocational Education outlined in the National Curriculum Framework 2023 (NCF-SE 2023).

In the NCF-SE 2023, work has been categorised in three broad forms: Work with Life Forms, Work with Machines and Materials, and Work in Human Services.

- Work with Life Forms involves working with plants and animals. For example, developing a vegetable garden and taking care of animals.
- Work with Machines and Materials involves working with materials (such as, paper, wood, clay and fabric) and using basic tools (such as, scissors and garden fork, knife, hammer, screwdriver, etc.) and machines (such as, bottle opener, ramp slide, wood screw, crane, bulldozer, etc.)
- Work in Human Services involves interaction with people to understand their needs and how we can help them. It involves communication and understanding the processes and resources for providing a particular service. For example, healthcare, social services, education, food services, community service, etc.

These 'Forms of Work' act as a guiding concept for developing the curriculum, syllabus and materials for the Middle Stage (Grades 6 to 8). The intent at this stage is to provide students exposure to a wide range of work. To achieve this, students are required to take up nine projects across Grades 6 to 8: three projects, one from each form of work, in each Grade.

The choice of projects is left entirely to schools. The NCF-SE 2023, and indeed this Activity Book, encourages schools to select projects based on local considerations and availability of resources.

Two examples each of projects from the Forms of Work that students can take up in Grade 6 are detailed in the Activity Book. It must be emphasised that these examples are meant to serve as illustrations of how projects can be designed and the key aspects that must be addressed.

To this end, a template for designing a project other than the examples has also been provided in the Activity Book (Annexure 1).

The following principles have informed the design of this Activity Book:

1. **Smooth introduction to Vocational Education:** This is the first time that Vocational Education will be introduced in the Middle Stage. The Activity Book must aim to make this transition as smooth as possible without prescribing to either the teacher or the student.
2. **Illustrations of projects requiring varied resources:** The Activity Book must illustrate projects that can be taken up by schools with different kinds of resources in terms of availability of experts as well as tools and materials.
3. **Alignment to learning outcomes:** The Activity Book must be designed to ensure attainment of the learning outcomes for Grade 6 and eventually the competencies for the Middle Stage.
4. **Consistency across projects:** The same format must be followed across all projects. This will ensure that each project presents a familiar sequence and outcomes.
5. **Coherence within projects:** While projects will comprise various activities, all these activities must lead to learning how to ‘do’ something. In other words, the activities must be linked and lead to progression of learning.
6. **Ownership of students:** The Activity Book must ‘speak’ to students. It must also give them opportunities to record their own learning and reflection based on the activities they will take up.
7. **Guidance for teachers:** The Activity Book must provide a framework for teachers who will be taking up Vocational Education for the first time. It must guide them in their expectations from students. It must also guide them to understand what is expected from them in the NCF-SE 2023.
8. **Value integration:** The Activity Book must offer students opportunities to ‘do’ different things, record small successes, take and give feedback, work with peers, try and re-try, answer questions, reflect, in short, and ‘experience’ the values related to work.
9. **Approach of conducting projects:** The focus must be on ‘doing’ with some element of preparation, and recording and reflections. Learning should emerge from the process of doing the activities. To this end, as far as possible, the initial activities must be rooted in what students are doing at present and what they can easily observe around themselves.

The Activity Book provides guidance to teachers for pedagogy as well as assessment of student learning through questions embedded in the different components. However, teachers should design their own tools and techniques for formative and summative assessments.

The Activity Book contains notes for teachers, school heads and students. It also includes Annexures that will be useful for teachers as they implement the activities for Vocational Education in Grade 6.

NOTE FOR TEACHERS AND SCHOOL HEADS

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 6, 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., life cycle of plants and biodiversity in the project 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 6. 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 the task into smaller activities.
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 the above, 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.

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 weekdays 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 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 groups. All students must participate in all 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.

Students can be continuously assessed by observing them during activities, asking them questions, and reviewing their Activity Books. 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 6.

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 6 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. If you wish to use a paper-pencil test, it could include situational questions, concept maps, flowcharts, questions related to learning from visits, and Multiple-Choice Questions (MCQs). 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. Weightage to

the theoretical aspects is suggested as 20% and 80% for the practical aspects.

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. An illustrative list of projects is 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 6?
2. Does the project helps 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)?

You must develop the project for a duration of about 30 hours (approximately 55 periods of 40 minutes each).

The proposed time allocation and connection of each section of the project to the Learning Outcomes for Grade 6 are given in Annexure 4. This may be referred to while developing a project.

Please note that suggestions for the use of Artificial Intelligence (AI) tools are placed in boxes throughout the Activity Book. Artificial Intelligence (AI) is a branch of computer science focused on creating systems or machines that can perform tasks that typically require human intelligence. The suggestions may be taken up if suitable resources are available. 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 must, in turn, 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.

Internet safety or cyber safety is critical when students are accessing the Internet or using Artificial Intelligence (AI) tools. While using the Internet and AI tools, students must be made aware of the consequences and implications of sharing private information, visiting sites that are not approved by the teacher, or sharing of passwords.

NOTE FOR STUDENTS

Dear students,

You are studying several subjects, like Languages, Social Sciences, Science, Mathematics, Art Education, and Physical Education and Well-Being in Grade 6. Another new and exciting subject that you will study is Vocational Education.

Vocational Education 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. This will happen through projects that you will do in school. These projects 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, this 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 check your answers.

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 a teacher, parent, or peers for help. Ask as many questions as needed if something is unclear. Collaboration and discussion can make learning more 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. Some examples of AI tools are ChatGPT, tools for translation or for finding information about something. 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 maybe 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.

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.**

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)

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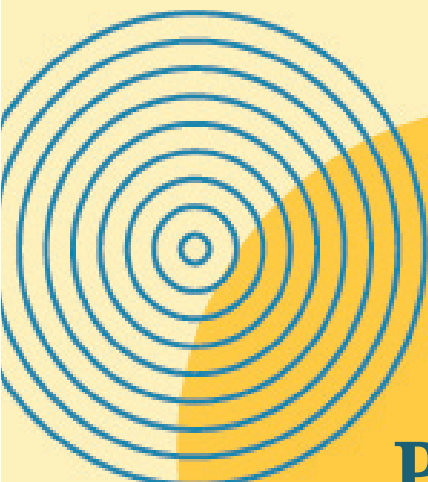
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Part 1

Work with Life Forms



‘Life forms’ include all living things on earth. They include human beings, animals, birds, fish, plants, insects, 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. 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

School Kitchen Garden



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This project will help you learn about growing plants for food. You will create a kitchen garden on your school campus, either in plant beds or in pots (Figure 1.1).

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

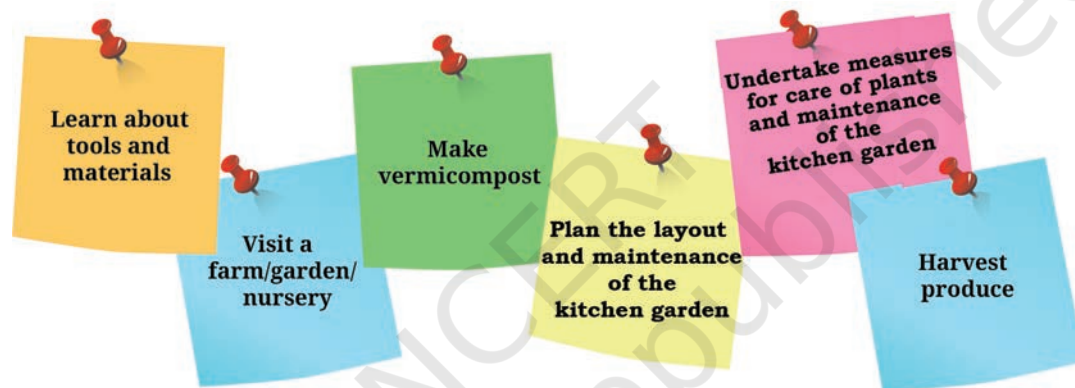


Figure 1.1: A school kitchen garden

We all enjoy different kinds of food. Some of us like to eat fresh fruits and vegetables, some like vegetables cooked with herbs and spices, yet others like preserved food, such as pickles and tomato sauce. Most of our food which comes from farms, vegetables, such as brinjal (eggplant), cucumber, chilli or herbs, coriander, and mint, can be grown in a kitchen garden.

A kitchen garden, also known as a vegetable garden, is a garden where fruits, vegetables, and herbs are grown. The 'produce' or yield from the garden is usually sufficient to meet a family's needs.

In this project you will learn about growing plants for food in your school. You will create a kitchen garden in your school campus, either in plant beds or in pots (Figure 1.1).



What will I be able to do?

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

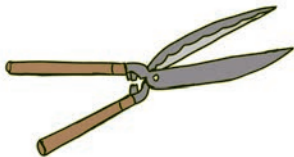
1. Identify common gardening tools, equipment and materials, and describe their uses;
2. Prepare soil either on the school ground or in pots using gardening tools;
3. Plant seeds or seedlings and help them grow through watering, use of manure and fertilisers and taking care;
4. Keep the plants in the kitchen garden safe with the help of fencing and organic pesticides; and
5. Harvest the produce in the kitchen garden or pots.

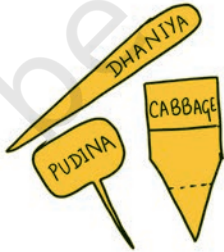


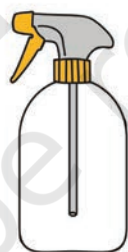
What will I need?

To carry out this project, you will need various tools and materials. Let us first try to learn about them (Table 1.1).

Table 1.1: Common tools and materials used for cultivating plants in a kitchen garden

Tools/Materials	Sketch	Uses
1. Garden trowel		This is used for digging up soil and planting seedlings.
2. Hand cultivator		This tool is used for loosening soil, removing weeds, and mixing manure in soil.
3. Watering can with rose attachment or hose pipe		These are used for watering plant beds or pots, seedlings and plants.
4. Gardening gloves (made of rubber)		This protective gear is used to protect hands and to provide a firm grip on tools.
5. Gardening shears		These are used for cutting branches, twigs and stems.

6. Seeds, seedlings, bulbs, rhizomes, cuttings, and so on.		These are used for growing plants in the garden.
7. Potting soil or mix. (A potting mix is a blend of material like compost, perlite vermiculite, soil, coir or peat-moss)		This material is used for filling containers or pots.
8. Organic mulching materials, such as grain straw, leaf mold, shredded leaves, grass clippings, etc.		They are used to retain moisture and suppress growth of weeds.
9. Plant labels		They are used to identify different plants in the garden.
10. Old pipes/Polyvinyl Chloride (PVC) pipes/wooden sticks/bamboo poles/metal poles and string		These are used to make a protective fence.

11. Bin and tarpaulin/ scrap of old thick cloth		These are used for preparing compost or vermicompost, which provide additional nutrition to plants.
12. Neem leaves and jerry can/large bottle		These materials may be used for preparing organic pesticide, which is used to kill or keep away pests or insects that are harmful for plants.
13. Manure		Manure is a natural fertiliser prepared from the dung of farm animals, which is used to provide additional nutrition to plants (Figure 1.2).
14. Spray bottle		It is used to spray small amount of a liquid.
15. Spade		It is a tool used for digging, edging and moving soil or other materials.

Note: If you cannot get all these tools and materials, do not worry. You can ask your teacher or the expert for alternatives.



Did you know?



Figure 1.2: *Dung from farm animals has been traditionally used in Bharat to make manure.*



How do I keep myself and others safe?

Some key precautions to be followed while doing kitchen gardening are as follows:

- Ask your teacher about the correct way to lift pots. If you feel the pot is too heavy, get someone to help you, and do not try to lift it alone (Figure 1.3).



Figure 1.3: *Stay safe while gardening, lift pots carefully, use tools correctly, use gloves and aprons, and read the available instructions for safe use of tools and materials.*

- Wear gloves when handling tools and materials to protect your skin. Ensure they fit well so that you have a good grip on tools.
- Follow instructions while using gardening tools and materials.
- Pay attention during demonstrations to understand correct techniques.
- Always ask for help if you are unsure about how to use a tool.

- Regularly clean the tools and equipment, and wipe them after washing to prevent rusting.
- Ensure tools are stored in an organised manner in a store or on shelves to prevent anyone from tripping over them.



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?

To get first-hand knowledge of how to make your kitchen garden, you can visit an agricultural farm. If there are no farms near your school, you can visit a nursery, a garden or an orchard (Figure 1.4).



Figure 1.4: Learning from an expert

Activity 1: Visit to an agricultural farm/nursery/garden to interact with the farmer/nursery worker/gardener/expert

It is important to prepare a list of questions before the visit. Some are given below. See if you can think of more. You will answer these questions after your visit.

1. Which plants are being grown?

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2. Were all the plants planted at the same time? If not, why?

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3. Can all the plants be grown in a kitchen garden? Yes/No

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4. How is the soil prepared for sowing or planting?

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5. How are the plants provided nutrition in addition to what they get from the soil?

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6. How can plants be protected from any kind of harm from animals and pests?

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7. What were the two most interesting things you learnt during your visit?

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Discuss your observations with your peers and teacher, and write about what you learnt about growing plants after your visit.



Did you know?

The science of agriculture and plant life was given a lot of importance in ancient Bharat as the main work was farming and the rearing of animals. The distilled wisdom and experience related to plant health, growth and treatment of diseases was documented in a treatise called '*Vrikshayurveda*' (*Ayurveda* for trees).

There were two texts by the same name of *Vrikshayurveda*, one written by Salihotra (approximately 400 BCE) and the second one by Surapala (1000 CE). The only existing copy of a palm leaf manuscript of Surapala's *Vrikshayurveda* is preserved at Oxford University.

The text deals with the cultivation of many species of plants, water management, soil conservation, fertilisers, various diseases affecting plants and their treatment.

In the *Vrikshayurveda*, Surapala encourages the planting of sacred trees like *Bilva* (*Bael* or stone apple), *Nyagrodha* (banyan), *Ashwattha* (fig) and *Neem*. **The text says that planting trees is one of the means to attain the goals of human life.**

Climate change, soil erosion and increasing health concerns have led to renewed interest in the traditional knowledge contained in texts like *Vrikshayurveda*. This knowledge can be used to maintain the health of the soil, promote good agricultural practices and preserve biodiversity.



What do I have to do?

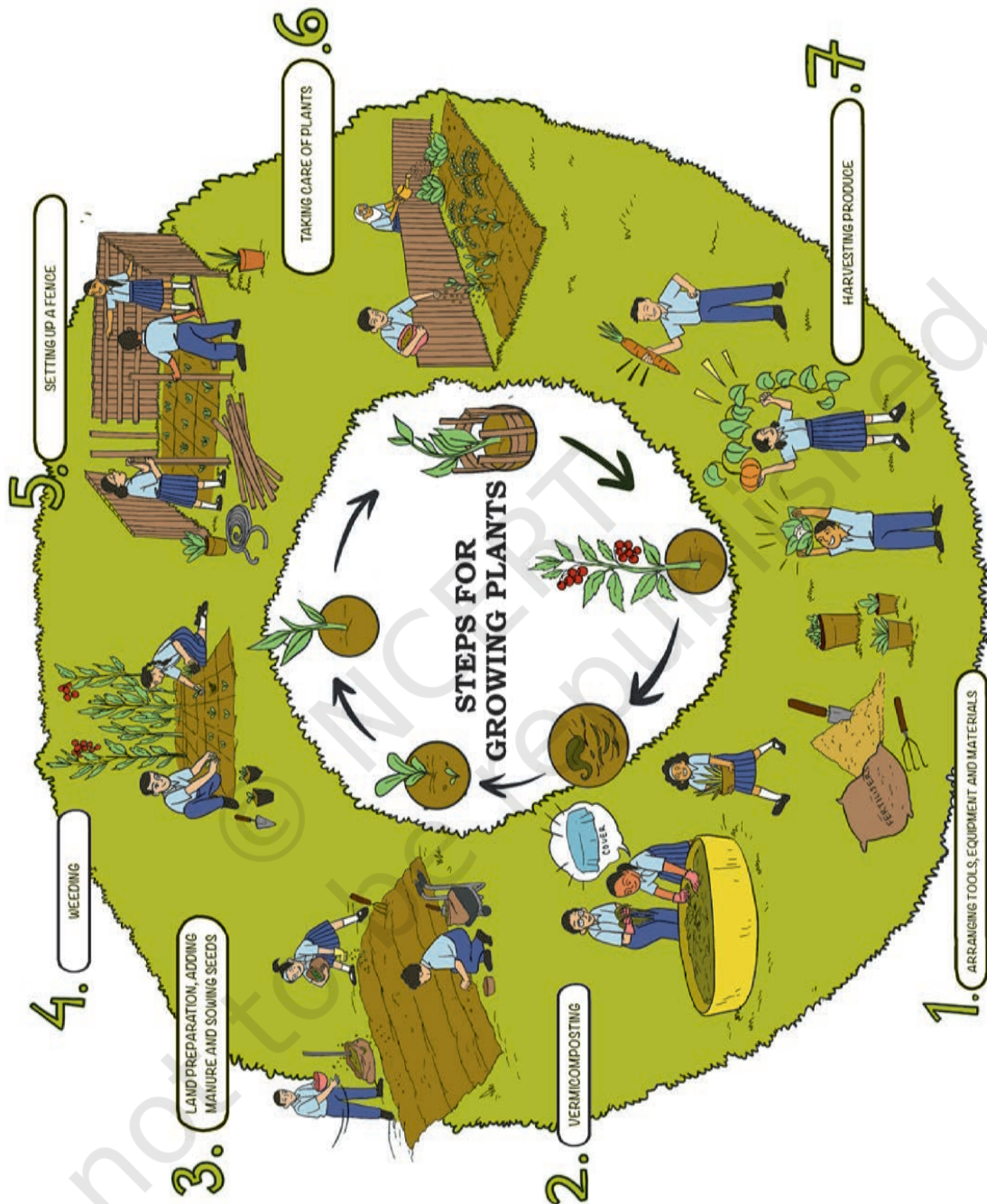


Figure 1.5: Growing plants in a kitchen garden

As you can see in Figure 1.5, a kitchen garden needs careful nurturing of plants to help them grow.

Let us now conduct the activities that will guide you on how to develop a kitchen garden and at the same time learn how to grow healthy plants.

Activity 2: Planning your school kitchen garden

The first step is to measure the land area and decide the various components of the kitchen garden (Figure 1.6). Some important decisions need to be taken; the questions below will help you with planning your kitchen garden.

1. Are you planning to make your school kitchen garden in the land available in school or in pots or both?

.....

.....

2. How are you going to calculate the area of your kitchen garden?

.....

.....



Figure 1.6: *Laying out the kitchen garden*

While selecting the location of your kitchen garden, you must consider factors, like exposure of plants to sunlight, drainage, and spacing requirements so that you are able to reach all the plants while watering.

3. What factors did you consider when selecting a location for the garden?

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Plants need nutrients to grow. Nutrients refer to specific elements, such as nitrogen, phosphorus and potash that plants absorb from the soil or growth medium for their growth and development. Organic fertilisers, such as manure, compost, vermicompost and green manure and inorganic fertilisers, such as urea and superphosphate are applied to the plants for supplying nutrients.

You can consider planting herbs or leafy vegetables that grow quickly. For example, you can grow herbs, like coriander, mint, spinach or leafy vegetables so that you can use the produce from your garden soon. These herbs and leafy vegetables are also very good for health as they are good source of vitamins and minerals.

Now, select the plants for your kitchen garden and get the seeds or seedlings for sowing or planting.

Activity 3: Making vermicompost

In this activity, you will learn how to make vermicompost.

There are many methods of preparing vermicompost. One such method is described below. You can also search for other methods on the Internet or ask farmers and other experts for advice.

1. Vermicompost is prepared in a bin made of plastic, wood or any other water-resistant material. The bin must be covered with tarpaulin or piece of old thick cloth. Holes must be made in its bottom to drain out extra water.
2. The compost bin should be filled with waste, such as kitchen waste, fallen leaves and other garden waste or any

biodegradable waste. You can use any organic waste from the midday meal in your school, or bring it from home or a nearby *Dhaba* or restaurant. These layers of waste are called 'bedding materials'.

3. Now add water to moisten the bedding material. Do this as per the instructions of the teacher.
4. Red earthworms (*Eisenia fetida*) should be introduced on top of the bedding material and allowed to burrow into it (Figure 1.7a). You can get them from a farm or nursery.
5. The earthworms must be fed by adding kitchen scraps, such as fruit and vegetable peelings, coffee grounds, eggshells, and non-greasy food waste to the bin. Avoid adding meat, dairy or oily foods, and citrus fruits, as they can attract pests or harm the worms.
6. The bedding should be kept moist by spraying it with water as needed, but not waterlogged. It should be covered with a lid to retain moisture and prevent pests.
7. Vermicompost from the bottom of the bin can be used once it becomes dark, crumbly, and earthy smelling, which usually happen within a few months (Figure 1.7b).



Figure 1.7 (a): Earthworms for preparing vermicompost



Figure 1.7 (b): Vermicompost prepared using scraps of leftover food



Did you know?

In case earthworms are not available, then you can make compost, using a process slightly different from that for vermicomposting.

You can search for the process of making compost on the Internet using the search keywords ‘vermicomposting of solid waste’.

The following questions will help you check your learning:

1. Which materials you used to make the vermicompost?

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2. What types of food scraps did you add to the bin?

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3. What changes did you notice in the compost bin over a period?

