

## MINI GARDEN (LEVEL 3)

<b>Description</b>	Learners will carry out various experiments to learn about plants. Then, they will put together their own mini garden and create art with flowers.
<b>Leading question</b>	What does it take to grow your own garden?
<b>Subjects covered</b>	Science, Art & Design
<b>Total time required</b>	40-60 minutes per day for 5 days
<b>Resources required</b>	Seeds, sprouted green gram, jar, towel, leaves, plastic bag, transparent plastic cup/ glass jars, an uprooted flowering plant/ weed (to be repotted after use), a potted plant, thread, paper, scissors
<b>Learning outcomes:</b>	<p>By the end of this project, learners will be able to:</p> <p>Knowledge-Based Outcomes:</p> <ol style="list-style-type: none"> <li>1. Classify things as living and non-living.</li> <li>2. Identify characteristics of living things (such as movement, growth, respiration, reproduction and response to stimuli)</li> <li>3. Observe life processes in plants related to different characteristics of living things.</li> <li>4. Classify flowers based on various features such as fragrance, structure and shape of petals.</li> </ol> <p>21<sup>st</sup> Century Skill Outcomes:</p> <ol style="list-style-type: none"> <li>1. Collaborate effectively to perform experiments and create a plant garden.</li> <li>2. Think critically while forming and testing hypotheses during experiments.</li> <li>3. Show creativity in designing the mini garden.</li> <li>4. Communicate effectively while presenting the mini garden to friends or family.</li> </ol>
<b>Previous Learning</b>	Life cycles of animals (frog, butterfly)
<b>Supervision required</b>	Medium

### Day 1 -

*Today, you will find out how to differentiate between living and non-living things, and start designing your mini garden!*

Time	Activity and Description
------	--------------------------

5 minutes	<p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>- Let us look around us and find 5 living and 5 non-living things.</li> <li>- What makes these things living or non-living?</li> </ul> <p><b>Tip:</b> Learners can be given prompts to encourage them to understand that plants are living things. For example, point to a plant, tree, bush etc. and ask the student whether that is a living or non-living thing.</p>												
15 minutes	<p><b>Characteristics of Living Things</b></p> <ul style="list-style-type: none"> <li>- How are living and non-living things different from each other?</li> <li>- Everything in life can be classified as living and nonliving, and living things are further grouped as plants and animals.</li> <li>- All living things show these behaviours or characteristics: <ul style="list-style-type: none"> <li>- They move</li> <li>- They breathe or carry out <b>respiration</b></li> <li>- They are sensitive, which means they respond to changes around them</li> <li>- They grow</li> <li>- They produce babies or carry out <b>reproduction</b></li> <li>- They eat</li> <li>- They get rid of waste</li> </ul> </li> </ul> <p><b>Note:</b> Ask students to draw this table in their notebooks and write one example each of a plant and an animal showing each characteristic of living things.</p> <table border="1" data-bbox="391 1037 1442 1335"> <thead> <tr> <th>Characteristic</th> <th>Plants</th> <th>Animals</th> </tr> </thead> <tbody> <tr> <td>Movement</td> <td>Sunflowers move with the sun</td> <td>Dogs walk</td> </tr> <tr> <td>Respiration</td> <td>Leaves of trees take in carbon dioxide and give out oxygen</td> <td>Cows breathe</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Characteristic	Plants	Animals	Movement	Sunflowers move with the sun	Dogs walk	Respiration	Leaves of trees take in carbon dioxide and give out oxygen	Cows breathe			
Characteristic	Plants	Animals											
Movement	Sunflowers move with the sun	Dogs walk											
Respiration	Leaves of trees take in carbon dioxide and give out oxygen	Cows breathe											
20 minutes	<p><b>Mini Garden Ideas</b></p> <p><b>Tip:</b> If possible, take learners to a park/ garden for this section to help them get more ideas from their surroundings.</p> <p>In this project, we will make our own mini garden and observe some of these characteristics!</p> <ul style="list-style-type: none"> <li>- What is your favourite plant or flower?</li> <li>- How are plants useful for us?</li> <li>- Many plants are useful to humans in different ways - we can eat them, use them as medicine, make colour out of them and many more.</li> <li>- What are some uses of your favourite plants?</li> </ul>												