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Activity 4: Preparing the kitchen garden for planting

Soil preparation involves clearing the soil of any debris, rocks, or unwanted plants that could hinder the growth of the plants. This ensures that your plants have room to grow and they get sufficient nutrition (Figure 1.8).



Figure 1.8: *Plant beds (left) and pots (right) for the kitchen garden*

The soil in plant beds or pots needs to be prepared before sowing the seeds or planting seedlings. You will have to mix manure with the soil as per the directions of your teacher.

The following questions will help you check your learning:

1. How did you prepare the soil for planting?

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2. Did you use organic manure? If yes, what proportion did you use for mixing organic manure with soil?

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Activity 5: Sowing seeds and planting of seedlings

You have already decided the plants to be grown in your kitchen garden in Activity 2.

Before planting seeds, read the instructions on the seed packets to understand the recommended planting depth, spacing, and season for planting. You can also use farm seeds preserved from the previous harvest by farmers or gardeners, in which case please ask them for guidance.

If you are transplanting seedlings, read any labels or tags that came with them for specific care instructions. If labels or tags are not available, ask the person who gave you the seedlings for guidance.

1. Sowing Seeds

Sow seeds as per the sequence below:

- (a) Make furrows or small holes in the soil according to the recommended spacing for sowing the seeds. If you are making your kitchen garden in pots, you will have to know the number of seeds or seedlings to be placed in each pot. The number of seeds or seedlings to be placed in each pot is decided by certain factors, including the type of plant, the size of pot and the desired plant growth.
- (b) Drop seeds into the furrows or holes. If the seeds are very small, sprinkle them evenly over the soil surface (Figure 1.9).
- (c) Cover the seeds lightly with soil, following the recommended planting depth.
- (d) Gently pat down the soil to ensure good seed-to-soil contact.



Figure 1.9: Sowing seeds in furrows

2. Planting seedlings

If you are planting seedling, then follow the steps given below:

- Dig holes in the prepared soil. The hole should be slightly larger than the length of the roots of the seedlings.
- Carefully remove seedlings from their containers, being mindful not to damage the roots.
- Place each seedling into the prepared hole. The soil level around the seedling should match the soil level in its original container.
- Gently fill the holes with soil, pressing lightly around the base of each seedling to secure the plant in its place.

Write the name of the plant and date of sowing on labels with the help of a permanent marker. These labels can be made of old plastic bags stuck on waste cardboard or even chart paper. Place the labels at the beginning of each row or section of the garden or in each pot to identify the date they were planted. This will help you keep track of your plants as they grow.

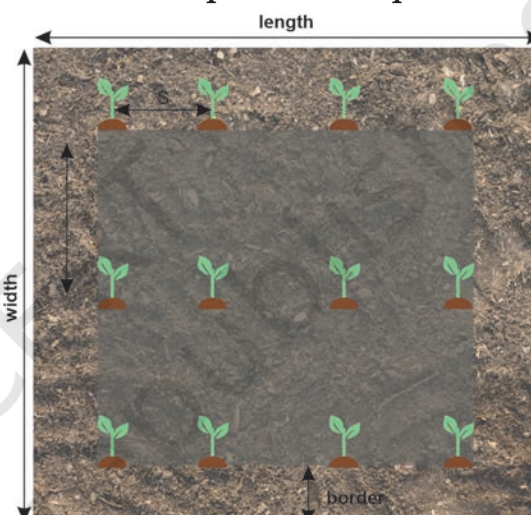


Figure 1.10: Soil background along with plant to plant space

Respond to the following questions to check your learning:

- How deep did you plant each type of seed? Use table 1.1 to fill the information.

Table 1.1: Data on seed sowing depth

S. No.	Name of Plant	Seed Sowing Depth (Centimetre)
1.		
2.		
3.		
4.		

2. How much space did you leave between one plant and the other? Use table 1.2 to fill the information.

Table 1.2: Maintaining data on plant to plant space

S. No	Name of Plant	Plant to Plant Space (Centimetre)
1.		
2.		
3.		
4.		

3. Was the plant to plant space same for all the plants grown by you? Yes ☐ No ☐

Activity 6: Taking care of plants

Plants need care to make sure they receive the nutrients, water and sunlight needed to thrive. Also, the plants are delicate and must be protected from any harm due to animals, pests, diseases or extreme weather.

General protection of plants include making a fence, companion planting, sanitation, weeding, wind protection, and using organic pesticides against pests and diseases.

1. Making a fence

You need to keep the plants safe from other animals and people who may step on them. You can do this by making a fence around your kitchen garden.

- The fence can be made using bamboo or locally available material.
- Measure the dimensions of the area that needs to be fenced.
- Draw a sketch of the area and decide where fence is to be placed.
- Collect locally available materials, like bamboo, old pipes or old wooden sticks for using them as ‘poles’ and use a strong string to bind the poles and make the fence.

The following questions will help you decide the quantity of materials you need:

1. What are the materials that you will use for fencing?

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2. How many poles and the length of string will you need for fencing?

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2. Steps for Plant Care and Maintenance

- (a) **Support your plants and creepers by staking:** Staking plants is a common practice to provide support and stability, especially for tall or weak stem plants that may otherwise become top-heavy and fall over (Figure 1.11). Plants, such as tomatoes, cucumbers, peas and beans require staking. First, you will need 'stakes'. You can use bamboo, a thin old branch that has fallen off a tree, or an old metal or plastic pipe as a stake. The height and thickness of the stake should be decided according to the length and weight of the plant. Now, using a string tie the plant with the stake.



Figure 1.11: Staking a plant for support

- (b) **Watering your plants:** It is essential to water plants regularly, ensuring that the soil remains consistently moist but not waterlogged, as overwatering is generally harmful for plants. Decide how the plants will be watered. You can use, a mug and bucket, watering can, or



Figure 1.12: *Watering freshly sown plant beds*

a pipe or something else (Figure 1.12). Develop a schedule to ensure plants receive sufficient water, especially during dry spells. New plants need more frequent watering. Water the plants in early morning or late afternoon to minimise water loss due to evaporation.

The questions below should be answered before watering the plants as it will help you to ensure watering as per the needs of plants.

1. How do you know when a plant needs water?

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2. How often do you need to water your plants?

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3. What is the best time for watering plants?

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4. What factors influence the quantity and frequency of watering?

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- (c) **Mulching post watering:** Apply a layer of mulch, such as straw, wood chips, or shredded leaves, around your plants to help retain moisture, suppress weeds, and ensure the soil temperature remains mostly the same.
- (d) **Monitoring the garden for signs of pests and applying organic pesticides:** Prepare organic pesticides using ingredients, like neem oil, garlic, chilli pepper, and soap. Apply organic pesticides as needed, and follow instructions carefully to minimise harm to beneficial insects, or birds and animals that are not harmful for plants.



Did you know?

Neem based pesticide is an organic pesticide used to control caterpillars, grasshoppers, whitefly and aphids in agricultural crops.

You can make an organic pesticide by following the steps given below:

1. Take 500 gram of neem leaves (if possible, you can ask an expert at the local *Krishi Vigyan Kendra* or Agriculture Research Centre to recommend any other bitter plant leaves), wash them and chop or break them into smaller pieces. You will experience a nice fragrance as the leaves are broken up.
2. Mix the neem leaves with 5 litres of water.
3. Put the mixture in a jerry can/large size bottle and leave it for around 14 days.
4. Separate suspended solids from liquid using a strainer.
5. You can spray this pesticide on your plants using a spray bottle.



Figure 1.13: *Removing weeds in a plant bed using hand cultivator*

(e) **Removing weeds:** Check regularly for weeds and remove them as soon as they appear (Figure 1.13). It is good to use a hand cultivator, if you have one for weeding. You can ask your teacher for an alternative, if hand cultivator is not available.

Decorate Your Garden

Your garden must look beautiful with plants growing neatly in rows and with proper layout and decoration. Think of ways in which you can beautify your garden and act on them.

Some things you can do to decorate your kitchen garden are as follows:

1. Use stones to make the flower beds or pots look neat. You can paint these stones using attractive colours.
2. Make decorative items that can be kept outside in the garden, like painted clay pots, paintings made on stones, or using old objects lying around the school to make 'sculptures'.
3. You can even make a scarecrow to keep the garden safe from birds.

You can get some ideas from the work done by Shri Nek Chand, who created a beautiful garden called the Rock Garden using waste material in the Union Territory of Chandigarh.

Activity 7: Observing your plants grow

Tracking growth of plants can be helpful in understanding their development and needs. Keep track of the growth of the plants in your kitchen garden (Figure 1.14). Observe changes in plant height and record other observations, such as change in the colour of leaves, appearance of flowers, and even attack of pests. You can maintain a diary where you record your observations. Use table 1.3 to record your observations.



Figure 1.14: *Keeping track of the growth of plants*

Table 1.3: Observations of plants as they grow in the kitchen garden

Date of Observation	Observations (data of emergence of seedling, height of plants, pests, changes in colour of leaves, flowering, etc.)
Week 1 (Date: -----)	
Week 2 (Date: -----)	
Week 3 (Date: -----)	

Keep a record of the progress of your kitchen garden by taking photographs from different angles or drawing sketches or both. Make sketches or paste the photos in the space given below:

Week 1/Month 1

Week 2/Month 2

Activity 8: Harvesting

Once ready for consumption, harvest your produce (Figure 1.15) and sort it, based on quality and size. You must ask your teacher about the method to harvest produce. For example, for leafy greens, such as lettuce and spinach, use a cut-and-come-again approach, harvesting outer leaves while allowing the inner leaves to continue growing. For root vegetables, like carrots and radishes, gently loosen the soil around the base of the plant and pull them out by hand or with the help of a garden trowel. For produce like tomatoes, brinjals (Figure 1.16) and peppers, use gardening shears to cut them from the vine, leaving a short stem attached. Remove any debris, foreign matter, or produce that is damaged to ensure only the best-quality is retained.



Figure 1.15: *Enjoy the produce of your labour*



(a)



(b)

Figure 1.16 (a): *Brinjal plant*, and **(b):** *Harvested Brinjals*

The following questions will help you to check your learning:

1. Which crop(s) you harvested?

(a)

(b)

(c)

2. How did you know they were ready for harvesting?

(a)

(b)

(c)

3. Which tools did you use to harvest the plants?

.....

.....

.....

.....

4. What precautions you took to avoid damaging the plants while harvesting?

.....

.....

.....

.....

5. What did you do with the produce after harvesting from the kitchen garden?

.....

.....

.....

.....

Activity 9: Visit to the vegetable market

Visit the local vegetable market, observe the vegetables and fruits and note the price of different vegetables and fruits. Prepare a price chart (refer to table 1.4) of your vegetables, based on your observation.

Table 1.4: Price chart of vegetable produce in market

Vegetable name	Price (₹)	Vegetable name	Price (₹)
1.		5.	
2.		6.	
3.		7.	
4.		8.	

Activity 10: Setting a price

You can give the produce from your kitchen garden to the school kitchen for midday meal or decide what to do based on instructions with your teacher and peers. Estimating the price of produce from your kitchen garden involves considering many factors, such as cost of seeds or seedling, cost on soil amendments, cost of tools and equipment, label cost, etc. But what if you planned to sell the produce? You can set a price for each item of your produce. Discuss how a price is fixed for the produce with your peers and teacher.

Here is a simple method to learn how to calculate the price after filing the information in table 1.5.

Table 1.5: Estimating price of produce from kitchen garden

What did you grow? (1)	How much money was spent on the seeds/seedling and other materials? (2)	What was the quantity harvested (number, or by weight)? (3)	What is the market price of the produce? (4)	How much money would you get for your produce? (5)



Did you know?

Did you know that plants can be grown without soil? Take a cutting of a money plant and place it in an old bottle filled with water. Place the bottle in bright but indirect sunlight. Do remember to change the water every week or so. See what happens!



Smart Kitchen Garden with Artificial Intelligence

You can design and make a smart kitchen garden utilising Artificial Intelligence (AI). AI assists in plant identification, watering plants, recording plant growth, identifying pests and whatever else you need.

I. Planning and Designing using AI

1. Search for suitable vegetables and herbs and learn when they should be planted. AI apps on mobile phone suggest plants based on your location.
2. Plan the layout of the garden bed or the placement of the pots, considering sunlight and spacing requirements. Some plants grow better when they are surrounded by others while others need space.

II. Making the Kitchen Garden

1. Fill the raised bed or pots with appropriate potting mix and ensure that extra water drains out.
2. Plant seeds or seedlings following the recommended spacing and depth.
3. Label each plant with its name and planting date for easy identification. You can print the labels or you can even paste a photograph of the plant on the label.

III. Smart Care and Monitoring

Search for suitable garden management apps or garden growth recording apps. Observe the plants regularly and use the app to track their progress, identifying potential issues like pests or diseases.

1. Use an image recognition app to identify any unfamiliar plants that may appear. These could be weeds or plants growing from seeds that were left over from the previous season.
2. Based on AI app suggestions and additional Internet searches, determine appropriate watering schedules, manure to be added and early detection and control of pests
3. Document observations of plant growth and other things that interest you, creating a record of your learning journey.

Geotagging, which refers to the process of adding geographical information to various forms of media, such as photos, videos, websites or social media posts can be created for your kitchen garden. You can use digital technologies for geotagging your garden (even if it is in pots).



What did I learn from others?

Write three most important things that you learned from others (they could be about making a kitchen garden, looking after plants or simply working with others).

.....

.....

.....

.....



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 number of periods 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. Design a container garden at your home. Think and discuss with your teacher what materials you will need and how you will proceed.
2. Find out the scientific names of the plants you have grown.
3. Geo-tag your kitchen garden; include longitude and latitude coordinates.



Think and Answer

1. What did you enjoy doing?
2. What were the challenges that you faced during the activities?
3. What will you do differently next time?
4. What were the conditions that helped your plants grow? If your plants did not grow well, what should you do next time?
5. What jobs are related to the project? Look around, speak to people and write your answer. A few examples of jobs related to the activities that you did are farmer, gardener, agricultural scientist, mechanic for agricultural equipment, such as tractors and harvesters.

Project 2

Biodiversity Register



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This project will help you to learn about biodiversity among living things in the world around us (Figure 2.1). You will create a biodiversity register based on your observations and the information you gather.

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

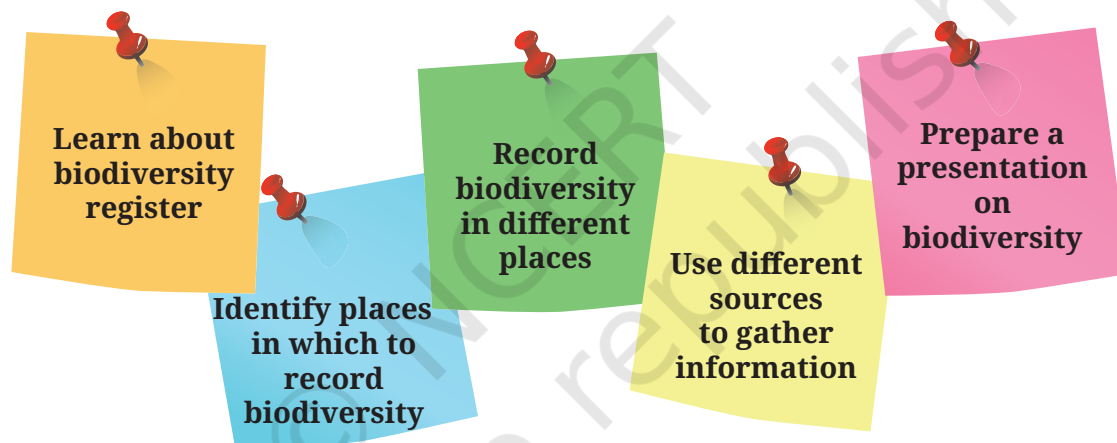


Figure 2.1: Look around at the diversity of living things in your surroundings

The diversity of living things, known as biodiversity, comprises the variety of life forms on earth. It includes plants, animals, birds, fish, insects, and even microorganisms that are found everywhere, including soil (see Figure 2.1).

You have learnt about the diversity of living things around us in Science.

A biodiversity register is used for documenting the diversity of living things in an area. It contains information about habitat, which includes the landscape and types of soil, scientific and local names of living things, what animals eat, living things that may harm others, and other different kinds of information.

Recording biodiversity is crucial because as habitats transform due to factors, such as land clearance for construction or agriculture, or shifts in climate, many species face extinction or become endangered. This interconnectedness means that the loss of any plant or species affects the ecosystems, including humans.

Biodiversity registers also provide people with information that is useful, for example, local knowledge related to crop plants and animals, plants that can be used for their medicinal value, pests that affect plants, when to plant crops, and so on.

You can create your own ‘mini’ biodiversity register by systematically recording the biodiversity around yourself. In case you come across a plant, insect, bird or animal that you are not familiar with, then you can get information by:

- i. Talking to teachers/elders/family members/experts
- ii. Looking up books in the library
- iii. Searching for the information with the help of the Internet on the computer
- iv. Using applications on mobile phones.

Terms used in the biodiversity register

Scientific name: A name given to living things that is the same across languages. Names differ across languages, but a scientific name ensures that people, especially scientists know that they are referring to the same living thing.

Variety refers to differences in a similar kind of plant, e.g., there are different varieties of mangoes, like *Alphonso*, *Kesar*, *Ratnagiri*, *Totapuri*, *Chaunsa*, *Dasheri*, *Langra*, *Banganpalli*, *Anwar Ratol* and *Pairi*.

Cropping season: It is the season in which a particular crop is grown.

Season of fruiting: This refers to the season when fruit trees produce fruits.

Source of seeds/plants: This refers to how new plants grow, whether from seeds, seedlings, bulbs, stem cuttings or any other method.

Affected crop: Crop that had been damaged by pests, e.g., diseases that affect plants, insects that eat the leaves or fruits, or any other reason.

Host: It is a plant or animal on which other plants or animals live. For example, dogs are hosts for fleas, who suck their blood, and some plants are hosts for caterpillars, who grow by eating leaves and fruits.

Pests: These are insects, birds or animals that are harmful to plants.

Pesticide: Pesticides are used to prevent or control harm to hosts by pests. They can be in the form of liquid, solid or gases.

Weedicide: Weedicides are used to prevent or control harm to plants by weeds.

GI tag: A Geographical Indication (GI) tag is given by the government and recognised all over the world. For plants, it means that the plant is grown in a specific geography and all the produce from that area is of a high standard. For example, we have many varieties of rice in our country – some with GI tags are *Navara* rice from Kerala, *Basmati* from Uttarakhand, and *Gobind Bhog* rice from West Bengal. Another example is of *Jalgaon* bananas from Maharashtra.



What will I be able to do?

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

1. Systematically record the biodiversity that you observe around yourself;
2. Use different methods to collect information related to biodiversity; and
3. Analyse information to present your understanding of the biodiversity around yourself.



What will I need?

To carry out this project, you will need the following materials:

- A notebook, pen, pencil, eraser, measuring scale, pencil and sharpener.
- You can use a handheld magnifying glass or lens in case you want to observe details of plants or insects.
- A camera or a smartphone (borrowed from your teacher or parents/guardians) can be used for taking photographs, and making video and audio recordings. However, you must make sketches of whatever you include in your biodiversity register.
- You can also use a smartphone for identification of living things.



How do I keep myself and others safe?

Discuss the precautions you need to take. For example:

- Wear shoes for the field visits.
- Cover your arms and legs to prevent mosquito bites.
- Be careful while observing wild plants, insects, birds and animals.
- Do not disturb any animals, birds or insects.
- Do not damage any plants.
- Do not leave any garbage behind. It is harmful for living things.



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



What do I need to know before I start?

Activity 1: What is around us?

Look around and observe the living things you can spot. You will find that each one of the plants supports a tiny cosmos full of insects, spiders, squirrels, birds, and other creatures that feed on it and seek shelter amongst its leaves and branches (Figure 2.2). You will record some of your observations and related information in your biodiversity register.



Figure 2.2: Recording observations of living things around us

Before you begin writing on your biodiversity register, complete table 2.1. This will help you in remembering the living organisms you often observe and where you see them (e.g., near a water body, in a farmland, or in a park). You can make a sketch or paste a photograph, if you want. This information will be useful when you plan surveys to fill your biodiversity register.

Table 2.1: Identifying locations where you can observe a variety of living things

Living things or living organisms	Names (Try and find the names in as many languages as you can)	Places (Where do you find them?)
Insects		
Birds		
Animals		
Worms		

Activity 2: Meet an expert

You can invite different experts to come and speak to you about biodiversity. For example, a forest officer or a farmer. A conservationist, who works for the protection of plants and animals can also be invited to speak about biodiversity. Another person you could invite is an expert in Ayurvedic medicine, a *Vaid* or *Vaidya*. The person is a practitioner of traditional tribal medicine, since they use medicinal herbs and other related plants.

You must prepare questions to ask the experts. Some examples are as follows:

1. Where can we find different kinds of plants in our locality?
2. How do we know whether the plants growing in the locality have been there for a long time or were brought from other places?
3. Are there any plants that are no longer found in the locality?
4. Which kind of plants should we be growing more to support biodiversity?
5. Is there any plant that we should not grow, as it harms biodiversity?
6. Do you have any tips for us, as we start documenting our biodiversity register?



What do I have to do?

You are now ready to start creating your biodiversity register. The first step is identification of the places to visit (you need to visit them more than once). You will also need to make a plan for your visits. Based on this plan, you have to fill the biodiversity register and then make a presentation based on your observations.

Activity 3: Identify places to survey

Decide which places you will visit to record biodiversity. For example, the area (i) around school, (ii) around water bodies, (iii) near your home, (iv) around farms/parks/gardens/nursery, (v) near a religious place, and (vi) near a market (Figure 2.3).



Figure 2.3 (a): Pond



Figure 2.3 (b): Forest



Figure 2.3 (c): Farm



Figure 2.3 (d): Park

Figure 2.3: Places for observing biodiversity: ponds, forests, farms, parks (clockwise)

You should be able to reach the areas quickly, so that you can easily go back in case you want to check your observations or the information you gathered.

The following questions will help you in conducting your survey systematically.

1. What types of habitats exist in your surroundings (e.g., forests, wetlands, grasslands, urban areas)?

.....

2. Have you noticed any area(s) where more plants grow, compared to other areas? Yes/No

3. What type of birds, mammals, insects, etc. have you observed in your surroundings?

.....

4. Are there any specific efforts being made to protect plants and animals in certain areas? For example, conservation of some species or permission to enter the area.

.....

.....

5. Now, which places do you plan to visit? Please write them below:

1.
2.
3.
4.
5.

Activity 4: Scheduling visits for observing biodiversity

- Consult local experts, biologists, conservationists and the like.
- Divide yourself into groups, with a maximum of 5 students in each group.
- Plan to visit the identified areas at different times of the school year so that you can observe if there are any changes during different seasons.

Make a schedule for visits and note it in table 2.2 below:

Table 2.2: Schedule for visits to fill biodiversity register

1.	4.
2.	5.
3.	6.

- Visit and explore the identified places, observing plants, insects, birds, and other living things along with necessary equipment and materials, such as binoculars magnifying lens, cameras, field guides, notebooks, etc.

Activity 5: Filling in the biodiversity register

Write your responses based on observations and discussions in tables 2.3 to 2.7 for each of the places you visit. There are many rows and columns in a biodiversity register (tables 2.3. to 2.7). Try to fill up as many as possible. You can also add more rows related to other kinds of information in discussion with your teacher and peers. You can also make new tables related to living things that are around you. For example, if you live in a big city, look for flowering and fruit trees in the colony garden, and so on (Figure 2.4 and 2.5).

While noting your observations, you should:

1. Remember to share your observations with each other. Maybe you missed something the first time you visited a place, but your friend did not. You can always go back again to check.
2. Fill in any new information each time you visit a place.
3. Take care to sketch or take photos of insects, worms, birds, plants, and animals that are new to you. This will help you identify them later by showing them to others or using an AI tool for identification.



Figure 2.4: Observing with the naked eye and a magnifying lens



Figure 2.5: Recording observations

If you still feel you cannot find any information for a specific part of a table, speak to your teacher before deciding to leave it blank. You are now ready to create your biodiversity register.

I. Observation of biodiversity in crop plants

1. Date of observation:
2. Location:
3. Habitat type:
4. Weather condition:
5. Observations:

Table 2.3: Description of Crops

S.No.	Description	1 (example)	2	3	4	5
1.	Crop name	Onion				
2.	Local name	<i>Kanda</i> in Marathi, <i>Vengayam</i> in Tamil, <i>Pyaz</i> in Hindi				
3.	Scientific name	<i>Allium cepa</i>				
4.	Variety name	Pachaganga				
5.	Planting method	Direct seeding/ bulbs/ transplants				
6.	Special features, like cropping and harvesting season	Onion can be planted and harvested in different seasons				
7.	Uses	Eaten raw or after cooking				
8.	Sketch/ photograph					

II. Observation of biodiversity in fruit plants

1. Date of observation:
2. Location:
3. Habitat type:
4. Weather condition:
5. Observations:

Table 2.4: Description of fruit plants

S.No.	Description	1 (example)	2	3	4	5
1.	Plant name	Mango				
2.	Local name	Mango (Amba)				
3.	Scientific name	<i>Mangifera indica</i>				
4.	Variety name	Alphonso				
5.	Planting method	Grafting or seeding				
6.	Special features, like fruiting season and aroma	Fruiting season-summer. Distinct intense and pleasant aroma.				
7.	Uses	Eaten raw or after making fruit pulp or juice.				
8.	Sketch/ photograph					

Note: Alphonso mangoes have been awarded the Geographical Indication (GI) tag which authenticates their origin from specific regions in Maharashtra, particularly Ratnagiri and Sindhudurg mangos.

III. Observation of biodiversity in fodder plants

1. Date of observation:
2. Location:
3. Habitat type:
4. Weather condition:
5. Observations:

Table 2.5: Description of fodder plants

S.No.	Description	1 (example)	2	3	4	5
1.	Plant name	Napier grass/ Elephant grass				
2.	Local name	<i>Hatti govat</i> (in Marathi)				
3.	Scientific name	<i>Pennisetum purpureum</i>				

4.	Variety name	Pusa giant				
5	Planting method	Cuttings of stem or splits				
6	Special features, like sowing time	Sowing time- February to March				
7	Uses	Used as forage for livestock. Habitat and shelter for wildlife				
8	Sketch/photograph					

IV. Observation of biodiversity in weed plants

1. Date of observation:
2. Location:
3. Habitat type:
4. Weather condition:
5. Observations:

Table 2.6: Description of weed plants

S.No.	Description	1 (example)	2	3	4	5
1.	Plant name	Bermuda grass				
2.	Local name	<i>Haral</i> (in Marathi)				
3.	Scientific name	<i>Cynodon dactylon</i>				
4.	Variety name	Pusa giant				
5.	Found in crops as a weed	Example- sugarcane, cotton, grassland, and fruit tree orchards.				
6.	Special features, if any	Highly tolerant to heat and drought. It provides habitat and food for various insects and wildlife species.				
7.	Uses	Used in playgrounds, sports fields, and high-traffic areas.				
8.	Sketch/photograph					

V. Observation of biodiversity in pests

1. Date of observation:
2. Location:
3. Habitat type:
4. Weather condition:
5. Observations:

Table 2.7: Description of pests

S.No.	Description	1 (example)	2	3	4	5
1.	Plant name	Potato				
2.	Local name	<i>Aloo</i> (in Hindi)				
3.	Scientific name	<i>Solanum tuberosum</i>				
4.	Pest name	Aphid (insect)				
5.	Scientific name of pest	<i>Myzus persicae</i> (green peach aphid) <i>Aphis gossypii</i> (cotton aphid)				
6.	Habitat	Aphids are commonly found on the undersides of leaves, as well as on tender shoots and buds of plants.				
7.	Special features, if any	Can be found as winged and wingless forms.				
8.	Time/Season of attack	After winter, as the temperature start rising				
9.	Sketch/ photograph					



Did you know?

You can visit the website of ‘Season Watch’ to register a tree in your neighbourhood and upload photographs every week. You can also track trees in other areas.

Can you find any tree similar to those in your neighbourhood in Season Watch?

Did you get additional information about them?

Activity 6: Identifying ‘unknown’

If there is any missing information or any additional information you may need to complete the tables from 2.3 to 2.7. You can ask an expert or a knowledgeable person in the community. You can use an AI tool or school library for getting information (Figure 2.6).



Figure 2.6: Use multiple sources of information to find the information you need



Using AI tools to collect more information about plants/crops/weeds/pests

Google Lens is an image recognition technology that uses something called machine learning and OCR (Optical Character Recognition) to analyse and provide information about objects, text, landmarks, and so on captured by a device’s camera. It can identify objects, read text, translate languages, scan barcodes and Quick Response (QR) codes, and integrate with various Google services. You can access Google Lens through the Google Photos

app or as a standalone app, and pointing the camera at objects, you can get relevant information or even perform tasks like translation and web searches.

Google Lens analyses any image and provides information. You can use Google Lens to identify scientific names, diseases, and other useful information about plants/crops/weeds insects, and pests using photos. If you have not taken the photos, you can capture them using Google Lens itself.

1. Download and open the Google Lens app on the smartphone.
2. Locate the Google Lens icon in the search bar and tap on it. This activates Google Lens.
3. Point your camera at the plant/insect/image you want to identify and tap the shutter button to search.

You can now add the missing information to the biodiversity register.

Activity 7: Presentation of biodiversity register

Make a presentation on the biodiversity in each of the places you visited by using the information you have gathered. You can create charts, diagrams, models or whatever else you think of.

Remember, the presentation will be based only on your observations and the information you have gathered. Highlight that there can be many variations in places and among living things. That is what biodiversity is all about.

Your presentation can be in two parts:

Part 1: Prepare a summary of the information you have gathered

Right now, the information you have gathered from visits made at different times, is in different tables. Imagine you have to explain the biodiversity around yourself to a visitor. Combine the information from all the tables to create a summary for this visitor.

Some guiding questions are given below. Please think of other questions and different ways to summarise your observations. You may include examples to support your reply to the questions:

1. What are the different plants that grow in the areas around you?

2. Which plants grow in all seasons and which are seasonal?
3. Can all crops and fruits be harvested in the same season?
4. Do all plants flower in the same season?
5. Are the plants useful for us? If yes, how?
6. Is the same fodder available throughout the year or only during some seasons?
7. Are all plants affected by weeds?
8. Are some weeds useful? Please name some weeds and describe their use.
9. Are all plants affected by some sort of pests?
10. Are plants affected by some pests more in some seasons than others?
11. What information did you gather from people in the community (e.g., use of plants as medicine, as fodder, sacred plants, etc.)?

In this way, you can provide a full picture to the visitor.

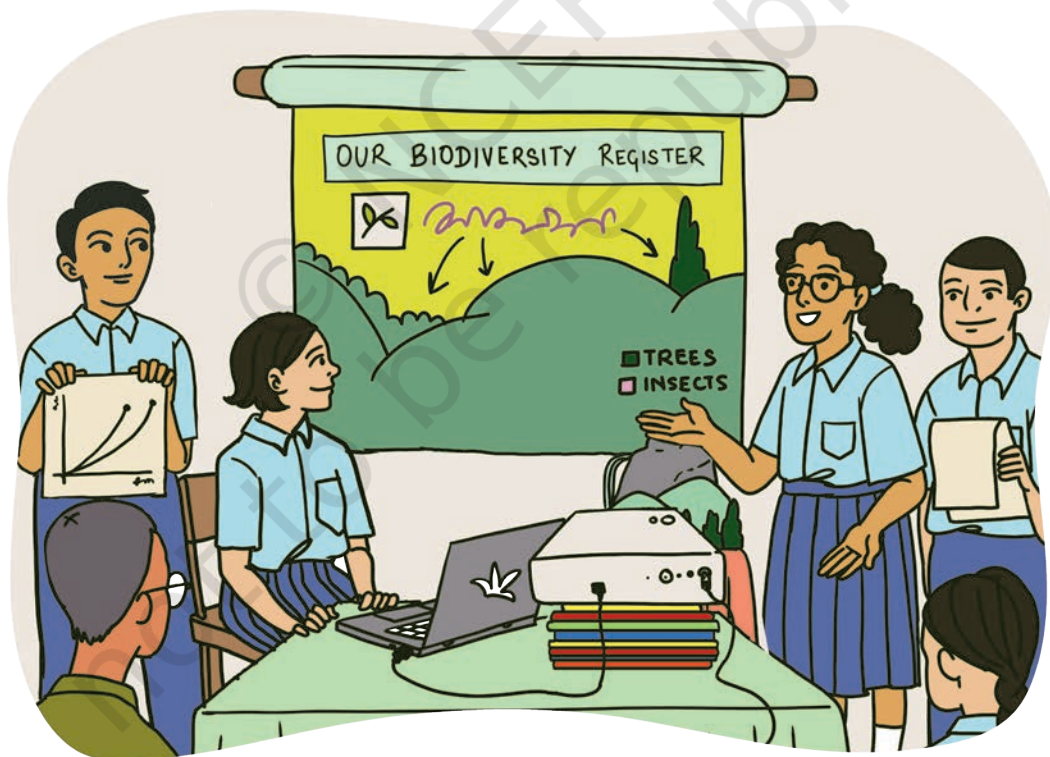


Figure 2.7: *Making a presentation on biodiversity register*

Part 2: Go beyond the information you have gathered

Now think of the ways in which you can present the information you have gathered for a deeper understanding about the biodiversity around yourself.

Your presentation will be a mix of diagrams and some explanations. Think of interesting ways to prepare it (Figure 2.7).

Some guiding questions are given below, but try and think of others.

1. Did you observe more living things in one place as compared to other?
2. How many varieties of plants and pests did you see in the places you visited?
3. Did you see the same kind of insects, pests, or worms in more than one of the places you visited?
4. Did you use any AI tool for this activity? If yes, which ones and how?
5. Did you use any other sources to gather information?

Include any conclusion or reflection that you would like to share through your presentation.



What did I learn from others?

Interaction with experts

You discussed with experts all the measures that can be taken to preserve biodiversity in the area. What do you think will work?

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.....

Interaction with members of the community

You might have spoken to a farmer in a rural area, a nursery worker or a gardener in the city or a community member in the rural or urban area.

Write about how the biodiversity changed over the years in the area, let us say in the last 10 or 20 years.

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.....



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 number of periods 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.

You might have gone to the same place more than once as per your schedule. It is also possible that you went back multiple times to gather information, try and calculate the total number of periods spent on each activity.

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





Did you know?

India is home to several Biodiversity Heritage Sites (BHS), which are areas recognised for their unique biodiversity. The purpose of these sites is to protect biodiversity in the area and recognise their importance in ensuring traditional cultural practices related to the natural environment.

The following are some notable Biodiversity Heritage Sites in India:

- The Nallur Tamarind Grove in Karnataka has tamarind trees that are over 400 years old.
- Gogabeel in Bihar is a paradise for bird lovers with over 90 species of birds, including many that travel from faraway places like Central Asia.
- Tonglu in West Bengal has plants that you would not find anywhere else in the world.
- Ameenpur Lake in Hyderabad is home to over 200 bird species, even though it is in the middle of a busy city.
- Majuli in Assam is the biggest river island on the planet and has monasteries called ‘*Satras*’.
- The Myristica swamps in Kerala are home to ancient nutmeg (*Jayafala*) trees, which is a spice we use in cooking.
- The Kali Tiger Reserve in Karnataka is a safe heaven for Bengal tigers and other big animals like elephants.
- The Chilkigarh Kanak Durga Sacred Grove in West Bengal has special plants used in traditional medicine. This grove is protected by the local people.
- In Ziro Valley, Arunachal Pradesh, people grow rice and fish together in a unique way.
- The Mawphlang Sacred Grove in Meghalaya is protected by local tribes and is full of rare plants and medicinal herbs.



What else can I do?

You can continue your observations of biodiversity at your home and other places you visited. Document your observations and create a nature journal or digital scrapbook.

Please note that you can observe birds, like kites, and animals, like mongoose in the city as well. Some scientists have started referring to these animals as ‘urban wildlife’.

Observe the birds that visit your home. Note down how they look and how they behave. Find out their local name and scientific name, and as much as you can discover about the birds.

Ask family members and elders in the community about the birds and animals that they could see when they were young.



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. What according to you is the importance of the biodiversity register?
5. What other jobs are related to the project? Look around, speak to people and write your answer. A few examples of jobs related to the activity that you did are forest officer, scientist, and conservationist.

TAKE CARE OF YOUR ENVIRONMENT AND PLANET EARTH

ENVIRONMENT	GREEN ENERGY	PLANTS	PLANET
			
LIVING AND NON-LIVING THINGS	NATURAL RESOURCES	FOOD AND HABITAT	OUR HOME
			
PROTECT	GENERATE	GROW	SAVE
			

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. 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

Maker Skills



0685CH03

This project will help you learn about simple machines that make work easier. You will develop skills to create toys from waste using simple machines and then explore the various simple machines used in a bicycle. You will also learn how to maintain and repair these machines to keep your bicycle in a good working condition.

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

Learn about
simple machines

Learn to
maintain
and repair a
bicycle

Learn about
simple
machines in
a bicycle

Make toys
from waste
using simple
machines



Figure 3.1: Making things out of waste materials using tools

There are many things around us which are complex machine, such as bicycles, toys, buses, cycle rickshaws and autorickshaws. We use doorknobs, and open and close doors and windows without thinking. But how do these things work? All these things have simple machines in them. For example, wheel and axle and pulleys are simple machines.

Simple machines help make our work easier. They help us to do things beyond our capacity, which are difficult or simply not possible. For example, can we lift heavy loads or break wood with our hands? A cart with wheels and axle can move very heavy objects with less force. Pulleys can lift heavy objects.

Do you know that even a big bus is actually made up of many interconnected small machines? And that the simple machines used in a bus are also used in bicycles and toys, and doors and windows? Yes! It is true that they are made up of simple machines.

Look at Figure 3.2 below and discuss what else simple machines can do.



Figure 3.2: Simple machines around us

In this project, we will first learn how to use simple machines to make simple toys. This will help us understand how these machines work. We will then identify the simple machines in a bicycle and how to keep them functioning well.

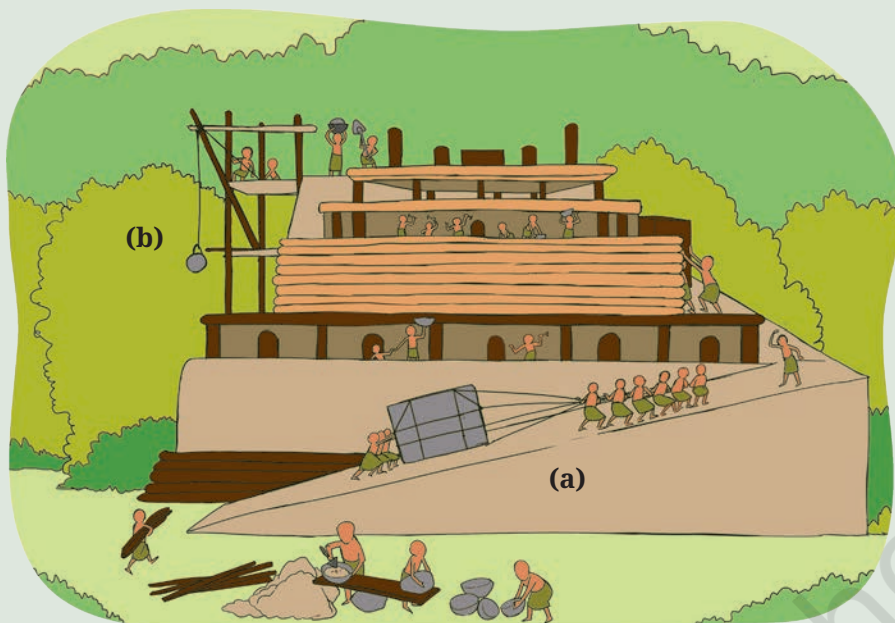


Figure 3.3: Simple machines have been in use since ages. Ancient people used inclined plane (Figure 3.3a), and pulley (Figure 3.3b) to transport heavy materials.

Ancient architecture

Huge stone temples in ancient India were constructed using a combination of skilled labour, simple tools and machines and clever engineering techniques. The process often involved quarrying and transporting large stone blocks, carving and shaping them, and then assembling them into the desired structure. Workers used basic tools, like chisels and hammers to carve the stones. They also used various innovative methods for lifting and placing the heavy stones, such as using inclined planes, levers and pulleys. These are all simple machines that we use till today (Figure 3.3).



What will I be able to do?

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

1. Make toys from various materials using simple machines. You can make catapult, robotic arms, elastic band propeller boat, balloon car, rubber band car, and windmill;

2. Identify the various simple machines that make up a complex machine, like a bicycle;
3. Identify the main parts of a bicycle and their functions. and
4. Identify common problems with bicycles, such as flat tyres, and misaligned brakes and perform necessary maintenance and repair.



What will I need?

For making toys from trash using simple machines

- **Materials required:** Cardboard, plastic pipe, empty plastic bottles, cardboard, plastic spoon, drinking straws, plastic bottle caps, paper, ice cream sticks, thread, rubber bands, glue, tape, glue gun, cellophane tape, clothes clips, all pin, balloon, colour box, chopsticks (these could be of wood, plastic or metal).
- **Tools required:** Scissors, metre scale, and cutter.

For learning about simple machines in a bicycle

You will need atleast 5–6 bicycles.

Materials required: Oil/grease.

Tools required: Spanner set, wrenches, chain brush, tyre levers and air pump.

You will also have to visit a bicycle shop or request someone who can repair a bicycle to come to the school to teach you.



How do I keep myself and others safe?

- Be careful with cutting tools and other sharp edges.
- Ensure that you clean the area after you finish an activity, and store materials and tools as per the instructions of your teacher.
- While using the toys, ensure that you do not hurt yourself or others.



What do I need to know before I start?

Can you identify simple machines in your surroundings? Look around, see what you can find.

Activity 1: Simple machines in our surroundings

Identify everything around you that helps you do something. Find out if it is a simple machine or if it is made up of simple machines.

You can ask your teacher or your friends and family for help. Write your observations in table 3.1.

Table 3.1: Simple machines around us

S.No.	Name of simple machine	How is it used?
1.	Knife	Used for cutting vegetables and fruits
2.	Vegetable peeler	Used for removing peels of fruits and vegetables
3.		
4.		
5.		
6.		



What do I have to do?

First, you will make toys using simple machines and then identify the simple machines in a bicycle. Next, you will learn how to maintain a bicycle.

Learning on the Internet

You can look up the steps to make the toys given in the Activity Book by searching on the Internet with the search keywords: 'DIY + XX (*name of toy*)' (DIY means 'Do It Yourself').

If you want to see videos, you can add the word '*video*' to the search keywords.