	<p>Make a rough drawing of your dream garden and include the types of plants you want to grow. Your garden must contain:</p> <ul style="list-style-type: none"> <li>- At least 2 vegetables, fruits, or flowers</li> <li>- Clearly labelled plants</li> <li>- A list of things we will need to grow the plants</li> </ul> <p><b>Tip:</b> Once done, review the list of things that the learners put together and make sure it contains: seeds, soil and water.</p>
<b>At home activities</b>	<ul style="list-style-type: none"> <li>- Ask a family member about the kind of common plants that can grow locally.</li> <li>- Find out about the different uses and benefits of these plants.</li> <li>- Get a few different types of seeds of such plants from vegetable or fruit wastes.</li> </ul>

## Day 2

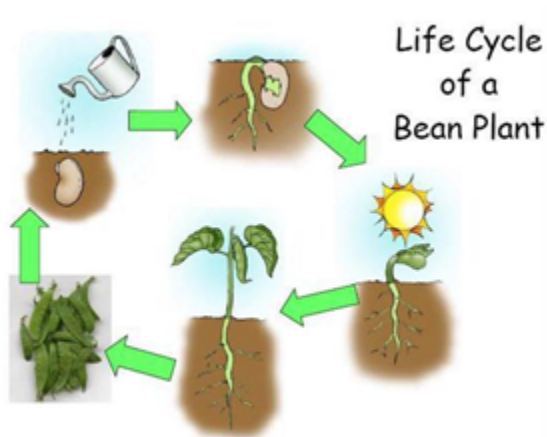
Today, you will learn about the life cycle of a plant and choose a location for your mini garden.

Time	Activity and Description
10 minutes	<p><b>Life Cycle of Plants</b></p> <p>What plants do you want to grow?</p> <ul style="list-style-type: none"> <li>- How long do you think they will need to grow?</li> <li>- What are some uses of these plants?</li> </ul> <p>Let's think about how plants grow from seeds.</p> <ul style="list-style-type: none"> <li>- Where do plants come from? How do we grow plants?</li> <li>- After a plant grows out of the soil, what happens to it? How long does it stay that way?</li> <li>- How does a plant change with time?</li> </ul> <p>Plants start out as seeds and then grow into plants slowly over time. After that, they wilt or die. This process is called their <b>life cycle</b>.</p> <ul style="list-style-type: none"> <li>- The process of plants growing from seed is called <b>germination</b> or <b>sprouting</b>.</li> <li>- The life cycle of plants contains these steps: <ul style="list-style-type: none"> <li>- Germination (root and shoot come out of the seed)</li> <li>- Roots grow into the soil</li> <li>- Shoot grows out of the soil</li> <li>- Stem and leaves grow</li> <li>- Flowers are produced</li> <li>- Flowers turn into fruits</li> <li>- Fruits contain seeds, which grow into new plants when they germinate</li> </ul> </li> </ul>
10 minutes	<p><b>Drawing the Life Cycle</b></p> <p>Draw a labelled life cycle of a plant you want to grow, showing all the stages we learned about. To do this,</p>

- Draw each stage separately (germination, roots growing into the soil, shoot growing out of the soil, stem and leaves growing, flowers being produced, and flowers turning into fruits)
- Label the different stages.
- Draw arrows between different stages to show that one stage leads to another.
- Colour each stage!

**Tip:**

- Show the life cycle of a bean plant (shown below) as an example.
- Ask learners to draw the life cycles of other organisms, such as butterflies and frogs.



10 minutes

**Germination**

Now that we have drawn the life cycles of plants that we want to grow, let us actually grow them and see how different stages of their life cycle look! To do this,

- Fill a plastic cup/ glass jar with wet cotton/ cloth/ paper towels.
- Push the seeds down between the wet material and bring it to the side of the jar so you can clearly see how it grows.