Internet safety

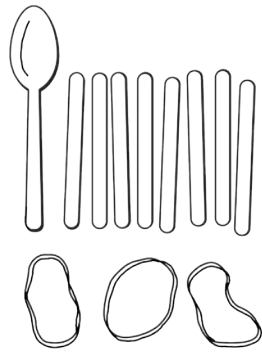
Ask your teacher for help while using the Internet, be careful not to upload or download anything, and do not share personal information anywhere.

Activity 2: Using levers to make toys

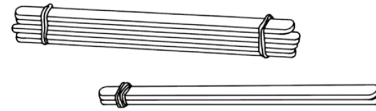
A lever is a fixed bar or handle that moves around a fixed point, called the *hinge/fulcrum*. A simple example of using a lever is when you use a spoon to open the lid of a tin. The tip of the spoon is fixed under the lid, and you apply force at the other end. Another example is that of a seesaw in the playground.

Some toys you can make using a lever are catapult, lazy tongs and robotic arm scissors. The simple catapult you will make has a single lever while the lazy tongs and robotic arms have multiple levers. Figures 3.4 and 3.5 show the steps for making a catapult and robotic arm, respectively, using waste materials.

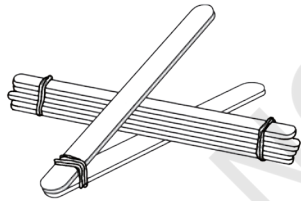
Working Model of Catapult



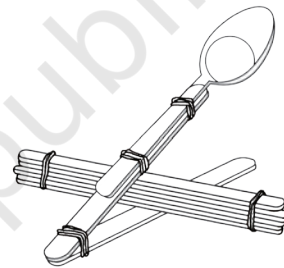
Materials : You will need ice cream sticks, rubber bands and an ice cream spoon.



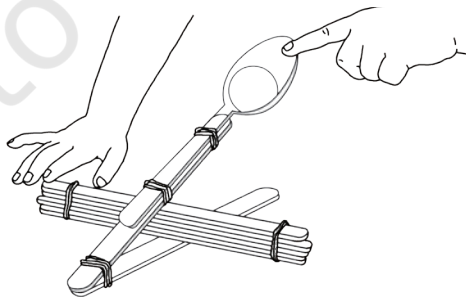
Step 1 : Stack about 5–6 ice cream sticks one on top of the other and hold them together with rubber bands — one on each end. Take two other ice cream sticks and hold them together at one end with a rubber band.



Step 2 : Place the two sets of ice cream sticks, as indicated in the figure.



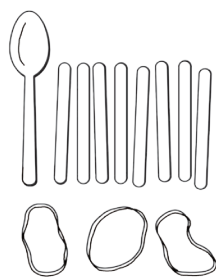
Step 3 : Using a rubber band, attach the ice cream spoon, as shown in the figure.



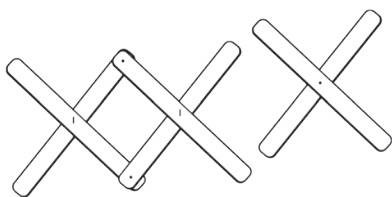
Your catapult is now ready.

Figure 3.4: Steps for making a catapult using icecream sticks and spoon

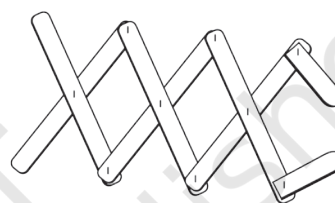
Working Model of Robotic Arm



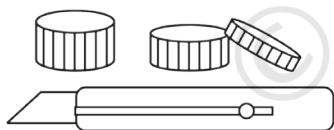
Materials : You will need icecream sticks, glue, old bottle caps, toothpicks, and a cutter.



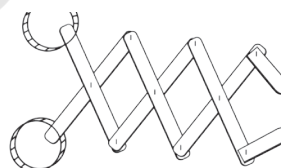
Step 1 : Pierce the ice cream sticks in the centre. Break a toothpick into small pieces and join the ice cream sticks by passing this piece through the holes. Remember to add glue where the sticks are joined.



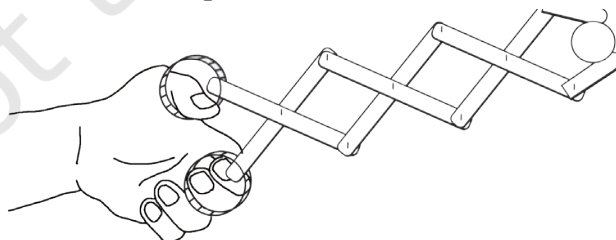
Step 2 : Join a few more ice cream sticks just like in Step 1. There needs to be a free movement of the ice cream sticks.



Step 3 : Cut out the centres of the bottle caps with the cutter so that you end up with two circular shapes.



Step 4 : Glue the bottle caps to the ends of the first set of ice cream sticks.



Your robotic arm is ready!

Figure 3.5: Steps for making a robotic arm using icecream sticks, bottle caps and toothpicks

1. Draw a sketch of the toy, giving accurate measurements where different parts are connected. You can paste a photograph of the toy in the space given below:



2. Write down instructions for someone who is using robotic arm for the first time.

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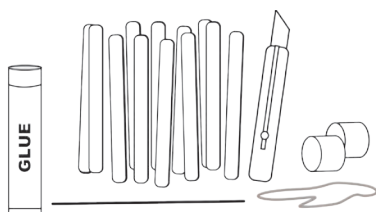
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Activity 3: Using a propeller to make toys

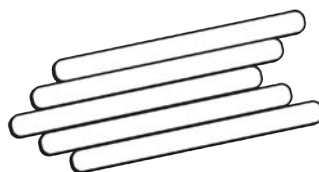
A propeller is a wheel with blades. As the wheel moves, the blades help movement by pushing through water or air.

You can make an elastic band boat using a propeller. Figure 3.6 shows the steps for making an elastic band boat using waste materials.

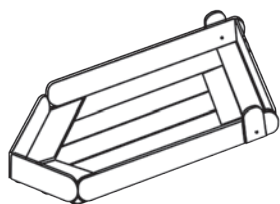
Working Model of Propeller Boat



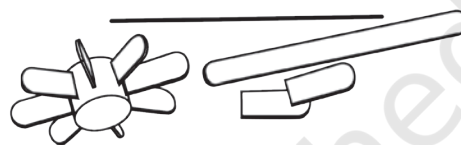
Materials : You will need ice cream sticks, glue, straw, bottle caps and rubber bands.



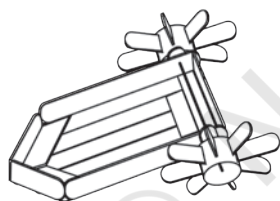
Step 1 : Paste ice cream sticks in the shape as indicated in the figure.



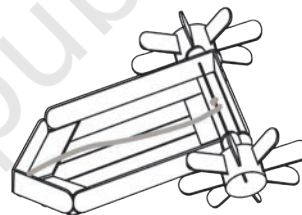
Step 2 : Paste additional ice cream sticks to make a boat shape. Make holes as indicated by the dots in the figure.



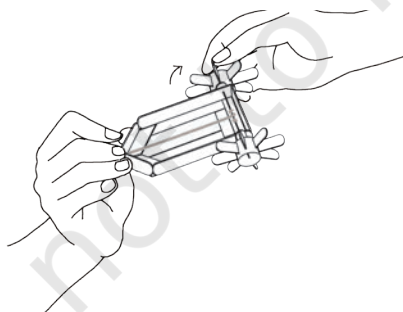
Step 3 : Make slits in the bottle caps, cut and paste ice cream sticks to the sides to make a propeller.



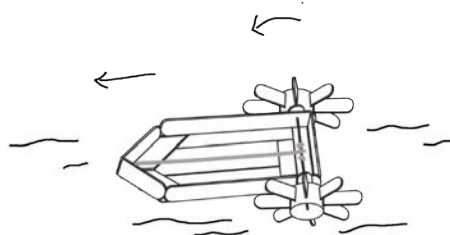
Step 4 : Pass a straw through the caps and the holes in the side of the boat as indicated in the figure.



Step 5 : Paste a rubber band at the tip of the boat and to the middle of the straw.



Step 6: Wind up the rubber band using the paddle wheels and place in water.



Your boat is ready.

Figure 3.6: Steps for making a propeller boat

3. Draw a sketch of the toy giving accurate measurements where different parts are connected. You can paste a photograph of the toy in the space given below.



4. Write down instructions for someone who is using propeller boat for the first time.

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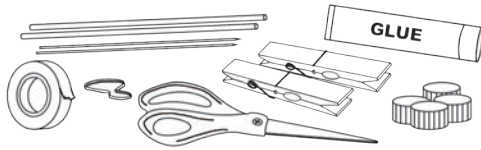
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Activity 4: Using a wheel and axle to make toys

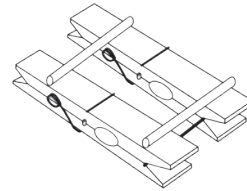
Wheel and axle is a simple machine that is made up of wheels held together by a rod so that they move together. In this way, if you have two wheels and axles, they balance each other and can move loads of any sort of shape placed above them. Car wheels are an example of wheel and axle.

Some toys, you can make using two sets of wheel and axle are rubber band car and air balloon car. Figure 3.7 shows the steps for making a rubber band car. Follow the steps to make your rubber band car.

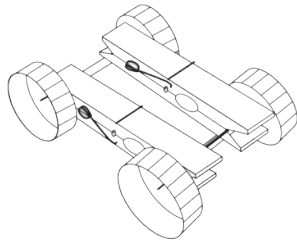
Rubber Band Car



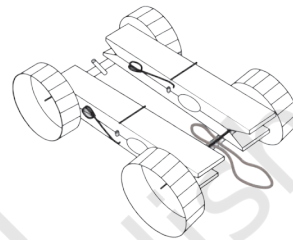
Materials : You will need clothes clips, straws, chopsticks/toothpick, bottle caps, cellophane tape, scissors, rubber bands and glue.



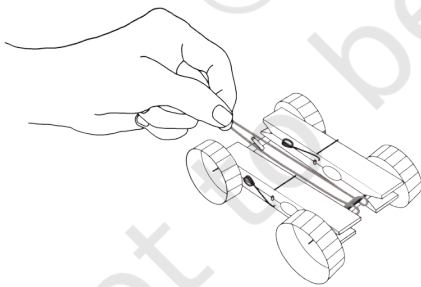
Step 1 : First cut a straw of length so that you can join the two clothes clips slightly far apart.



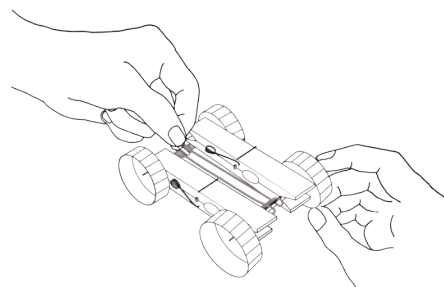
Step 2 : Make holes in the exact centres of four bottle caps and attach them to a toothpick/piece of wooden skewer to act as wheels for the clothes clips. Attach one cap, pass it through the straw at each end and then attach the other cap. Remember to use glue to hold the bottle cap and toothpick/part of wooden skewer together.



Step 3 : Attach a small part of a toothpick/chopsticks between one set of wheels. You will have to glue it to the straw. This is the front of the car. On the other end, loop a rubber band over the straw. This is the back of the car.



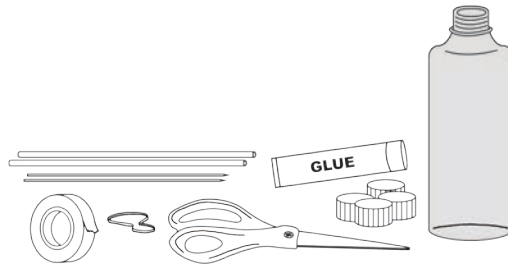
Step 4 : Pass the other end of the rubber band over the small piece between the wheels at the back of the car.



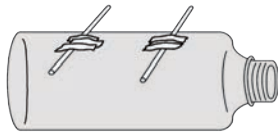
Step 5 : Wind up the rubber band at the back of the car and release it on stable ground. Your car is ready to race.

Figure 3.7: Steps for making a rubber band car

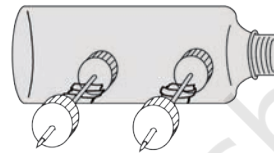
Air Balloon Car



Materials : You will need flexible straws, an old plastic bottle, old bottle caps, cellophane tape, a rubber band, chopsticks, balloon and glue.



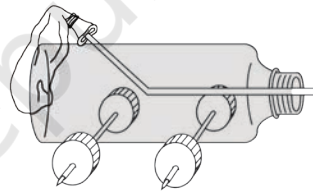
Step 1 : Tape the chopsticks onto the bottle as shown in the figure.



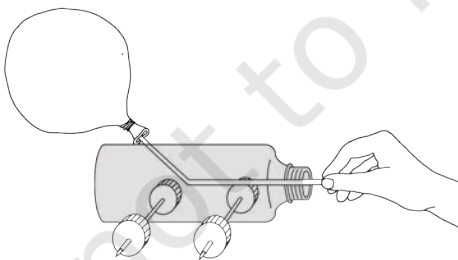
Step 2 : Make holes in the bottle caps and attach them to the chopsticks as indicated in the figure. Remember to use glue to ensure they stay attached.



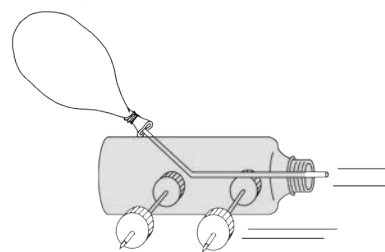
Step 3 : Fix the balloon to one end of the straw with a rubber band.



Step 4 : Make a hole in the bottle and insert the straw as indicated in the figure.



Working model 1 : Blow the balloon from the open end of the straw and then press your finger to the straw. Place it on an even surface.



Working model 2 : Release your finger. Your balloon car is ready to move.

Figure 3.8 : Steps for making an air balloon car

1. Paste a photograph of the toy that you created in the space given below.



2. Write down instructions for someone who is using air balloon car for the first time.

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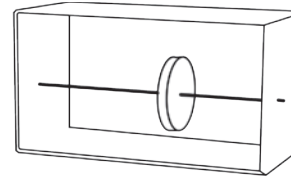
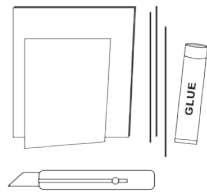
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Activity 5: Using more than one simple machine to make toys

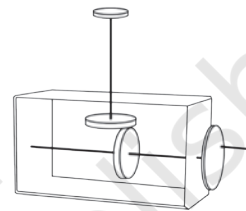
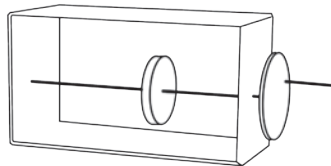
A windmill is a machine that generates energy from wind. A real windmill is made up of many parts. But your working model of windmill can be made by using a combination of simple machines like propeller and wheel and axle, along with other parts to make these machines work together. Figure 3.9 shows the steps for making a windmill using various materials.

Windmill



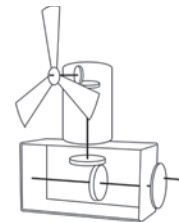
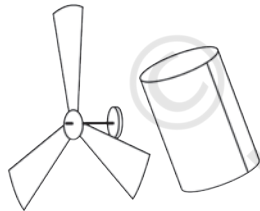
Materials : You will need pieces of cardboard, chart paper, straws, glue and a cutter.

Step 1 : Make a cardboard box as shown in the figure. Make holes in the centre of the sides and pass the straw through the holes with a circular piece of cardboard passing through it.



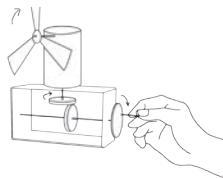
Step 2 : Attach another circular piece of cardboard of the same size to the other end of the straw. Stick a small piece of straw to the cardboard circle outside the box.

Step 3 : Repeat step 2 for another side as indicated in the figure except that now you must place the circular pieces of cardboard at the ends of the straw.



Step 4 : Make a cylinder with chart paper as shown. Make a fan with a short piece of straw, circular pieces of cardboard and blades cut out of chart paper.

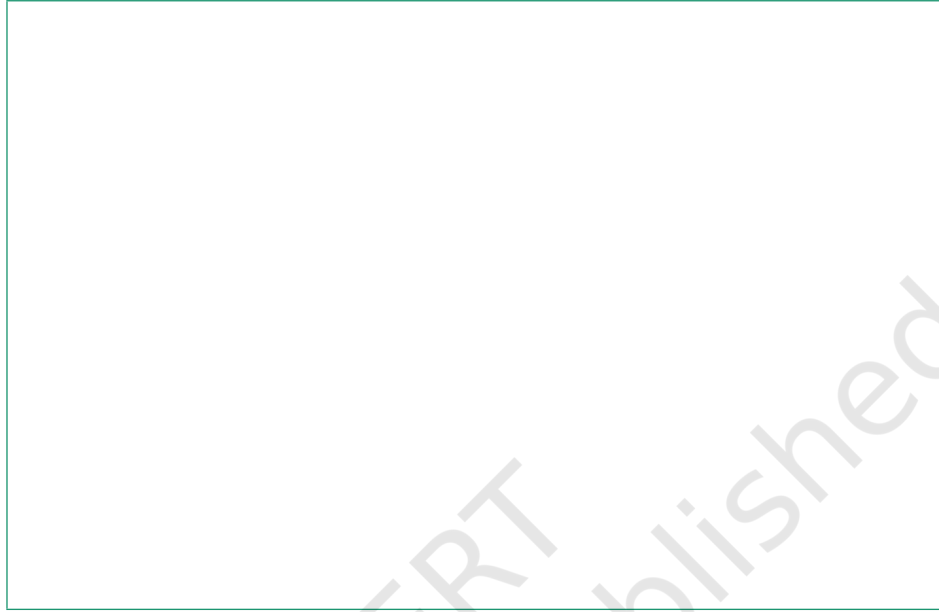
Step 5 : Assemble the pieces as shown in the figure.



You now have a working windmill.

Figure 3.9: Steps for making a working model of a windmill

1. Draw a sketch of the windmill, with accurate measurements of different parts. You can paste a photograph of the toy in the space given below.



2. Write down instructions for someone who is using the working model of windmill for the first time.

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Using ChatGPT for ideas

ChatGPT is an AI ‘chatbot’, a smart Intelligent Assistant. This AI tool uses information available on the Internet to answer your questions.

Ask ChatGPT for ideas on using waste material to make fun things. You may be surprised by what it comes up with!

Activity 6: Simple machines in a bicycle

So far, you have learnt about different forms of simple machines. You will now explore how simple machines are used to create a bigger machine.

A bicycle is made using different simple machines, such as wheels, wheels and axles, levers and pulleys (Figure 3.10). In this activity, you will learn about the parts of a bicycle and how to keep them functioning.

Bicycles have many moving parts that work together to accomplish a task (Table 3.2). All the parts (wheels, gears, pedal, etc.) of a bicycle work together to transform the effort of a rider into motion.



Figure 3.10: Parts of a bicycle

Table 3.2: Parts of a bicycle and their function

Part	Function
Brake Pads	They are placed around wheels and they 'grab' them to resist their motion.
Brakes	They slow down or stop the bicycle. The different types of brakes are rim brakes, disc brakes and drum brakes.
Chain	It transfers power to the rear wheel.

Chain rings, sprocket	They guide the chain and transmit power from pedal to chain.
Frame	This is the main structure that supports the rider and connects all the parts.
Handlebars	They provide a place to hold and steer the bicycle.
Hubs	These are the central part of the wheel. They allow the wheel to spin around the axle.
Kickstand	It enables the bicycle to stand upright.
Cycle light	It improves visibility and safety.
Pedals	These are the point of contact for the rider's feet to apply force.
Rims	They support the tyres, and provide braking surface (rim brakes).
Saddle	This is where the rider sits.
Seatpost	This connects the saddle to the frame, usually of adjustable height.
Spokes	They connect the rim to the hub and provide strength and stability.
Tyres	They provide traction and cushioning.

Some common problems and solutions related to bicycles are:

- 1. Rusting of parts:** You can clean the parts using sandpaper and apply oil or paint, as appropriate.
- 2. Loose parts:** You can fix them using the appropriate tools. Ask your teacher which tools are used and write them here.

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- 3. Wheels not moving freely:** Oiling of moving parts will help.

- 4. Flat tyres:** Air pressure in tyres should be checked regularly to avoid flat tyres.

Now let us look at each part of the bicycle more closely. As mentioned earlier, the bicycle is made up of different kinds of simple machines. To ensure that it keeps running smoothly, you need to check its parts and maintain them regularly (Figure 3.11). If needed, you can seek help from experts in the bicycle repair shop. Fill table 3.3 with the help of your peers and teacher.



Figure 3.11: Working on keeping a bicycle in good working condition

Table 3.3: Fixing parts of a bicycle

Part of bicycle	Function of part	Is the part functioning well? (Yes/No)	Did you do anything to fix the part? (Yes/No)
Brake			
Chain			
Spokes			
Kickstand			
Handlebars			
Tyre			

Activity 7: Visit to a bicycle repair shop

You must visit a bicycle repair shop to learn from the experts. You can also request your teacher to invite a bicycle mechanic to the school to teach you all about maintaining and repairing a bicycle.

Some questions you can ask the mechanic are given below:

1. Is there anything that should be regularly checked before riding?

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2. Can the saddle height be adjusted? How?