**Note:** Ask learners to draw the table shown below and write down their hypothesis (what they think will happen), the materials they used, and the method they followed to plant the seeds. They will fill their observations every day for two weeks, and keep the material inside the cup/ jar wet.

<b>Hypothesis:</b>	
<b>Materials Needed:</b>	
<b>Method:</b>	

	<p><b>Observations:</b></p> <p>Let's experiment with 3 different setups to find out what plants need to grow! To do this,</p> <ul style="list-style-type: none"> <li>- Make the same setup in a different jar, this time using dry paper towel/ cloth/ cotton.</li> <li>- Draw a similar table, as you did for the previous jar, and fill in your hypothesis, materials needed, and method.</li> </ul>									
10 minutes	<p><b>Location for Mini Garden</b></p> <p><b>Note:</b> Get learners to identify a location for their mini garden (this can be a spot in their backyard, lawn or kitchen garden).</p> <ul style="list-style-type: none"> <li>- In case an open area is unavailable, learners can use three or four pots/ old paint buckets/ cans to make a container garden!</li> <li>- Make sure that the location receives plenty of sunlight!</li> </ul>									
<b>Literacy/ Numeracy Extension (Optional)</b>	<ul style="list-style-type: none"> <li>- Create a guide of medicinal and food uses of plants that grow in your neighbourhood and share it with your friends and family. You can use a format, such as the one shown below, to do this:</li> </ul> <table border="1" data-bbox="464 894 1344 1125"> <thead> <tr> <th>Plant</th> <th>Location</th> <th>Possible uses</th> </tr> </thead> <tbody> <tr> <td>Basil</td> <td>In the community garden</td> <td>In salads or pasta</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>- Draw and illustrate a map of your neighbourhood that shows where each of these plants are located.</li> </ul>	Plant	Location	Possible uses	Basil	In the community garden	In salads or pasta			
Plant	Location	Possible uses								
Basil	In the community garden	In salads or pasta								

### Day 3 –

Today, you will find out about the different parts of a plant and learn in detail about flowers.

Time	Activity and Description
15 minutes	<p><b>Setting up the Mini Garden</b></p> <p>Let us go to the location and plant seeds in our mini/ container garden!</p> <p>These seeds will take a few months to grow into full plants. We will monitor their growth every week.</p> <ul style="list-style-type: none"> <li>- What do you think we need to look for when we visit our seeds?</li> <li>- Create a table to write your observations every time you come to the garden</li> </ul> <p><b>Note:</b> Show the table given below to the learners to give them an idea about how to create a format to record relevant observations.</p>

Plant	Height	Stage	Health	Actions
<i>Bean</i>	<i>5 cm</i>	<i>Seedling</i>	<i>Good</i>	<i>Water every three days</i>

10 minutes	<p><b>Parts of a Plant</b>  <b>Note:</b> Show the learners the uprooted flowering weed/ plant. After this activity, learners can help in repotting the plant.</p> <p>What different parts of the plant that you can identify?</p> <ul style="list-style-type: none"> <li>- Where is the root? Shoot? Stem? Flower? Leaves?</li> <li>- How are each of these parts useful for the plant?</li> </ul> <p>Different parts of a plant are useful to it in different ways.</p> <ul style="list-style-type: none"> <li>- <b>Roots</b> anchor the plant to the ground, which is why we cannot just pick plants easily. This protects plants from flying away by strong winds. They also collect water and nutrients from the soil.</li> <li>- The <b>stem</b> is responsible for transporting nutrients collected by the roots upward to the rest of the plant.</li> <li>- The <b>leaves</b> are responsible for respiration or breathing. They also make food for the plant.</li> <li>- Many plants bear <b>flowers</b> and <b>fruits</b>. <b>Buds</b> are little growths that develop into leaves or flowers. Buds come out of <b>nodes</b>.</li> </ul> <p>All of the parts of the plant that grow above the ground are called the <b>shoot system</b>. The shoot system consists of stems, leaves, and the reproductive parts of the plant (flowers and fruits).</p> <p>Let us draw and label each part of the plant then return it to the soil.</p>
------------	---

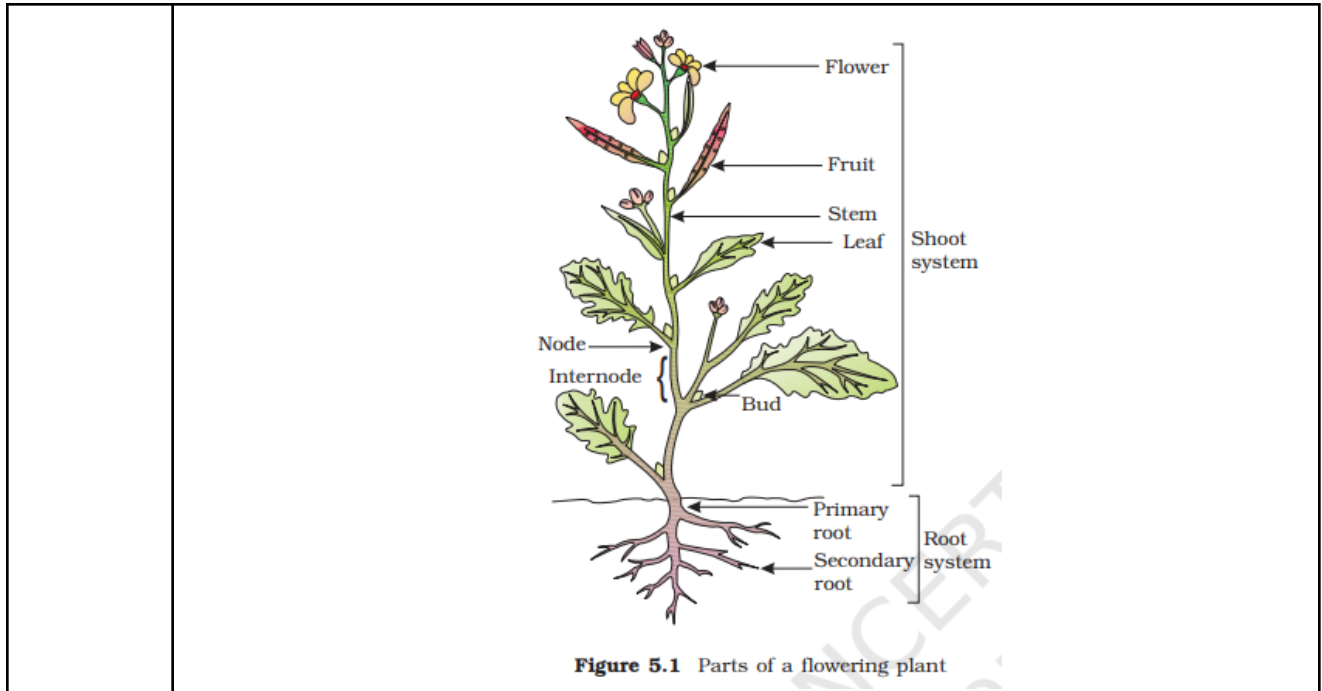
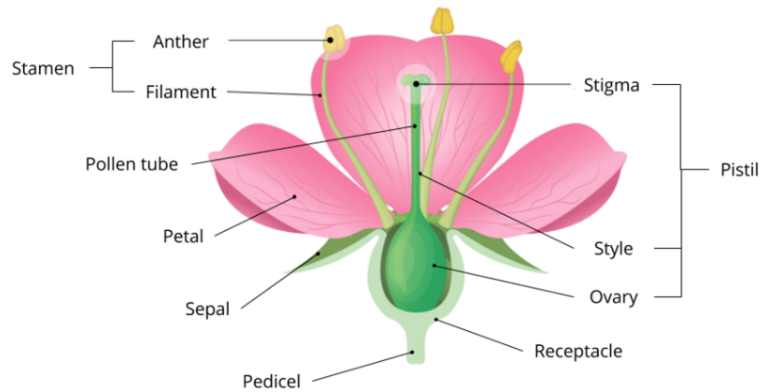


Figure 5.1 Parts of a flowering plant

10 minutes

**Parts of a Flower**

**Note:** Show learners the flower from the uprooted plant/ weed, and ask them if they can identify any parts (such as petals, sepals, anther etc). Once done, explain the different parts of a flower using the image below. Also, explain that petals are often used to make colours.