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3. What is the best way to clean a bicycle?

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4. How do you know that the tyres need to be inflated?

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5. How is a punctured tyre repaired?

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6. How often should a bicycle chain be oiled?

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7. How can the squeaking brakes of a bicycle be fixed?

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8. How are the wheels of a bicycle aligned?

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Activity 8: Organise an exhibition of the toys

Planning an exhibition of toys made by you and your peers in a school can be an exciting and enriching experience for all students and visitors. Take the help of your teacher to plan and organise the exhibition. The following are some tips to guide you to organise such an event.

1. Define the purpose of the exhibition. Is it to raise awareness about the toys, showcase creativity, or teach how to make toys using waste materials? For example, during the exhibition, you can demonstrate the skills of making toys.

2. Decide on a theme for the exhibition (e.g., eco-friendly toys, historical toys, and futuristic toys).
3. Ensure that the toys made by you all align with the chosen theme.
4. Decide on the exhibition space within the school.
5. Plan the layout of the exhibition, ensuring there is enough space for each toy and for visitors to move around. Decorate the venue in line with the theme to create an engaging atmosphere.
6. Send invitations to parents, local artists, and community members.
7. Arrange the toys attractively, ensuring each has a label with the creator's name and a brief description. Ensure all toys are safe to handle and the venue is child-friendly.
8. Have volunteers supervise the exhibition to assist visitors and manage any issues.
9. Collect feedback from visitors, students, and teachers to understand what went well and what could be improved.
10. Take photos and videos to document the event and share highlights through the school's newsletter or website.



What did I learn from others?

Name any three things you learnt from your friends while making toys or working models.

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Name any three things you learnt from the expert.

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What did I do and how long did it take?

You translate your ideas into actions.

It is important to understand how much time is required for an activity to be completed. Calculate the approximate number of periods 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?

Make a chain reaction machine using different kinds of simple machines made from trash.

You can search on the Internet for ideas using the following search keywords: Simple machine + Chain reaction toy.



Think and Answer

1. What did you enjoy doing?
2. What were the challenges you faced?
3. What would you like to do differently?
4. Design a toy that you can use to help a peer understand a concept related to Mathematics or Science.

5. Can you estimate the number of times the wheel will rotate when covering a distance of 10 metres?

Hint: You can either use the circumference of the rim of the bicycle tyre or observe the movement of the bicycle tyre.

6. Can using a bicycle make a difference to our health and the environment? If yes, how?
7. What jobs are related to the project? Look around, speak to people and write your answer. A few examples of jobs related to the work, you just did, are bicycle mechanic, toy maker, and engineer.

Project 4

Animation and Games



0685CH04

This project will help you learn how to create animations and games on your own using a visual programming language.

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

Learn how we
communicate
with devices

Make a model
of an offline
game

Learn to use
Scratch

Design, try out
and improve
an online game

Make your own
animation and
game



Figure 4.1: *Learn to communicate with computer*

You may have played games on a smartphone or a computer (Figure 4.1), with figures that move and respond to your inputs. You may also have seen ‘animation’ films and ‘animojis’ (animated emojis) on your smartphone. You might have wondered how these games, animojis or videos of moving figures (both humans and animals) and objects are made. People called ‘programmers’ use something called ‘coding’ to do this. This project will help you create your own online games and animations.

Designing games and animations require a blend of creativity and technology. It all begins with an idea. Designers then develop

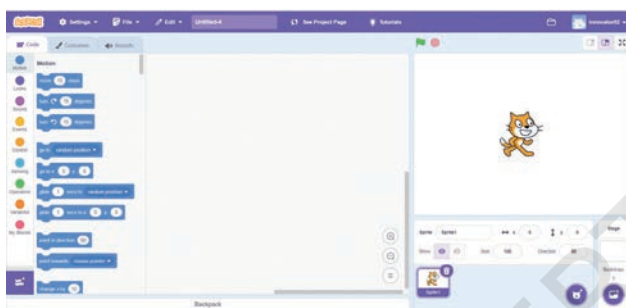


Figure 4.2: *Scratch interface*

and refine their ideas before they actually start the work. This is made possible by artists who create visual elements, and programmers who do the coding.

You can create your own animations and games using ‘Scratch’ (Figure 4.2). Just as we use different languages to communicate, programmers use programming languages to communicate with devices like smartphones, computers, tablets, smartwatches, satellite and driverless cars.

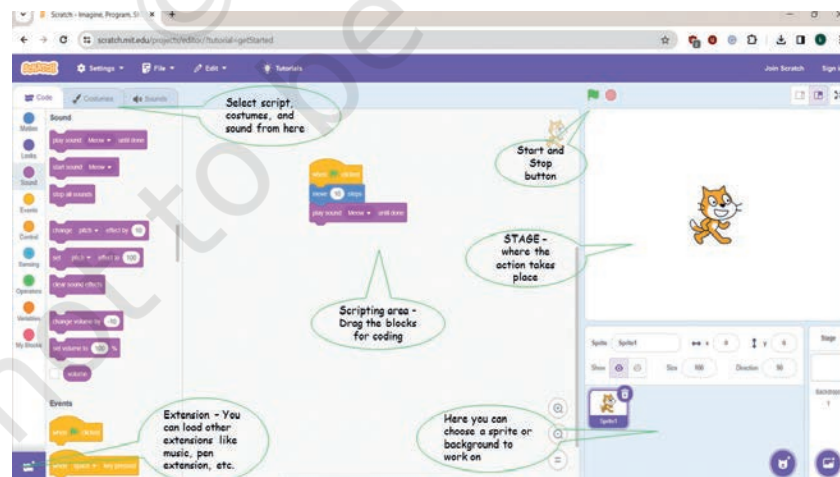


Figure 4.3: *Default Scratch window*

Scratch is easy to use. It is called a ‘visual programming language’ since you can move around ‘blocks’ instead of writing complicated programmes in languages that take time to learn. These blocks allow you ‘write’ programmes to create animated figures, design games, and create your own wallpaper (Figure 4.3).

Coding allows us to communicate with computers and smartphones. When you click on a button and the computer or smartphone responds, your click is translated into instructions in a language the machine understands. A series of instructions to computers or smartphones are called a programme.

There are many languages with which you can communicate with computers, like Javascript, Python and C++. Among these languages, there are visual programming languages in which a series of programming instructions are clubbed into ‘blocks’. It allows us to combine different blocks and create sets of instructions.



What will I be able to do?

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

1. Create a simple Scratch project with block programming; and
2. Design games and animations using Scratch.



What will I need?

To carry out this project, you will need:

- Computer or laptop with Internet connection.
- ‘Scratch’ downloaded in the computer or laptop
- Notebook
- Pen or pencil
- Loose papers
- Markers
- Cardboards



How do I keep myself and others safe?

Discuss the safety precautions, which should be taken while accessing the Internet with the teacher and your peers. Make a list of 'to do' and 'not to do'. Make sure you follow this list while working. If in doubt, ask your teacher.

Using computers for playing video games or searching for some information on the Internet is fun. As anything done in excess is not good, excess screen time is not good for your mental and physical health. Playing outside and including physical sports are good for your body and mind, so make sure you get enough of that in addition to the fun you have with smartphones and computers. So, limit your screen time as advised by your teacher and/or family members.



What do I need to know before I start?

You should be able to perform basic functions on a computer, like using the Mouse and Keyboard, checking for Internet connectivity, browsing or searching on a browser, and downloading and installing software.



What do I have to do?

Activity 1: Game design

We play many games. These games include outdoor games (e.g., Cricket, Blind Man's Buff, etc.) and indoor games (e.g., Chess, Ludo, Card Games, etc.).

The following questions are meant to help you think about the games:

1. Why do we play games?

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2. Which is your favourite game?

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3. What do you like in your favourite game?

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4. How many members can play in your favourite game?

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5. What rules are to be followed in your favourite game?

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6. Is there anything else interesting about your favourite game?

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Activity 2: Model your favourite game

Make a model of your favourite game using craft materials. For example, if you like Ludo or Snakes and Ladder, use cardboard and buttons to make the board. If you like Cricket, make a model of the cricket pitch. If you like Blind Man's Buff, make a model of the field or playground where you will play Blind Man's Buff, marking boundaries clearly (Figure 4.4).



Figure 4.4: Making a model of a game helps you think about the details of a game

Draw a sketch or paste a photograph of the model of a game in the space given below:



Activity 3: Trying out online games

You have done some activities related to games you play offline or in the real world. Now try some online games!

Play a few games on the smartphone or computer or laptop, and try out different kinds of games.

On the basis of your try outs of the online games, respond to the following questions:

1. Do all the games have rules? Yes ☐ No ☐
2. Did they all have characters, such as cartoons, Micky Mouse, etc.? Yes ☐ No ☐
3. Did the characters interact with each other in all the games? Yes ☐ No ☐
4. Was there a colour background in all the games? Yes ☐ No ☐
5. Was there music in the games? Yes ☐ No ☐
6. Did you find any game interesting and challenging? If yes, why? If not, how could it be made more interesting and challenging? Yes ☐ No ☐

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Activity 4: Preparing to make your own game with animation

You have thought about your favourite games; both offline and online. You have identified the rules, players, the interaction between these players and challenges in both online and offline games you played. Online games and a few offline games,

include music and a background that make them attractive and interesting. Now look for some interesting online games and animations created using Scratch. You can look for match the pair game (Figure 4.5).

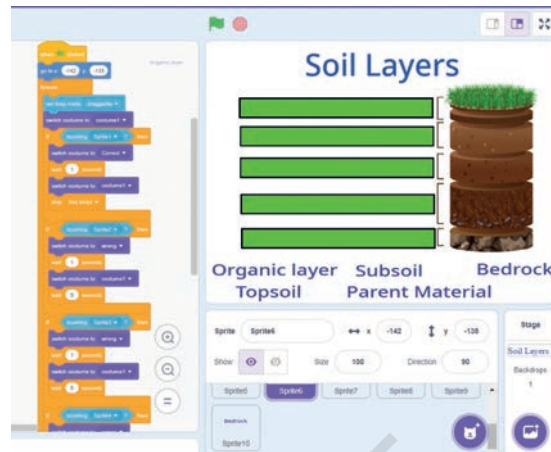


Figure 4.5: The figure shows a game to identify and match the layer of soil correctly.

You can use the following prompts (keywords for search) to find games and animations:

1. Play animations using Scratch
2. Educational Scratch games for school students
3. Scratch games for practicing math skills
4. Creative Scratch games with music and sound effects
5. Scratch games for teaching history or geography
6. Adventure games made in Scratch

Creating an account on Scratch

1. You will have to login to the Scratch website to create an account.
2. Open your Scratch account using an email address. You can use the email address of your teacher or a family member.
3. To start creating, click on the 'Create' button.

You can find tutorials for making animations and games using Scratch. Type the following keywords:

- Scratch game tutorials for beginners
- How to make a maze game on Scratch
- Interactive storytelling on Scratch
- Creating multiplayer games on Scratch

1. Did you face any difficulty in creating your account on Scratch? Yes/No If yes, how was it solved?

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You can now begin using Scratch.

Activity 5: Build characters, objects and a backdrop of your game

Try out a few things with Scratch. Figures 4.6 to 4.10 show some of the things you will see on the screen.

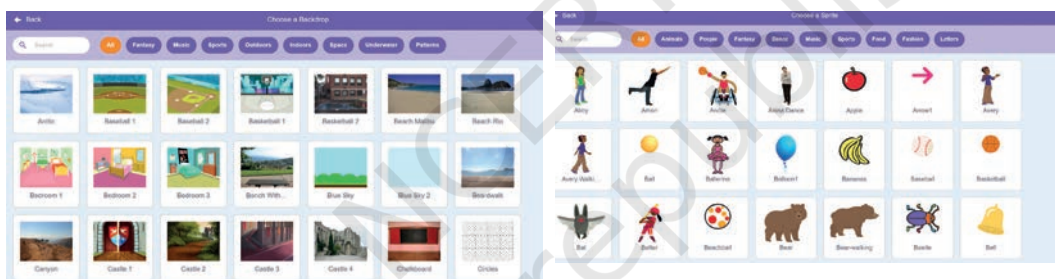


Figure 4.6: Backgrounds and Sprite on Scratch

As you begin using Scratch, keep responding to the questions given below. They will help you think about things you can do. You can look at your responses the next time you plan to create something using Scratch.

1. Were you able to select and import Sprite? Yes ☐ No ☐
2. Were you able to use the in-built Sprite or did you use some image from the Internet or a photo you had taken? Or did you use both?

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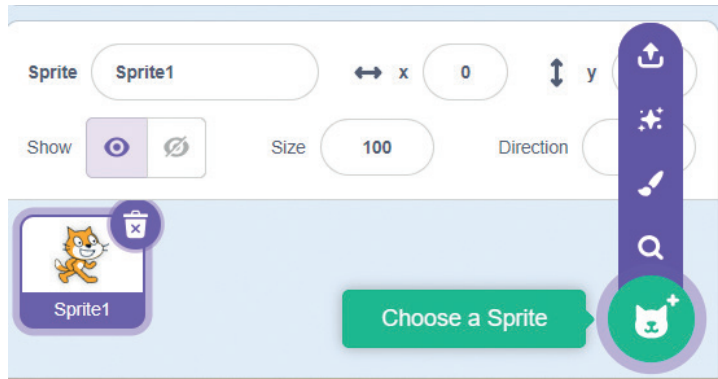


Figure 4.7: Choosing the Sprite to be loaded on to your game

3. Did you attempt creating your own Sprite by drawing?
Yes ☐ No ☐
4. Were you able to change the costumes of the chosen Sprite?
Yes ☐ No ☐
5. Were you able to identify and import objects?
Yes ☐ No ☐
6. Were you able to identify and use appropriate backdrops for the chosen Sprite?
Yes ☐ No ☐

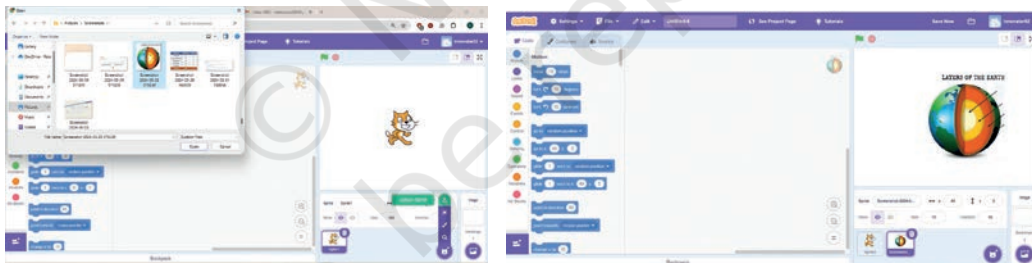


Figure 4.8: Uploading Sprite on a computer

Creating your own images using AI!

You can create your own images using an AI image generator. An AI image generator that takes a keyword, also called as 'text prompt', processes it and creates an image that best matches the description given in the text prompt.

You can do the following to generate AI images for this project:

1. **Choose an AI image generator:** You can ask your teacher and others for help.
2. **Input your ideas:** Describe what you want in simple words. For example, if you are thinking of a flying cat, say, “A cat flying in the sky.”
3. **Explore options:** Apply different styles and see how the tool reworks the images.
4. **Refine and Experiment:** If you want changes, describe them. For instance, “Make the cat smaller” or “Change the background to a forest.”
5. **Download or Save:** Download or save the image to your device.
6. You can now use it for whichever purpose you want.

Activity 6: Programming your characters and objects

Now you need to animate your Sprite (Figure 4.9).

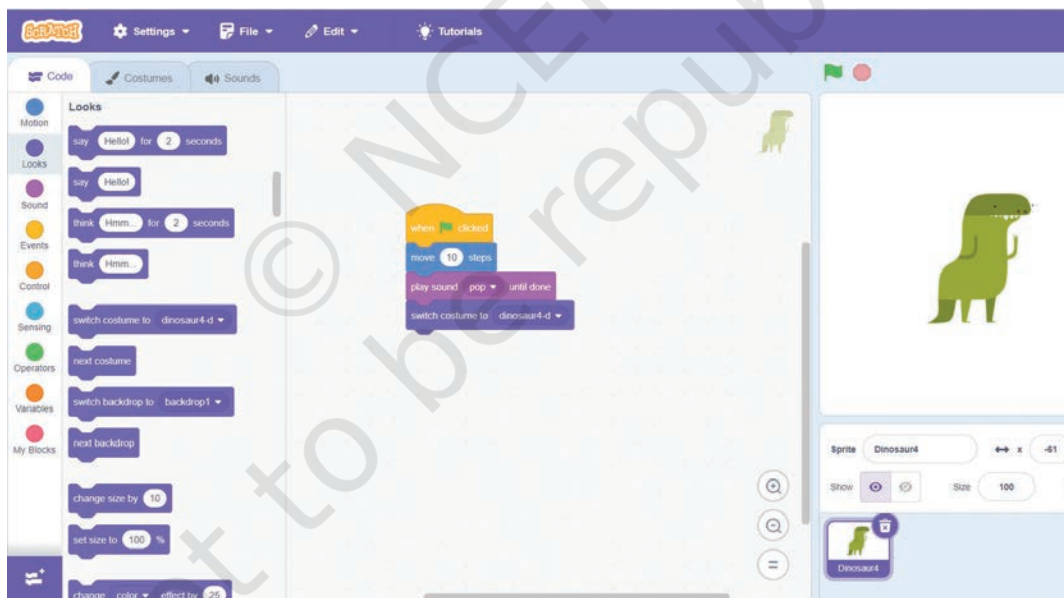


Figure 4.9: Select your Sprite, and drag the code blocks on to your window to have it follow your instructions

The following questions will help you think of what you can do and also help you maintain a record you can refer to later:

1. Were you able to use a combination of 'Motion' and 'Looks' blocks to animate your Sprite? Yes ☐ No ☐
2. Were you able to animate Sprite using 'Control' and 'Events' blocks? Yes ☐ No ☐
3. Were you able to include music in your animated block? Yes ☐ No ☐
4. Were you able to select multiple Sprite? Yes ☐ No ☐
5. Were you able to change their costume? Yes ☐ No ☐

Activity 7: Create an animated birthday card for your friend

Now make an animated birthday card for a friend, using his/her name and/or image (Figure 4.10).

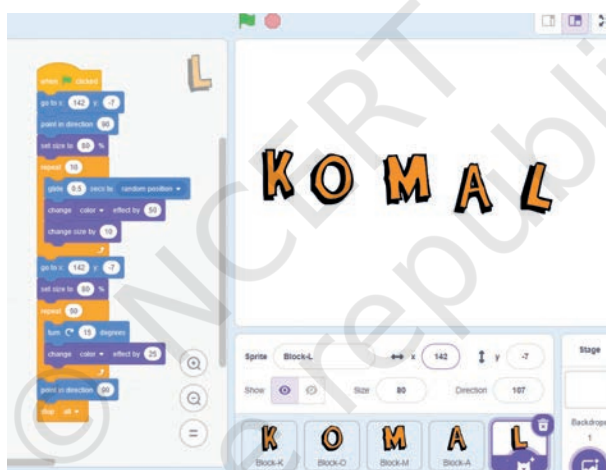


Figure 4.10: You can do animation on Scratch too; the letters are animated in this window

The set of questions given below will both guide you and help you keep a record of what you are doing.

1. Were you able to import and use your friend's picture as a Sprite? Yes ☐ No ☐
2. Were you able to use a combination of 'Motion', 'Looks', 'Control' and 'Events' blocks to create an animated birthday message using your friend's Sprite? Yes ☐ No ☐
3. Were you able to use your friend's favourite song as background music for the animated card? Yes ☐ No ☐

4. Were you able to save the card and share it with your friend? Yes ☐ No ☐

5. Did you face any challenges in designing this animated birthday card? Yes ☐ No ☐

If yes, how did you resolve them?

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6. Did you try creating something else using Scratch?

Yes ☐ No ☐

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Activity 8: Designing your game

You are now ready to design your own game.

The first thing you need to do is plan the details of your game. This is known as making a ‘storyboard’ (Figure 4.11).

Storyboard

A storyboard helps in planning what will be shown on the screen during a game or animation. It is like a roadmap. You can make it on paper or use the computer to create a document with the details of your plan. You can sketch your characters, detail how they will respond to commands, and show the sequence of actions, in short. Everything that is in your head can go into the storyboard.

Making a storyboard is important to ensure a detailed plan so that you do not have to stop and think as you start making your game or animation.