Let us draw the diagram of a flower and label its different parts.

**Literacy/  
Numeracy  
Extension  
(Optional)**

If we have a wooden container that is 60 cm long, 30 cm wide and 20 cm high. What is the maximum volume of soil that we can fit inside the container? (**Hint:** we need to calculate the volume of a container. Volume of a rectangular prism = length x width x height)

Day 4 –

Today, you will perform a few experiments to identify roles of different parts of a plant.

Time	Activity and Description								
5 minutes	<p><b>Note:</b> Ask learners to make three copies of the observation table shown below. Inform them that they will use one each for the three different experiments that they will conduct today.</p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;"><b>Hypothesis:</b></td> <td></td> </tr> <tr> <td><b>Materials Needed:</b></td> <td></td> </tr> <tr> <td><b>Method:</b></td> <td></td> </tr> <tr> <td><b>Observations:</b></td> <td></td> </tr> </table>	<b>Hypothesis:</b>		<b>Materials Needed:</b>		<b>Method:</b>		<b>Observations:</b>	
<b>Hypothesis:</b>									
<b>Materials Needed:</b>									
<b>Method:</b>									
<b>Observations:</b>									
10 minutes	<p><b>Experiment 1 - Transpiration</b></p> <p>Let us go outside to conduct our first experiment and collect a few things we need for the other experiments!</p> <p><b>Note:</b> Learners will need a transparent plastic bag and a potted plant placed in the sun for this experiment. Before the class ends, get learners to observe the plastic bag and fill in their observations.</p> <p>The aim of the first experiment is to find out whether or not plants carry out <b>transpiration</b> or release water from their leaves. What should we do to find out if plants <b>transpire</b> or not?</p> <p>To perform this experiment, we will:</p> <ul style="list-style-type: none"> <li>- Choose an existing plant and water it well.</li> <li>- Tie a plastic bag tightly around one leaf of the plant and leave it in the sun for half an hour.</li> <li>- If we see water droplets deposited on the inner surface of the plastic bag, we can infer that the leaf released water or performed transpiration.</li> </ul> <p>Let us perform the experiment!</p> <ul style="list-style-type: none"> <li>- First, fill out the table with the hypothesis (what you think will happen), materials needed, and the method.</li> <li>- Once done, follow the steps you list in the method (1. water the plant, 2. tie a plastic bag tightly around one leaf, 3. Leave the plant in the sun).</li> </ul>								
10 minutes	<p><b>Experiment 2 - Respiration</b></p> <p><b>Note:</b> For safety reasons, please demonstrate this experiment to learners instead of getting them to perform it. Before the class ends, get learners to observe the leaves used in the experiment and fill in their observations.</p>								

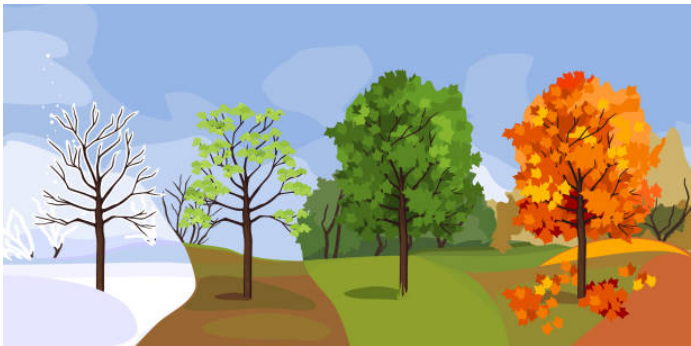


	<p>We know that all living things carry out respiration. Plants <b>respire</b> through their leaves. The aim of this experiment is to observe respiration in plants.</p> <p>To perform this experiment, we will:</p> <ul style="list-style-type: none"> <li>- Place 2-3 fresh leaves in a glass jar/ paper cup.</li> <li>- Add hot water to the jar/ cup and submerge the leaves below the surface of the water using some weight (a screw/ nut etc).</li> <li>- Wait for an hour and look at the leaves.</li> <li>- If we find bubbles on leaves, we can infer that they performed respiration, and released a gas as a result.</li> </ul> <p><b>Note:</b> Get learners to fill out the hypothesis, materials needed and the method in their observation table <del>and then demonstrate perform the experiment.</del></p>
10 minutes	<p><b>Experiment 3 - Transportation of Water and Nutrients</b></p> <p>Let's do an experiment to observe how the stem transports water and nutrients upward!</p> <p>To perform this experiment, we will:</p> <ul style="list-style-type: none"> <li>- Place a flower (preferably with white petals) with a long stem in a cup filled with coloured liquid (you can add a colouring material, such as ink or turmeric powder to the water).</li> <li>- If the petals of the flower turn the same colour as the colouring material, we can infer that the stem carried the coloured water to the flower.</li> </ul> <p><b>Note:</b> Get learners to fill out the hypothesis, materials needed and the method in their observation table and then perform the experiment. Get them to observe the flower and write their observations after an hour.</p>
5 minutes	<p><b>Reflection</b></p> <ul style="list-style-type: none"> <li>- What experiments did we perform today? What did we want to find out through each experiment?</li> <li>- Do leaves perform transpiration? How do you know?</li> <li>- What about respiration?</li> <li>- Does stem transport water and nutrients to different parts of a plant? How do you know?</li> </ul>

### Day 5 -

Today, you will observe the growth of plants in your mini/ container garden and draw how they will look one month from now!

Time	Activity and Description
10 minutes	<p><b>Mini Garden</b></p> <p>Today is the last day of the project! Let us look at our mini/ container garden, water the plants, and write down our observations.</p> <ul style="list-style-type: none"> <li>- What do you observe?</li> <li>- Have the plants grown at all?</li> </ul>

20 minutes	<p><b>Drawing Projected Growth</b></p> <p>Our seeds have a long way to turn into big plants! Now, we will make a drawing of how our mini/ container garden will look one month later!</p> <ul style="list-style-type: none"> <li>- Draw all the parts of the plants that we have learnt about!</li> <li>- Make sure you draw and label different parts of each plant!</li> <li>- Make sure one of your drawings includes all the parts of the root and shoot system including:             <ul style="list-style-type: none"> <li>- Flower</li> <li>- Fruit</li> <li>- Stem</li> <li>- Leaves</li> <li>- Buds</li> <li>- Roots</li> </ul> </li> <li>- Once done, draw how your mini/ container garden will look like in different seasons (different stages of its life cycle)!</li> </ul>  <p>Make sure you colour your drawings!</p>
10 minutes	<p><b>Presentation</b></p> <p>Show your mini/ container garden to your friends and family and explain to them:</p> <ul style="list-style-type: none"> <li>- What steps you took to put the garden together,</li> <li>- What your drawing shows, and</li> <li>- Why do your plants look different in different seasons?</li> </ul>

<b>Additional enrichment activities:</b>	Students can build 3D models showing how transpiration and transportation take place inside of a plant. They can use paper, cardboard, plastic tubes and water to create their models.
<b>Modifications for simplification</b>	Students can draw It can also be simplified by eliminating the students' drawings of the garden and accepting the mini garden as the final product.

## ASSESSMENT CRITERIA

A majority of my students were able to:

- Plant at least one seed.

- Follow the scientific method correctly and record observations during experiments.
- Create a legible labelled drawing of the parts of their plant including the shoot and root system.
- Explain the functions of each part and uses of the plants used in the container/ mini garden.

## APPENDIX

---