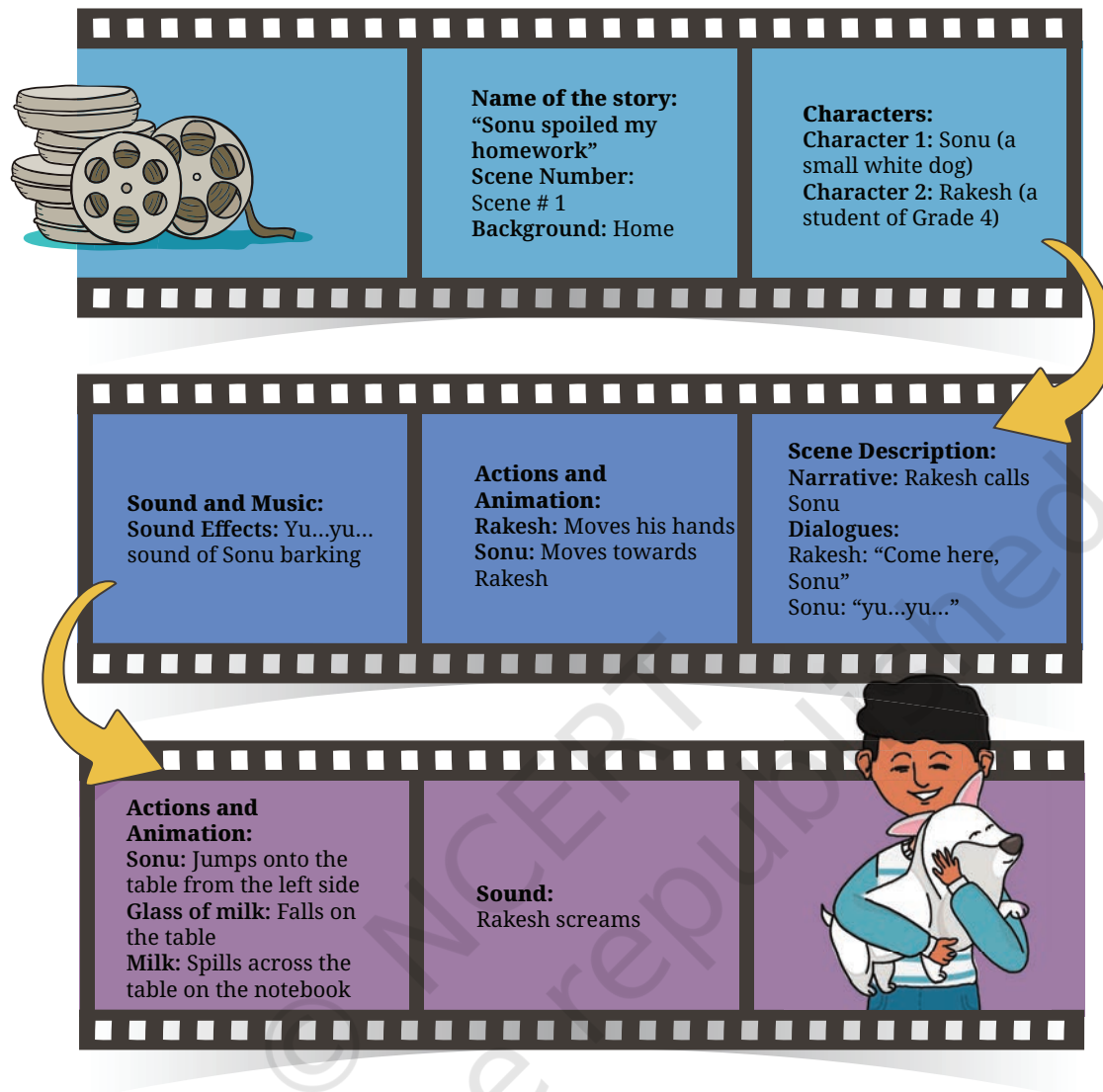


Figure 4.11: An example of a storyboard for an animation

Notes:

Special Instructions: Make sure Rakesh is sitting on a study table and a glass of milk is placed on his table.

Finally, you can show that Sonu jumps towards Rakesh, causing the glass to fall, spilling milk on table.

Present the game idea to your peers; did you receive any suggestions? Yes/No

If yes, how did you use them?

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Activity 9: Coding your game

With the help of your teachers or any other person, write the code (Figure 4.12) for the designed game by:

- Creating characters and scenes
- Animating characters
- Using dialogue and text
- Using event blocks to trigger different events in the story
- Using sound blocks to add background music

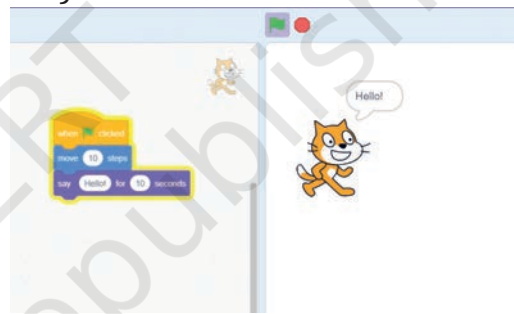


Figure 4.12: In this code, the Cat will move 10 steps ahead and say “Hello” once you press start

1. Write a script for the game you designed in Activity 5 using in-built blocks, such as motion, looks, sound, events, control, sensing, operators, variables, etc. and control structures that include loops and conditional statements.

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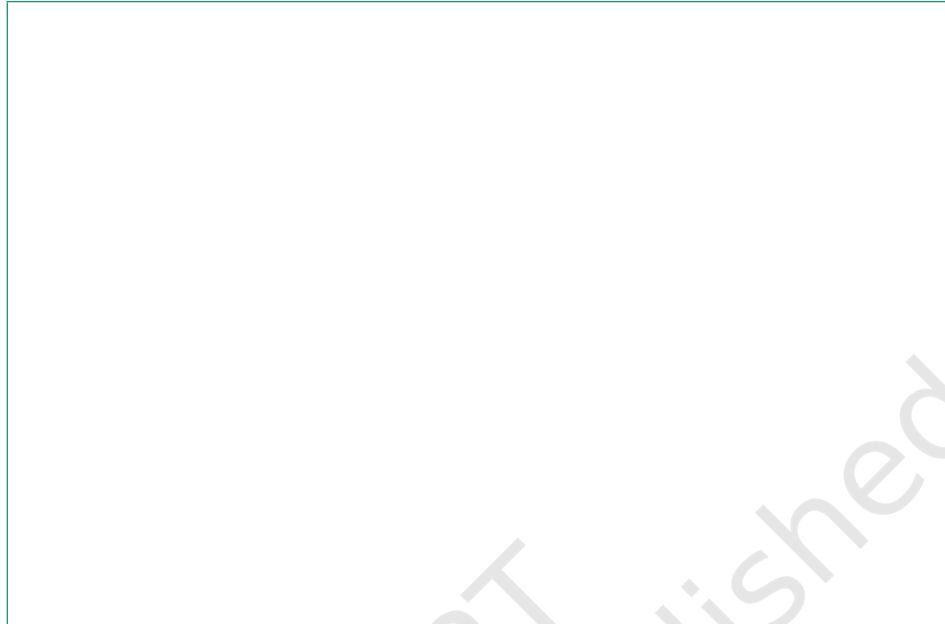
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2. Prepare a logo with the name of your game and paste the photograph of the same in the space given below.



3. Were you able to do the following?
- a. Setting the stage
- Choose or create a backdrop for the game's stage by importing image. Yes ☐ No ☐
 - Design or import Sprite Yes ☐ No ☐
 - Design or import object Yes ☐ No ☐
- b. Code your Sprite
- Use a combination of 'Motion' and 'Looks' blocks to programme the movements of your Sprite. Yes ☐ No ☐
 - Experiment with different code blocks to control movement, interactions, animations and game logic. Yes ☐ No ☐
- c. Implement game mechanics
- Define the rules of game using 'Control' blocks. Yes ☐ No ☐
 - Use conditional (if else statements), loops, variables and sensing blocks to create interactive gameplay elements. Yes ☐ No ☐

- Use 'Event' blocks to trigger actions in response to specific events. Yes ☐ No ☐

- Enhance the gaming experience by adding background music using 'Sound' effects. Yes ☐ No ☐

4. Did you face any challenges in designing the game?
If yes, how did you resolve them? Yes ☐ No ☐

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Activity 10: Trying it out

Check if your game is working.

1. Publish your game by clicking on the 'Share' button in Scratch.
2. Request other group members to play the game.
3. Are there any issues or 'bugs' that need to be removed for smooth working? Yes ☐ No ☐

Activity 11: Sharing your game

Now imagine if someone you have not worked with were to play the game. You would have to introduce the game to them and give basic instructions. You can do that by either making an audio or video clip or creating a document.

The questions below will help you develop these instructions.

1. What is the name of your game?

.....

2. What are the different components of the game?

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3. What are the rules of the game or instructions to play?

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What did I learn from others and how did I use it?

You saw videos on Scratch and discussed with others how to create the games.

1. Did you watch any tutorials or observe how others coded their projects?

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2. Did you work on any project with classmates? What did you learn from them?

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3. Did you ask for help or advice from your teacher or peers? What was the most helpful piece of advice you received?

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4. What new techniques or blocks did you discover with the help of peers?

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5. Did learning from others inspire any new ideas or features in your projects?

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6. Have you had the opportunity to teach or help others with Scratch? What did you teach them, and how did it help you reinforce your own understanding?

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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 number of periods 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. You can create a game/animated story related to your daily life, using photographs of people and objects around you. Please remember to take permission first. Discuss your favourite folk story with your family members and elders in the community. Prepare a storyboard detailing the characters, plots, important scenes, etc. Translate this story into Scratch by creating characters and scenes; animating characters; using dialogue and text; using event blocks to trigger different events in the story; and using sound blocks to add background music.
2. You can use the Scratch extensions to make different games. For example, you can use the Pen extension to create your own shapes and figures (Figure 4.13).

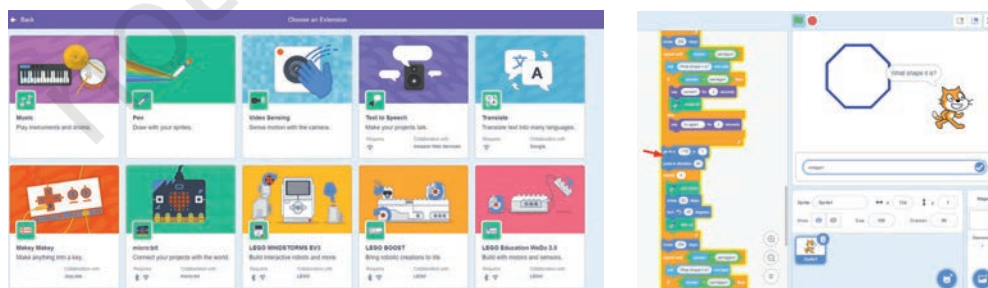


Figure 4.13: Scratch extensions and use of Pen extension



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. Compare online and offline games. State three things you like about each.
5. What jobs are related to the project? Look around, speak to people and write your answer. A few examples of jobs related to the activities you just did, are programmer, software developer, game developer and 3D animator.

TAKE CARE OF YOUR MENTAL AND PHYSICAL HEALTH

TALK ABOUT YOUR FEELINGS	STAY FIT AND ACTIVE	EAT HEALTHY FOOD	GET ENOUGH SLEEP
			
DO THINGS YOU ENJOY	TAKE BREAKS AT WORK	STAY CONNECTED WITH FRIENDS	PRACTICE BEING KIND
			

Part 3

Work in Human Services

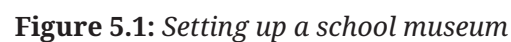


Human Services are about serving people and interacting with them in different ways. Projects on Work in Human Services will help you learn how to work with people. You can take up projects related to taking care of your health and that of your family and others, you can make interesting videos and audio 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. 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.

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

Take feedback from visitors



You have learnt about many sources for understanding history and culture in Social Science. Among these sources are artefacts, objects made by humans that are old, unique and beautiful and related to our traditions and culture. These artefacts can be ancient or a part of our lives and societies in the present.

A museum is a place in which artefacts are kept. Museums help us understand our history and culture (Figure 5.1). They show us what ancient people wore, what kind of work they did, what kind of artwork they created (e.g., paintings and sculptures), and what they wrote (manuscripts). Museums help us build the past in our minds, and see things, which we may never be able to otherwise.

Museums also help us learn about the present culture and work of different groups of people in the country and the world. They display artefacts related to art, traditions (Figure 5.2), architecture, and science. For example, the National Science Centres/Museums spread across India help us learn about things that no longer exist, such as dinosaurs, and also about things that we can expect in the future. There are even some curious objects that defy what we think or we know, like a 1200 kg granite ball that spins on water at the National Science Centre in Delhi.



Figure 5.2: *The Tribal Museum of Madhya Pradesh in Bhopal has displays of the traditional art, craft and culture of various tribes*

While Science Museums primarily focus on concepts related to science, museums in general display a variety of things, including traditional textiles and the style of wearing them. In some museums, even animals are preserved and exhibited.

Do you have traditional things in your house things which can be displayed in museum? Look around and bring them into the classroom. If you cannot bring these artefacts into the classroom, take their photographs or drawings and these could be a part of your museum.



Figure 5.3: Open air museum at the Kisama Heritage Village with houses of different tribes in Nagaland, each with its unique design.



What will I be able to do?

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

1. Describe how museums preserve history and traditions;
2. Identify artefacts that are of interest to you and your peers;
3. Create a school museum with your peers; and
4. Present the history of artefacts using different forms of the presentation.



What will I need?

- Locally collected artefacts that are old, beautiful, or important to your family, and/or photographs of these artefacts.
- Storage containers and display boxes.
- Cleaning brush and cloth.
- Chart paper or cards for making labels.

- Markers, sketch pens, drawing pencils, coloured pens and scissors.
- Equipment and materials for presentation; computer and projector.



How do I keep myself and others safe?

- Our heritage is the source of our pride and honour. It is our duty to preserve it. Take care of the artefacts, and they should be handled with care to avoid any damage.
- During a visit to a museum, avoid direct contact with the artefacts as they might be made of sensitive material. Please follow all instructions on the sign boards at the museum.

You have learnt about the Sindhu-Sarasvati civilisation in Social Science. You have also read about Dholavira (Figure 5.4). Locate Dholavira on the map of India.

Archaeological sites are places where evidence of ancient human societies is preserved. These sites are excavated by archaeologists. They carefully dig up these sites, and analyse the artefacts and other remains that are uncovered. These artefacts help us to understand the kind of societies that existed many years ago at these sites. The objects discovered during excavation are kept in a museum located near the site.



Figure 5.4: *Sentinel room in eastern gate of castle, Dholavira*



What do I need to know before I start?

Look around your home and neighbourhood. List the names of at least five artefacts that you find interesting because they

are old or special to you and your family. Examples include old coins, telephones, vessels, stamps, wood carving, furniture, stone carving, *Shilalekh* (inscriptions, that is writing or engraving, carved on stone or walls of caves or buildings), ancient manuscripts, religious manuscripts, statues, radio, gramophone, camera, spectacles, sticks, ancient books, traditional clothes, and so on.

Activity 1: Visiting a museum

Visiting a museum will help you with setting up the school museum. In case, you are not able to visit a museum yourself, you can ask your friends and others if they have visited a museum, and what they saw during their visit or you can also visit the website of a museum and see the exhibits there. Take note of their descriptions. Some museums have ‘virtual exhibitions’.

Virtual Museum Tour

You can take a virtual tour of the Museums in India on the website of the Ministry of Culture, Government of India (you can use the search keywords, such as the ‘ministry of culture’ + ‘virtual museums’). Figure 5.5 shows the screen grab of website maintained by the Ministry of Culture, Government of India.

Use Google Lens or a similar Optical Character Recognition (OCR) tool to search for more information on the collections of the museum.

Share your learnings on how Google Lens assisted through the tour.



Figure 5.5: Screen grab of website maintained by the Ministry of Culture, Government of India



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

While visiting museum understand the layout of the museum and key exhibits. Take your time to explore the museum, observe the exhibits, read information panels and check if there are any interactive activities (e.g., lighting up parts of the exhibits, moving some parts, a quiz you can take, etc.). If possible, discuss your observations with an expert (it could be the person who selects and looks after the artefacts in the museum, the curator, or a local historian) and ask any questions you have.

Based on the above, please respond to the following questions:

1. What was the most interesting exhibit you saw in the museum?

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2. Why did you find it interesting?

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.....

3. Describe any one exhibit that has significance in our lives even today.

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Activity 2: Learn the history of your family and area

To begin, it is important to learn more about the place you live in and the association of your family with it. The questions below will help you with this.

1. Did your village/town/city ever have different name?

.....

2. Do you know when was it founded or established? If yes, write the year.

.....

3. Where did your family originally come from?

.....

4. Do you have any family traditions or customs that have been passed down through generations?

.....

.....

5. Are there any local stories or traditions related to the village/town/city? (e.g., any story about the area, any connection with history, any time of the year when many people come to visit, etc.)

Write about the story or the tradition related to your village/town/city.

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6. Are there historical movements or landmarks/buildings in your village/city/town? If yes, write a short note about any one of them.

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7. Is there any old institution or monument that you have visited? If yes, what is it famous for?

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8. What are the oldest artefacts in your house? Write their names here.

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Activity 3: Identify artefacts and learn about them

Identify atleast 5 artefacts in your home and write about them in the table 5.1.

Table 5.1: Writing about the artefacts

Questions	Artefact 1	Artefact 2	Artefact 3	Artefact 4	Artefact 5
What is the artefact?					
Who is the owner?					
How old is it?					
Will you bring it to class or will you bring a photograph?					

Note: If you plan to bring photographs into the classroom, make sure you take it from different angles. So that anyone looking at the photographs, can see the artefact as if it was in front of them.



Using Google Lens

You can use AI tools like Google Lens to explore information about artefacts as well as monuments, or landmarks by simply pointing the smartphones camera at them. Google Lens can also provide information about artworks, historical artefacts, and famous landmarks, allowing us to learn more about our art and culture.

There are many other apps related to the virtual tours of museums or for gaining knowledge about old stamps and coins.

Choose one of the artefacts selected for exhibition in the museum. Create a timeline showing its history and evolution, including when it was commonly used and, if still in use, how it is being used. You can also record any significant events related to it, for example, some relative brought it as a gift on the occasion of your grandparent's marriage, and it was the first of its kind in the village (for example, an old radio or camera).



Figure 5.6: Old brass bells

Activity 4: Selecting artefacts for the museum

Within the group, select five artefacts that you think should be part of the exhibition in the museum. You will have to decide on the final set of exhibits with all your peers. Remember, you must choose carefully, and also explain why you chose these artefacts and not the others.



Figure 5.7: Old travelling iron from the 1950s that worked on electricity



Figure 5.8: Old railway lanterns



Figure 5.9: Mobile phone from the year 1998

All the artefacts are important, and even if your artefact is not included in the final exhibition, you learnt something valuable about local history and culture.

The following questions will help you finalise the artefacts:

1. How will you select the final five artefacts for the exhibition? What factors will you keep in mind while choosing the artefact?

.....

.....

.....

.....



Figure 5.10: Camera, flash and lenses from the early 1960s



Figure 5.11: Brass sieve from the 1940s



Reading or translating old documents

AI tools such as Google Lens, Microsoft Office Lens, Adobe Scan and Text Fairy can read text from images by using Optical Character Recognition (OCR). You can use them to read old documents that are difficult to read or to translate documents in a language that you understand.



Figure 5.12: AI tools use for translation

This will help in case you want to add old documents to the artefacts in the museum.

1. Download and open the Google app on the smartphone.
2. Locate the Google Lens icon in the search bar and tap on it. This activates Google Lens.
3. Point your camera at the text you want to read. Ensure the text is clear and within focus for better results. Use the highlighters that appear to select the desired portion of text.
4. Depending on your desired action:
 - **To read:** Google Lens will automatically attempt to recognise the text and display it on your screen, making it easier to read, especially for small fonts or challenging angles.
 - **To copy:** Look for the 'Homework' option. Tap on it and you will see options, like 'Copy Text' or 'Copy to Computer'. Tap on 'Copy' to copy the text to your clipboard. You can then paste it onto another app, like notes or documents.
 - **To translate:** Look for the 'Translate' option at the bottom of the screen. Tap on it and choose the desired language you want to translate the text. The lens will display the translated text alongside the original.

Draw a picture or paste a photograph of each object you have selected and write a short description of its history and/or usage in table 5.2.

Table 5.2: Recording details of identified artefacts

Object	Sketch Photograph	History and Usage	Is it still being used? (Yes/No)
Object 1			
Object 2			
Object 3			
Object 4			
Object 5			

Activity 5: Keeping the artefacts safe



Figure 5.13: Telegram and stamps from the 1960s

For example, a brass article needs to be washed and polished, a wooden object needs to be dusted with a soft brush, and clothes should be hung carefully, away from any nails or sharp edges. Photographs should be carefully kept in envelopes, ensuring they do not get bent or out of shape.

Select any two artefacts and respond to the following question:

1. What will you do to ensure the artefacts are safe and in good condition?

.....

.....



Figure 5.14: Brass pot for making tea (Samovar) from Kashmir

Activity 6: Preparing presentation on artefacts

There is a story behind each artefact and you need to present it to each visitor to the museum. You can do this in many ways, you can find a folk story about the artefact or develop a story. You can make videos (especially for objects you



Figure 5.15: An old handmade fan (Pankha) made of recycled wool and cloth that was used before electricity reached all homes

cannot bring to school, an interview with someone talking about the history of the object), create a slide presentation, write a Blog/Wikipedia article, or use a chart and coloured pens to make posters describing the artefact.

Think and respond to the following questions:

1. What kind of presentation will you make? (e.g., digital slide presentation, poster, video, etc.)

.....

2. Why did you choose this/these kind of presentation(s)?

.....

.....

.....

3. What are the specifications of your presentation (e.g., size of poster, duration of video, etc.)?

.....

.....

.....

Practice giving an oral description of the artefact in your group before showcasing it to visitors.



Figure 5.16: A museum display in a school showing history of educational toys



Translating your own presentation

There are various AI tools (e.g., Bhashini's Anuvaad and Google Translate) that can be used to prepare audio presentations in other languages.

Bhashini Anuvaad: Bhashini Anuvaad is a set of AI tools that can translate spoken words from one language to another. It helps with translation, transcription and transliteration in Indian languages. It enables users to communicate, access information, and create content in their preferred Indian languages.

Google Translate: Google Translate is a tool that instantly translates words, phrases, and web pages from English to over 100 other languages.

Bhashini Anuvaad

Step 1: Access Bhashini:

- Open a web browser on your computer or tablet.
- Type 'Bhashini' in the search bar and press Enter.
- Click on the Bhashini website link to access the tool.

Step 2: Choose Your Languages:

- Look for a section that lets you select languages. Bhashini can translate many languages, so choose the one you want to speak and the one you want to translate to.

Step 3: Input Your Text:

- Find a space where you can type or speak your sentence. If you are more comfortable typing, use the keyboard. If you want to speak, make sure your device has a microphone, and look for the microphone icon.

Google Translate

Step 1: Access Google Translate:

- Open a web browser on your computer or tablet.
- Type "Google translate" in the search bar and press Enter.
- Click on the Google Translate website link to access the tool.

Step 2: Choose Your Languages:

- Similar to Bhashini, select the language you want to translate from and the language you want to translate to.

Step 3: Input Your Text:

- Type or speak the sentence you want to translate. Google Translate also has a microphone icon for voice input.

Step 4: Translate and Listen:

- Once you have entered your text, click the translate button. If you are using voice input, wait for Bhashini to process your spoken words.
- Bhashini will then show you the translated text on the screen. You can also listen to the translated version by clicking a speaker icon, if available.

Step 5: Experiment and Explore:

- Do not be afraid to try different sentences and languages. Experiment with Bhashini to see how it works in various situations.
- Explore different features available, like changing the language 'direction' or adjusting settings.

Step 4: Translate and Listen:

- Click the translate button to see the translated text. You can also listen to the translation by clicking on a speaker icon.

Step 5: Explore Additional Features:

- Google Translate offers additional features like conversation mode, which allows you to have a back and forth translated conversation.

Step 6: Practice and Have Fun:

- Practice translating sentences and have fun discovering how these tools can open up a world of languages.

Activity 7: Organising an exhibition of artefacts



Figure 5.17: Display of collected artefacts

1. You can organise an exhibition of artefacts in your school with your peers under the teacher's guidance. Decide on a suitable date and location within the school premises. Ensure the space is large enough to accommodate exhibits and visitors.
2. Work with your peers to take responsibility for five artefacts for the museum. Discuss and finalise a brief description of each of the artefacts. Write the final descriptions neatly on labels. Discuss how these labels will be placed, whether on display boards or pasted on charts next to the artefacts (table 5.3).
3. Set up tables, stands, and display boards. Ensure artefacts are securely displayed and labelled.
4. Create posters, flyers, and social media posts to promote the exhibition.
5. Send out invitations to parents, family, friends, school staff and community members. Invite your friends and family.
6. Organise the exhibition of artefacts as decided and collect feedback from visitors, students, and teachers to understand what went well and what could be improved.

Table 5.3: Labels to describe objects briefly

Objects	Description on Label
Object 1	
Object 2	
Object 3	
Object 4	
Object 5	

Draw a sketch to show the layout of how the artefacts will be exhibited.



Keep a visitor's book for feedback and comments related to your presentation, about the artefacts on display, and any feedback.



What did I learn from others?

If you were able to visit a museum, then

1. Find out how artefacts in museums are stored and cared for. Write down at least three methods that museums use to preserve artefacts.

(a)

.....

(b)

.....

(c)

.....

Learning from experts

If you have invited someone who can answer your questions, e.g., someone who works in a museum, a historian, or an archaeologist, to discuss historical artefacts with your class then write at least 3 things that you learnt.

Listen to a talk show or short documentary on artefacts and how they help us understand the lives of people in ancient times.

Write at least three things that you learnt.

1.
.....
2.
.....
3.
.....

Learning from visitors

Write down any three examples of feedback from visitors.

1.
.....
2.
.....
3.
.....

What did you learn from this feedback?

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



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.

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

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



What else can I do?

Discuss the project with your relatives from different cities. Ask them to share or tell about some of the museum-worthy artefacts in their home or locality. Display them by either bringing the object or photographs to your class.



Think and Answer

1. What did you enjoy doing?
2. What were the challenges you faced?
3. What would you like to do differently?
4. How do museums help us in learning about our heritage and history?
5. What jobs are related to the project? Look around, speak to people and write your answer. A few examples of jobs related to the work you just did are archaeologist, historian, museum curator, and tour guide.

Project 6

Cooking without Fire



0685CH06

This project will help you learn about cooking without fire. You will read recipes, and use the correct kitchen tools and ingredients to make tasty dishes.

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



Figure 6.1: Working together in a kitchen

We all enjoy eating! Some of us also enjoy cooking. Cooking involves many methods like boiling, baking, steaming, grilling and frying. Raw food is heated to a high temperature, which changes the food, kills germs, improves texture and flavour, and makes it tastier and easier to eat.

We often use a gas or other type of stove for cooking — the heat cooks the food. We also use different utensils, depending on what we are preparing. But did you know that we can cook without fire as well? Additionally, we also eat some foods without heating. Besides raw fruits, we eat certain raw vegetables. Only those vegetables that do not need cooking to be edible, can be eaten raw. For instance, can you eat raw potatoes?

Raw vegetables maintain their maximum nutritional value since they are not exposed to heat, which can break down nutrients.

Preparing food items and dishes without the use of fire or heat opens up a world of creativity and nutrition. The use of fresh, uncooked ingredients to create healthy meals involves techniques, for making *salads* and refreshing smoothies to inventive dips and desserts, and the possibilities are endless. This approach not only preserves the nutritional value of the ingredients but also encourages a closer connection to the food we consume, promoting mindful eating and a healthy lifestyle.

Cooking also gives pleasure and develops a sense of pride. It also helps us to understand the importance of teamwork and cooperation as people who work in kitchen, like chef, cook, specialist cook, dish washer, kitchen porter and others have to work together.

Do you help out when someone is cooking at home?

Nutritional Value of Food

You must have learnt about different components of food, nutritional value, balanced diet and related concepts in Science. A diet rich in essential nutrients, especially those coming from raw fruits and vegetables, helps us in maintaining a healthy body and mind.



What will I be able to do?

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

1. Make use of basic kitchen tools, equipments and utensils;
2. Prepare tasty dishes without using fire;
3. Present dishes in a way that make them look tempting; and
4. Dispose of food waste and leftovers in an environment-friendly manner.



What will I need?

- Tray, bowl, plates and vessels or pots.
- Measuring cups, knife, kitchen weighing scale, chopping board, peeler, grater, fork, whisk, tablespoon, cups, wooden churner (*Maadhani*).
- Locally available fruits, vegetables, lentils, pulses, milk, curd, puffed rice, peanuts, butter and bread.
- Soap and water.
- Apron, haircap or any cloth to cover hair.
- Dustbins for keeping wet and dry waste.



(a)



(b)



(c)



(d)



(e)

Figure 6.2: Kitchen tools (from left to right); (a) chopping board and knife, (b) measuring cups, (c) grater, (d) peeler and (e) whisk



How do I keep myself and others safe?

- Always wash your hands before and after handling food.
- You must be extremely careful when using sharp tools, and make sure you use them as demonstrated. Do not rush.
- Clean up any water or any other liquid that may have spilled immediately to prevent anyone from slipping and falling.
- Follow all other safety rules as discussed with your teacher at all times.



Internet safety: Ask your teacher for help while using the internet. Be careful not to upload or download anything, and do not share personal information anywhere.



What do I need to know before I start?

You will need to know the recipes of the dishes you are going to prepare. A recipe is a set of instructions that tells you how to make a dish. It has the list of ingredients and the steps to follow.

There are many ways to cook, but you will use a few way in the projects are as follows:

- **Mixing:** Combining ingredients together, as in a *salad* or a beverage.
- **Spreading:** Applying a soft substance over a surface, such as butter or cheese spread on bread or *Chutney* in a *Chapatti* roll.
- **Assembling:** Putting ingredients together to make a dish, like making *Bhel Puri* or sprouts *Chaat*.

Activity 1: Reading recipes

A recipe includes the ingredients and instructions to prepare a dish. A few recipes are given here. You can look for more in a recipe book or on the internet.

Before you start following the recipes, you need to learn how to read them:

- **Read it all first:** Before you start, read the entire recipe from start to end.
- **Check the ingredients:** Make sure you have the right quantity of all the ingredients.
- **Prepare:** Gather the equipment and utensils you may need.
- **Follow the steps:** Complete each step in the order it is listed.
- **Look up for unfamiliar words:** If you see a word you do not know, use a dictionary or ask the teacher.

Dish Presentation

The way your dish looks is almost as important as its taste.

Here are a few tips for making your dish look great:

- Use colourful ingredients to make your dish vibrant; if you make a fruit *salad*, use fruits of different colours.
- Arrange your food neatly on the plate. Add a little garnish; e.g., some Sev and peanuts placed decoratively on a plate of *Bhel Puri* or mint leaves on buttermilk to make it look nice.
- You can search on the internet for photographs of beautifully arranged food for inspiration, using the keywords; ‘presentation + beautiful + dishes + food’ and ‘presentation + beautiful + dishes + food + Indian’.

The space provided against the name in each recipe is for you to write any other name(s) you use for the dish.

Making Buttermilk /.....

You will need:

- 2 cups of curd
- 2 cups of water
- 1 teaspoon of roasted cumin powder
- Salt to taste
- Chopped mint leaves (optional)

What to do:

- In a bowl combine curd, water, cumin powder, and salt.
- Whisk until smooth.
- Pour into glasses and garnish with chopped mint leaves, if desired.



Making Jaljeera /.....

You will need:

- 2 tablespoons of *Jaljeera* powder
- 4 cups of cold water
- 1 tablespoon of lemon juice
- 1 tablespoon of mint leaves, finely chopped
- 1 tablespoon of coriander leaves, finely chopped

What to do:

- Take a large jug and add chopped mint leaves, chopped coriander leaves, *Jaljeera* powder and lemon juice. Mix them up well.
- Add 4 cups of water to the jug and mix quickly till all the ingredients are completely blended. If possible, you can use a blender.
- Pour the mixture equally into the glasses and then pour the remaining water into the glasses, mix well.
- Serve immediately.



Making

Kokam Sherbet /.....

You will need:

- 10-12 dried *kokam* petals
- 4 cups of water
- Sugar or honey to taste
- Roasted cumin powder (optional)

What to do:

- Soak the *kokam* petals in water for 2-3 hours.
- Strain the *kokam* -infused water into a pitcher.
- Add sugar or honey to taste and stir until dissolved.
- Optionally, add a pinch of roasted cumin powder for extra flavor.
- Chill in the refrigerator before serving (optional).



Making

Salad /.....

You will need:

- 3 cups of cut assorted locally available vegetables (cucumbers, tomatoes, capsicum, carrots, lettuce)
- $\frac{1}{4}$ cup of vegetable oil
- 2 tablespoons of lemon juice
- 1 teaspoon of honey
- Salt and pepper to taste

What to do:

- Wash and chop the vegetables into small cubes.
- Tear the lettuce leaves into small pieces.
- In a small bowl combine vegetable oil, lemon juice, honey, salt, and pepper.
- Wisk till the mixture is well combined, taste and adjust the seasoning.
- In a large bowl, toss the vegetables with salad dressing, salt, and pepper.

Making *Koshimbir* /.....

You will need:

- 1 cup of soaked and drained *Moong Dal*
- 1/2 cup of grated carrot
- 1/4 cup of grated coconut
- 1/2 cup of cucumber, small cubes
- 1-2 green chillies, finely chopped
- Chopped coriander leaves
- Salt to taste
- Lemon juice to taste

What to do:

- Wash and soak the *Moong Dal* for 30 minutes.
- Wash and prepare the vegetables.
- In a bowl, mix soaked *Moong Dal*, grated carrot, grated coconut, chopped green chillies, and coriander.
- Season with salt and lemon juice according to taste.



Making *Fruit Chaat* /.....

You will need:

- 3 cups of cut assorted locally available fruits (e.g. apples, grapes, oranges)
- 2 tablespoons of lemon juice
- Honey or sugar (optional)
- *Chaat Masala* to taste

What to do:

- Wash and chop fruits into bite-sized pieces.
- Put the cut fruit in a large bowl, drizzle lemon juice to prevent discoloration.
- Sweeten with honey or sugar, season with *Chaat Masala*.
- Toss gently to combine.



Making *Shrikhand* /



You will need:

- 3 cups of thick curd
- 1/2 cup of powdered sugar
- 1/2 teaspoon of cardamom powder
- Saffron strands (optional)
- Chopped nuts for garnish (optional)

What to do:

- Hang the curd in a muslin cloth for a few hours to remove excess water.
- In a bowl, mix the hung curd, powdered sugar and cardamom powder until smooth.
- Add saffron strands for flavor.
- Garnish with chopped nuts before serving.

Making *Bhel Puri* /



You will need:

- 2 cups of puffed rice (*Murmura*)
- 1/2 cup of chopped onions
- 1/2 cup of chopped tomatoes
- 1/4 cup of chopped coriander
- 1/4 cup of Sev or roasted peanuts
- *Chaat Masala* to taste
- Salt to taste
- 2 tablespoons of Mint Chutney (optional)

What to do:

- Wash and chop the onions, tomatoes, and coriander.
- In a large bowl, mix puffed rice, chopped onions, chopped tomatoes, and chopped coriander
- Season with *Chaat Masala* and salt.
- Mix well and enjoy.
- Top with Sev or roasted peanuts before serving.

If a mixer or grinding stone is available to make Mint Chutney, add 2 tablespoons to the *Bhel Puri* (optional).

Making Sprouts /.....

You will need:

- 1/2 cup of legumes (e.g. green *Moong*, *Kabuli Chana*, black *Chana*)
- Water
- Muslin cloth
- Fold the muslin cloth over the grains or legumes and place them in a bowl. Cover it lightly with a lid so air can circulate.
- Check the muslin cloth from time to time. If it starts to feel dry, sprinkle some water over it to keep it moist.

What to do:

- Put the legumes in three separate bowls.
- Cover with water and let them soak overnight.
- Place the soaked legumes onto a wet muslin cloth. Sprinkle some water over them.
- It will take at least 12 hours for the legumes to sprout. You will see little sprouts coming out of each one of the soaked legumes.
- Once you see the sprouts, transfer them to a storage container. They are now ready to be included in your salad.

Making Lemonade /.....

You will need:

- 4 cups of water
- 8 lemons
- 1/2 cup of sugar (as per taste)

What to do:

- Cut and squeeze the juice out of the lemons.
- In a bowl, mix water, lemon juice, and sugar until it dissolves.
- Chill in the refrigerator before serving (optional) .



Making Mint Chutney /.....

You will need:

- 1/4 cup of mint leaves
- 1/4 cup of coriander leaves
- 1 or 2 green chillies
- 1 small piece of ginger (about the size of your thumb)
- 1 small lemon
- Pinch of salt
- Water



What to do:

- Wash the mint and coriander leaves, shake off the extra water.
- Cut the ginger and green chillies.
- Grind coriander leaves, mint leaves, ginger, green chillies, salt, and a little water in a mixer or grinding stone till smooth.
- Add the juice of the lemon, mix well.

Making Sandwich /.....

You will need:

- 8 bread slices
- 2 tomatoes
- 2 cucumbers
- 2 tablespoons butter
- Salt and pepper to taste



What to do:

- Wash and slice the vegetables.
- Spread a thin layer of butter on all the bread slices.
- Put a layer of sliced tomato or cucumber.
- Season with salt and pepper.
- Cover with another bread slice.
- Cut the sandwich to the desired shape.

If a mixer is available, spread a thin layer of the *Chutney* after the butter (optional).

Making Cucumber *Raita* /.....

You will need:

- 1 cup of plain yogurt
- 1 grated cucumber
- 1/2 teaspoon roasted cumin powder
- 1 tablespoon chopped coriander leaves
- Salt and pepper to taste

What to do:

- In a bowl, whisk the yogurt until smooth.
- Add the grated cucumber, roasted cumin powder, salt, and chopped coriander leaves. Mix well.
- Serve immediately.

If a mixer or grinding stone is available to make *Mint Chutney*, add 1-2 table spoons to the *Raita* (optional).



Making Sprouts *Chaat* /.....

You will need:

- 1 ½ cup of assorted sprouts (e.g. green *Moong*, *Kabuli Chana*, black *Chana*)
- 1 ½ cup of chopped vegetables (e.g. tomatoes, onions, cucumbers, carrot)
- 1-2 green chillies, finely chopped
- 1 tablespoon lemon juice or vinegar
- Salt and pepper to taste

What to do:

- Wash and cut the vegetables.
- In a bowl, mix sprouts and chopped vegetables.
- Season with lemon juice or vinegar, salt and pepper.
- Toss well to combine.



Making Making Coconut Chocolate Balls /

You will need:

- 1 cup of shredded coconut (unsweetened)
- 1/2 cup of sweetened condensed milk
- 3 tablespoons of cocoa powder
- 1/2 teaspoon of vanilla extract
- Additional shredded coconut or cocoa powder for rolling (optional)
- A mixing and serving bowl

What to do:

- In a mixing bowl, combine the shredded coconut, sweetened condensed milk, cocoa powder, and vanilla extract. Stir until everything is well combined and forms a thick, sticky mixture.

What to do:

- Scoop out small portions of the mixture and roll them into balls between your palms. You can make them any size you prefer, but they are usually small.
- If desired, roll the balls in additional shredded coconut or cocoa powder to coat them evenly.
- Place the coated balls on a plate or tray lined with paper.
- Leave the balls to set at room temperature for at least 1-2 hours. During this time, they will firm up slightly, making them easier to handle.
- Once they have set, your coconut chocolate balls are ready to enjoy!



Activity 2: Deciding on dishes to be prepared

Conduct a survey of students in the school to find out what they like to eat. Some questions you may ask are as follows:

1. What is your favourite dish?
2. Which dishes do you like that can be prepared without fire?

Table 6.1 : Preferences of food items mentioned by students during the survey

		Give preference from 1 to 5 , 1 = Least preferred , 5 = Most preferred												
Sr. No.	Name of student	Buttermilk	Bhel Puri	Sprout Chaat	Salad	Sandwich	Jaljeera	Lemonade	Kokam Sherbet	Koshimbir	Fruit Chaat	Cucumber Raita	Shrikhand	Coconut Chocolate Balls
1.														
2.														
3.														
4.														
5.														

On the basis of the survey, list the dishes that will be prepared as part of the activity in the school.

1.
2.
3.
4.
5.



Did you know?

Using Artificial Intelligence to read information on food packets.

Have you seen the thick and thin black lines on back of any package? This is called a 'Bar Code'. This code contains information that can be read by machines. You can use mobile apps like Google Lens to read this Bar Code to get information related to ingredients, nutritional information, expiry dates and so on.

Try reading the Bar Code of any food packet.

Activity 3: Measure your food ingredients

You might have discussed standard and non-standard units of measurement in your Science classes.

When cooking, both standard and non-standard units are commonly used for measuring ingredients. Understanding these measurements will help you to ensure accuracy and consistency in your preparation. For example, one pinch of sugar (non-standard measurement) and 10 grams of flour (standard measurement).

In case a kitchen weighing scale or measuring cups are not available, you can use common kitchen items, like cups, teaspoons and table spoons to estimate quantities kitchen of ingredients. Some examples of measuring quantities of liquids are given below:

- A teaspoon can contain about 5 ml of liquid.
- A table spoon can contain about 15 ml of liquid.
- One cup can contain about 250 ml of liquid.
- One litre of any liquid can be estimated with a capacity of 1 litre drinking water bottle.

Therefore, it is good to have a rough idea of how many grams or litres of an ingredient can fit into a cup or table spoon.

Using cups and a kitchen weighing scale to measure different kinds of ingredients (liquid and solid). Measure the same quantity of any ingredient with a cup, tablespoon or teaspoon used on a daily basis and record your observations in Table 6.2.

Using a kitchen weighing scale (Figure 6.3) to measure the quantity that can fit into a cup, teaspoon or tablespoon will help in choosing the right amount of ingredients.



Figure 6.3: Kitchen weighing scale

Table 6.2: Estimation of quantity of ingredient for conversion

Ingredient	Quantity in Grams or Litres	One Cup	One Teaspoon	One Tablespoon
Honey				
Lemon juice				
Cucumber (chopped)				
Flour (Atta or Maida)				

Activity 4: Handling tools with care and safety

Proper use and handling of kitchen tools not only enhance the cooking experience but also ensure safety and hygiene. For instance, sharp knives should be handled with care. Use a chopping board while cutting and always cut the food item away from the body and keep fingers clear of the blade. Measuring cups and spoons should be used accurately to ensure recipe success. Appliances like blenders and mixers should be operated according to manufacturer instructions to prevent accidents. Cleaning tools properly after use is equally important to prevent cross-contamination and maintain a hygienic kitchen environment.

Table 6.3: Draw sketch of the tools

Tool	Sketch of tool
1. Knife	
2. Grater	
3. Whisk	
4. Peeler	

Activity 5: Storing food

Various ingredients require different cleaning and storage methods. Proper storage is essential to maintain freshness and prevent spoilage. For instance, grains and legumes should be kept in airtight containers to protect them from pests and moisture. Likewise, spices and herbs should be stored in airtight containers, away from heat and light. Use small bowls, plates, or containers to keep ingredients separate. If you have many ingredients, you may label them to avoid confusion.

Refer to table 6.4 to identify and record the optimal storage methods for different ingredients.

Table 6.4: Storing conditions for different ingredients

Ingredient	Best way to store (e.g. room temperature, cool place, in the fridge)
Hard fruit	
Soft Fruit	
Green leafy vegetables	
Onions	
Cut vegetables	
Bread	
Milk	

Activity 6: Handling and disposing of kitchen waste

Segregation of kitchen waste into different bins is an effective way to manage and dispose of kitchen waste responsibly. Organic waste can be collected separately and used for composting or vermicomposting to create nutrient-rich soil for gardening or disposed of through municipal composting programmes, where available.

Follow local guidelines and regulations for waste segregation and disposal practices. Empty containers like bottles, jars, and food trays (check for recycling symbols) should be disposed of separately for recycling. Clean cardboard, newspapers, magazines, and paper packaging can also be kept for recycling.



Figure 6.4: (a) Segregating waste and (b) Disposal of segregated waste

Answer the following questions:

1. Where did you dispose of the segregated waste?
.....
.....
.....
.....
2. What did you do with plastic containers after using them?
.....
.....
.....
.....
3. What did you do to reduce the amount of waste produced in the kitchen?
.....
.....
.....
.....

4. What kind of waste can be used for composting?

.....

.....

.....

.....

5. What can we do with leftover food instead of throwing it away?

.....

.....

.....

.....

Activity 7: Beverage making

Beverages include any drink besides water. Some examples include lemonade, buttermilk, *Jaljeera*, and *Kokam* sherbet.



Figure 6.5: Preparing buttermilk

1. What beverage did you prepare?

.....

.....

.....

.....

2. List the ingredients and their quantities used for making the beverages. Estimate the number of people you could serve with the ingredients used.

.....

.....

.....

.....

3. Taste the beverages made by other groups. Did you notice any difference in taste? Yes/No.

.....

.....

.....

.....

4. Provide and receive suggestions from other groups. Did you implement any suggestions? If yes, how did you incorporate them (e.g., adjusting ingredient quantities)?

.....

.....

5. Describe the amount of waste generated (e.g., half a bag, one bag, or another description of quantity).

.....

.....

.....

.....

Activity 8: Make dishes that require cutting and mixing

Now that the beverages are done, you can start making dishes that need cutting and mixing (Figure 6.6). You will cut fruits and vegetables that are ready to eat and mixing them together with salt, lime juice or any other ingredient to make a tasty dish!

Some examples of food you can cut and mix are salad and fruit *Chaat*.

Please answer the following questions after you have finished your activity.



Figure 6.6: Preparing a dish by cutting and mixing

1. What did you make today?

.....

.....

2. How did you decide what ingredients to use?

.....

.....

3. What was the most challenging part of making this dish?

.....

.....

4. Did you learn any new skills while preparing it?

.....

.....

5. Did you add your idea to the recipe? If so, what did you change?

.....

.....

6. Did you work with anyone else while making this dish? How did you divide tasks?

.....

.....

7. What was the best part of working together?

.....

.....

8. What did you learn from making this dish?

.....

.....

9. What quantity of waste was generated from the activity?

.....

.....

Activity 9: Make dishes that require cutting and assembling

Now to take the next step — to ‘assemble’ dishes. Assembling dishes means to take bits of ready to eat food and making them into something different with a little work.

Examples of dishes that need to be assembled are *Koshimbir*, sprouts *Chaat*, *Bhel Puri*, coconut chocolate balls, cucumber *Raita* and sandwich.



Figure 6.7: Make sure the food tastes good before serving it in the Mela!

Please respond to the following questions after you have finished cooking:

1. What did you make?

.....

.....

.....

.....

2. List the ingredients and the quantity of each used to make the dishes.

.....

.....

.....

.....

3. How many people could you serve with the quantity of ingredients you used?

.....

.....

.....

.....

4. Go around and taste the dishes that other groups have made. Do you find any difference in taste? Yes/No. Give and take suggestions from them?

.....

.....

.....

.....

5. Did you implement any of those suggestions? If yes, how?

.....

.....

.....

.....

6. How much waste was produced (half a bag, one bag or any other way you would like to describe the quantity)?

.....

.....

.....

.....

Activity 10: Organise a food *Mela*

You can organise a food *Mela* to exhibit the dishes, you learnt to prepare. With the help of your teacher and peers, plan and organise a food *Mela* on a small scale.

Answer the following questions.

1. What do you think is special about your food item?

.....

.....

.....

.....

2. Make a poster or an invitation card or write a social media message to invite visitors.



3. How will you attract people to try the food items?

.....

.....

.....

.....

4. How will you maintain cleanliness and hygiene in and around your stall?

.....

.....

.....

.....

5. How will you clean up after the event?

.....

.....

.....

.....



What did I learn from others?

Think about what you did and respond to the following questions:

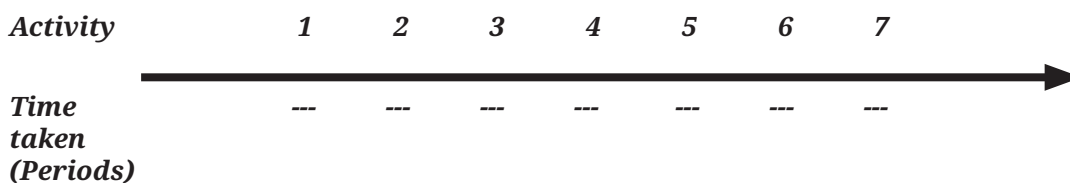
1. Did you get recipes other than the ones in your Activity Book? Yes/No
2. Did you ask someone to help with the recipes in your Activity Book? Yes/No
3. Did you face any issues while working in team? How did you resolve it?
4. Did you learn measurement of ingredients from others? Yes/No



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 number of periods 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.



What else can I do?

Create your own recipe. Be inspired by the different recipes you practiced!

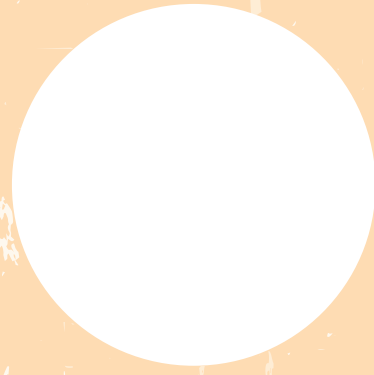
Name of the dish:

What is needed	What is to be done



Think and Answer!

1. What did you enjoy doing during the activity?
2. What would you like to do differently?
3. Do you think you can prepare an entire balanced meal without using fire? Yes/No.
4. What jobs are related to the project? Look around, speak to people and write your answer. A few examples of jobs related to the work you just did are cook at home, chef in a hotel, and an artist who presents food in different forms.



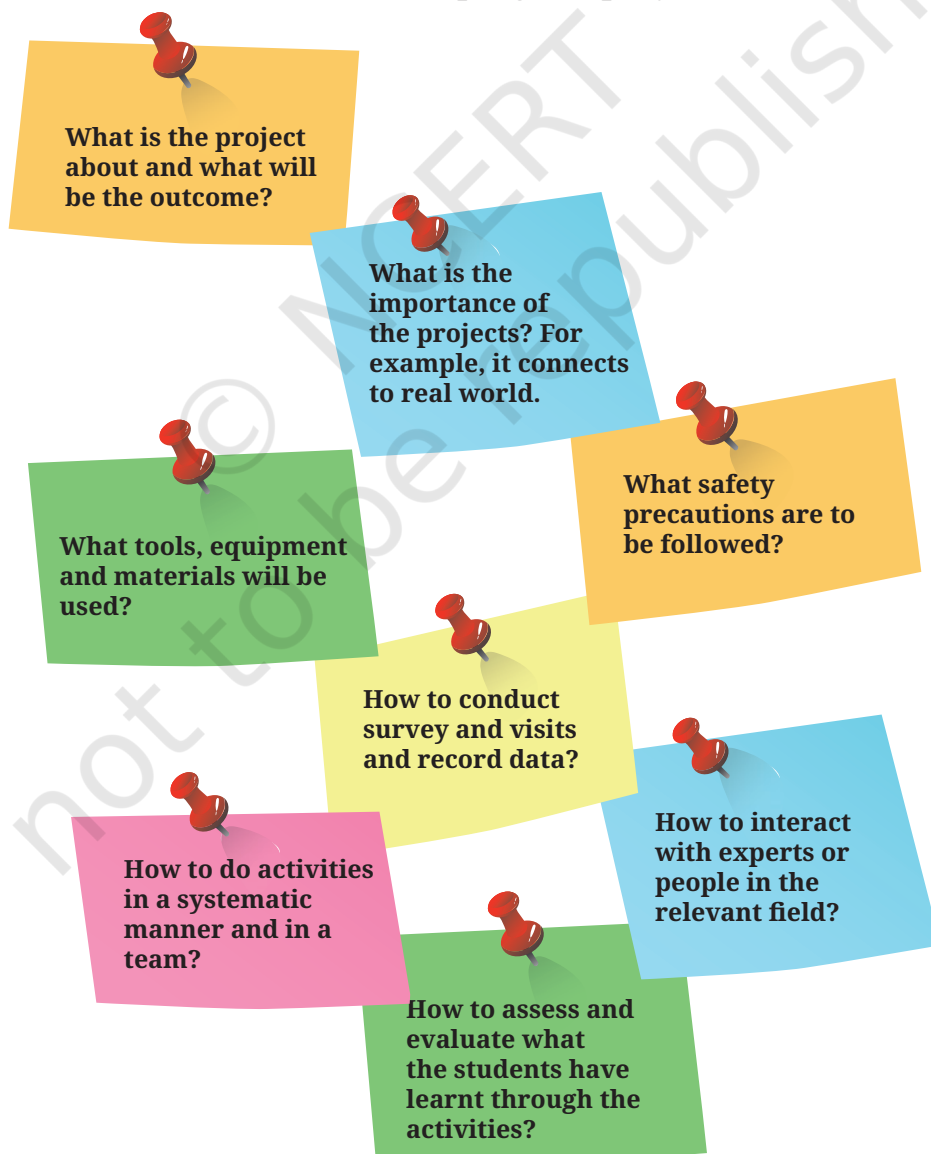
Annexures for Teachers

ANNEXURE 1

Project Template

Developing effective projects in schools requires 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. Address 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 cybersecurity and 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:

- i. The materials you used and how you used them.
- ii. The tools you used and how you used them.
- iii. The process you followed, such as the selection of materials/ tools, sequence of tasks, and how you completed each one.
- iv. If you collected information/data/objects, describe them and explain why they are useful.
- v. If you made something, include a photograph or a sketch.
- vi. If you grew a plant, record its growth.
- vii. What safety precautions did you take while doing the activities?
- viii. Did you use any AI tools? If yes, which ones did you use and how did you use them?

- ix. Did you share the outcome of your project with others outside the school? Describe your plan and how you executed it.
- x. 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, and 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?

ANNEXURE 2

Curricular Goals and Learning Outcomes for Grade 6

The table below details the Competencies (C) for the Middle Stage and Learning Outcomes (LOs) defined for Grade 6 for attainment of each Curricular Goal (CG).

Competency	Learning Outcomes
CG-1 Develops in-depth basic skills and allied knowledge of work and their associated materials/procedures	
C-1.1 Performs procedures competently through required tools/equipment	LO 1—Selects tools appropriate for specific task LO 2—Uses tools correctly to complete given task
C-1.2 Approaches tasks in a planned and systematic manner	LO 3—Demonstrates appropriate stepwise process for completing the given task LO 4—Develops time-based plan for completion of task
C-1.3 Maintains and handles materials/equipment for the required activity	LO 5—Describes the steps necessary to keep materials and equipment ready for use LO 6—Follows the safety protocol while handling tools/materials

CG-2 Understands the place and usefulness of vocational skills and vocations in the world of work	
C-2.1 Describes the contribution of vocation in the world of work	LO 7—Describes the importance of vocation in the world around them
C-2.2 Applies skills and knowledge learned in the area	Not to be assessed in this grade
C-2.3 Evaluates and quantifies the associated products and materials	LO 8—Identifies criteria for evaluating quality of products LO 9—Identifies criteria for evaluating quantity of products
CG-3 Develops essential values while working across areas	
C-3.1 Develops the following values while engaging in work: • Attention to detail • Persistence and focus • Curiosity and Creativity • Empathy and sensitivity • Collaboration and teamwork • Willingness to do physical work	LO 10—Keenly observes the usage of tools and materials during the demonstration and asks relevant questions LO 11—Demonstrates care and respect towards people doing physical labour, irrespective of gender LO 12—Plans tasks with peers and helps others during difficulties at work LO 13—Reworks/redoes task for improved efficiency LO 14—Asks questions about the functioning of tools and machines, and gives suggestions for alternative use LO 15—Willingness to do physical work while enjoying working with tools and materials
CG-4 Develops basic skills and allied knowledge to run and contribute to a home	
C-4.1 Applies the acquired vocational skills and knowledge in home setting	LO 16—Identifies where at home such skills and knowledge are relevant

ANNEXURE 3

Exemplar Projects for Grades 6 to 8

Given below is the list of projects for each form of work, which can be taken up for Vocational Education in the Middle stage (Grades 6 to 8).

Work with Life Forms	Work with Machines and Materials	Work in Human Services
1. Keyhole garden 2. School kitchen garden 3. Hydroponics 4. Grow what you eat 5. Nutrient Film Technique Hydroponics 6. Small nursery in school (local fruits) 7. Nursery in polyhouse 8. Making a terrarium 9. Biodiversity register 10. Image recognition: AI model 11. Using AI to identify plant diseases and pests 12. Understanding animal behaviour	1. Coding to create animation and games 2. Basic maker skills (simple machines) 3. Making a tree guard 4. Garden seating bench 5. Making products from bamboo 6. Bamboo stool 7. Working with electronics 8. Working with microcontrollers 9. Make your own robot 10. Pottery 11. Stitch and sew 12. Making a wooden stool	1. Food <i>Mela</i> cooking without fire 2. Food <i>Mela</i>: cooking with fire 3. Food stall in school/market 4. Taking care of own health 5. My health and my family's health 6. Healthy mind and healthy body 7. Class museum 8. Making a comic book 9. Visit to heritage sites/old houses 10. Family budget navigator

13. Surveying medicinal plants, herbs and spices	13. Household water connection	11. Draw mehndi on hands
	14. Fashion and garments	12. Beauty–basic grooming
	15. Weaving on a loom-table mat with a motif	13. Ancient history broadcasts
	16. Food preservation through organic techniques	14. Podcasts
	17. Making a wooden stool/shoe rack	
	18. Make a pad/photo frame/pen stand	
	19. 3D printing	
	20. School band from waste materials	
	21. Using artificial intelligence	

ANNEXURE 4

Time Allocation and Mapping of Learning Outcomes

The tables below indicate the allocation of time and mapping of Learning Outcomes for the activities included in the examples of projects for Grade 6.

Time Allocation: The time allocated for the activity is suggestive. Teachers can make necessary adjustments based on the 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 ensuing tables.

Student Reflection: Reflection prompts are included (‘What did I learn?’ and ‘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 connection with 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 developed while working across areas, are applicable across all activities.

Project 1: School Kitchen Garden

Connection with other curricular areas: Science and Art Education

Activities	Required Periods: 53	Related Learning Outcomes
<i>What will I be able to do?</i>	2	LO 1, LO 2, LO 3, LO 7
<i>What will I need?</i>		
<i>How do I keep myself and others safe?</i>		LO 6
<i>What will I need to know before I start?</i>		
<i>Field visit—Visit to farm/park/nursery</i>	6	LO1, LO 3, LO 5, LO 7
<i>What do I have to do?</i>		
<i>Start preparing your kitchen garden</i>	8	LO 3, LO 4
<i>Protecting your garden</i>	6	LO 1, LO 2, LO 3, LO4, LO 5, LO 6, LO 8, LO 9
<i>Watering schedule</i>	2	
<i>Making a fence</i>	4	
<i>Neem leaves based pesticide</i>	2	
<i>Using mulch</i>	2	
<i>Making vermicompost</i>	6	
<i>Observing your plants grow</i>	2	LO 3, LO 8, LO 9
<i>Looking at output</i>	4	LO 8, LO 9
<i>What did I learn from others</i>	6	LO 1, LO 5, LO 7
<i>What did I do and how long did it take?</i>	1	LO 4
<i>What else can I do?</i>	1	LO 7, LO 8, LO 9
<i>Think and Answer</i>	1	LO 16

LO 10, LO 11, LO 12, LO 13, LO 14 and LO 15 to be observed throughout the project

Project 2: Biodiversity Register

Connection with other curricular areas: Science and Art Education

Activities	Required periods: 54	Related Learning Outcomes
What will I be able to do?	2	LO 1, LO 7
What will I need?		
How do I keep myself and others safe?		LO 6
What will I need to know before I start?		
What is around us?	4	LO1, LO 3, LO 5, LO 7
Meet an expert	6	
How do I keep myself and others safe?		
What do I have to do?		
Survey of surroundings	2	LO 3, LO 4
Preparation to record in the biodiversity register	4	
Filling in the biodiversity register	15	LO 1, LO 2, LO 3, LO 5, LO 6, LO 8, LO9
Identifying unknown	6	
Presentation of biodiversity register	8	
What did I learn from others?	2	LO 1, LO 5, LO 7
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
Think and Answer	2	LO 16

LO 10, LO 11, LO 12, LO 13, LO 14 and LO 15 to be observed throughout the project

Project 3: School Maker Laboratories

Connection with other curricular areas: Science

Activities	Required Periods: 55	Related Learning Outcomes
What will I be able to do?	4	LO 1, LO 7
What will I need?		
How do I keep myself and others safe?		LO 6
What will I need to know before I start?		
Simple machines in our surroundings	3	LO 7
What do I have to do?		
Using levers to make toys—catapult, robotic arm scissors, lazy and tongs	6	LO 1, LO 2, LO 3, LO 5, LO 6, LO 8, LO 9
Using propellers to make toys—elastic band boat	4	
Using a wheel and axle to make toys—rubber band car, air balloon car	3	
Using more than one simple machine to make toys—windmill	4	
Knowing and maintaining a bicycle		
Parts of a bicycle	4	
Common problems in a bicycle	4	
Visit to a bicycle repair shop	6	
How does the bicycle work?	6	
Planning for a Mela	3	
What did I learn from others and how did I use it?	2	LO 1, LO 5, LO 7
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
Think and Answer	2	LO 16

LO 10, LO 11, LO 12, LO 13, LO 14 and LO 15 to be observed throughout the project

Project 4: Animation and Games

Connection with other curricular areas: Cross-cutting, Physical Education and Well-Being

Activities	Required Periods: 45	Related Learning Outcomes
What will I be able to do?	2	LO 1, LO 7
What will I need?		
How do I keep myself and others safe?		LO 6
What will I need to know before I start?		
The games we play	2	LO1, LO 3, LO 4, LO 5
Model your favourite game	4	
Trying out online games	4	
Preparing to make your own game with animation	4	
What do I have to do?		
Build characters, objects and backdrop of your game	2	LO 1, LO 2, LO 3, LO 5, LO 6, LO 8, LO9
Programming your characters and objects	2	
Create an animated birthday card for your friend	2	
Designing your own game	4	
Coding your game	8	
Trying it out	1	
Sharing your game	1	
Making it better	2	
What did I learn from others?	1	LO 1, LO 5, LO 7
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
Think and Answer	2	LO 16

LO 10, LO 11, LO 12, LO 13, LO 14 and LO 15 to be observed throughout the project

Project 5: School Museum

Connection with other curricular areas: Social Science, Language Education

Activities	Required periods: 50	Related Learning Outcomes	LO 10, LO 11, LO 12, LO 13, LO 14 and LO 15 to be observed throughout the project
What will I be able to do?	3	LO 1, LO 7	
What will I need?			
How do I keep myself and others safe?		LO 6	
What will I need to know before I start?			
Visiting a museum	6	LO1, LO 3, LO 5, LO 7	
Your own history	4		
What do I have to do?			
Identifying artefacts and learning about them	8		
Identifying the final artefacts	4	LO 1, LO 2, LO 3, LO 4, LO 5, LO 6, LO 8, LO9	
Keeping the artefacts safe	4		
Preparing presentation of artefacts	6		
Holding an exhibition during Kaushal Mela or school event	6		
What did I learn from others and how did I use it?	3	LO 1, LO 5, LO 7	
What did I do and how long did it take?	2	LO 4	
What else can I do?	3	LO 7, LO 8, LO 9	
Think and Answer	2	LO 16	

Project 6: Cooking without Fire

Connection with other curricular areas: Science

Activities	Required periods: 48	Related Learning Outcomes	LO 10, LO 11, LO 12, LO 13, LO 14 and LO 15 to be observed throughout the project
<i>What will I be able to do?</i>	2	LO 1, LO 7	
<i>What will I need?</i>			
<i>How do I keep myself and others safe?</i>		LO 6	
<i>What will I need to know before I start?</i>			
<i>Reading recipes</i>	2		
<i>Deciding which items to make</i>	5	LO 1, LO 2, LO 3, LO 5, LO 6, LO 7, LO 8, LO 9, LO 16	
<i>How to measure, use tools and store food</i>	6		
<i>Disposing of waste</i>	2		
<i>What do I have to do?</i>			
<i>Making beverages</i>	3		
<i>Making dishes that require cutting and mixing</i>	4	LO 1, LO 2, LO 3, LO 5, LO 6, LO 8, LO 9	
<i>Making dishes that require cutting and assembling</i>	8		
<i>Planning a Mela</i>	6	LO 4	
<i>What did I learn from others and how did I use it?</i>	3	LO 1, LO 5, LO 7	
<i>What did I do and how long did it take?</i>	2	LO 4	
<i>What else can I do?</i>	3	LO 7, LO 8, LO 9	
<i>Think and Answer</i>	2	LO 16	

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