



# The Thinking Classroom

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Lesson Plans for Primary Teachers

**SCIENCE: PLANTS**

## **The Thinking Classroom** **A Guide for Teachers**

### **Introduction**

This module containing seven primary level lesson plans (LPs) will lead you towards transforming your classroom into a Thinking Classroom.

### **The Aims of Education**

“To educate Pakistanis to be:

- Seekers of truth and knowledge who can apply both for the progress of society;
- Creative, constructive, communicative and reflective individuals;
- Disciplined, productive, moderate and enlightened citizens;
- Capable of effectively participating in the highly competitive global knowledge-based economy and the information age; citizens committed to creating a just civil society that respects diversity of views, beliefs and faiths.”

(Ministry of Education, Government of Pakistan, 2006)

So with these aims, surely we need to change something in the way we teach!

### **Why we need Critical Thinking (CT)**

Everyone thinks, but a lot of it is biased, distorted and uninformed. The quality of our life and what we create and build and the decisions we make depend on how we think. Poor thinking and lack of CT can lead us to many poor decisions.

### **What does CT entail?**

- Assessing, analysing and reconstructing any problem, situation or content
- Making informed decisions
- Logical thinking and reasoning
- Being able to create and innovate; build something new and original
- Out of the box thinking and questioning deeply from different perspectives
- Thinking about thinking & how to improve it

### **Why it is difficult to be Critical Thinkers in our school system**

- Too many facts
- Too much memorising and too little thinking
- Lecture and rote memorisation, which does not require critical thinking
- Students are not “trained” to think

### **Teaching Framework for the TTC Lesson Plans**

You probably teach one new concept (or chapter) for one or maybe two weeks. We have developed these LPs on the premise that it is one five-day week. If it is two, or you carry on until the children have understood, you can explore the concept in more depth.

A suggestion for the Five-Day LP is that for the first three days you deliver the content from your textbook the way you always do and then spend the next two days on CT and active learning. Active learning is when children are engaged in hands-on activities and in making sense and meaning of the content themselves rather than listening passively to a teacher’s lecture on a topic. Some examples of active learning are: classroom discussions, small group work, working with materials, debates on an idea, problem solving and listing ideas, making presentations. So, how about creating some excitement in your classroom with active learning.

### **Guidelines for You the Teacher**

#### **Young children are not too young for complex concepts**

You may think that some of the ideas or concepts being introduced in these LPs are too difficult for such young children. In reality, however, we are introducing them to ideas that they are already familiar with because they have either heard their parents talk about them or have heard someone else either in person or on television or radio. What we are doing here is giving them the opportunity to explore these ideas, to think about them in a focused manner. Please remember, we are not expecting them to give us correct, accurate answers.

#### **Listen to and accept children’s answers no matter what**

Let the children be inventive with their responses and if their answers sound amusing or strange, we still need to accept their answers and extend the conversation. Concepts are constructed gradually

over time by exploring their attributes and thinking critically about them and coming to our own understanding of them. Both children and adults go through this process when they encounter something new. The something new can be either concrete or abstract.

### **Engage with the children**

It is important for teachers to create a climate of trust and comfort where the children don't feel threatened or inhibited. Talk to them conversationally, ask after them and show them that you are interested in them as individuals. When the activity says make a circle, you need to decide what will be most appropriate for that activity, whether to sit or stand in a circle and you should sit or stand with them.

### **Give children space and time to think**

During discussions, remember that some children may need a little time and positive encouragement to express their thoughts and some may prefer to remain quiet for a few seconds or minutes. Do provide waiting time after asking a question to give less confident children an opportunity to formulate their responses. Remember to smile or laugh when something is funny. Your facial expressions should match what you are saying and remember to speak in a soft, natural, conversational tone.

### **Planning the lesson for the week ahead**

As the teacher, you understand your local context, what your children can do and what their interests are. You also know how much space you have in your classroom and what resources are available to you, so it is up to you to decide how to implement the active learning CT LP in your classroom. Do please read through the entire LP carefully and decide before the new week begins, what to do each day for the week ahead and also prepare all the materials you will need.

### **Time required for the LP**

We have not mentioned a time frame in each lesson plan but it will probably take about 80 to 90 and in some cases about 110 minutes, spread over two days. It depends on you, the number of children you have in class and your timetable. You may need more or less.

### **Group size**

Some segments of the plan require the entire class and no small groups. When you need to divide them into groups, and the LP says divide the children into groups of five you can do this easily if you have 25 children present that day. If you have one or two children left, it is not a problem, just accommodate them into any group. If you have 36 children, you can divide them into groups of six.

### **Group roles**

It is a good idea to assign roles to the members of each group so that everyone knows what to do. The entire group must participate and share their ideas and views and if the task calls for more roles than listed here, please go ahead and delegate the tasks. There must be:

A **timekeeper** who makes sure the work is done in the timeframe that you have given them.

A **note taker** who listens to what group members are saying and writes down everything based on the task you have given them.

A **presenter** who will present the group's work when everyone has finished and you give the signal to present.

### **Structure of The Thinking Classroom Lesson Plan**

Each LP for Classes 1 to 5, ECE and Multi-age follow a similar structure. The ECE LPs have a couple of additional features that are not in the Primary Level LPs. These are differentiated with an \* at the beginning. All the modules and topics are linked to The National Curricula, developed by the MoE, Government of Pakistan, 2006-07.

This is how the LPs have been structured:

**1. Curriculum Link:** The link is stated exactly as it is in the relevant curriculum. The Student Learning Outcomes (SLOs Primary Level) and Expected Learning Outcomes (ELOs ECE) and page numbers are mentioned so that you can find it easily in the document. In certain curriculum documents bullet points have been used to separate SLOs, in others letters and in some roman numerals have been used. We have used these exactly as they are in the respective curriculum. The SLOs and ELOs may not be in sequence, for example, i ii iii or a b c. This is because all the SLOs and ELOs for one topic or theme are not addressed in one LP. So only those that are being addressed are mentioned. So you may see, i iv & viii or a d & g.

**2. Students' Learning Outcomes:** These are the same as the objectives in a LP. We are familiar with objectives and have been taught that before we plan a lesson we have to be clear about our objectives for that lesson. We have to think about what we hope the children will learn when we have completed that lesson. So the SLOs are the objectives of the plan.

\* **Expected Learning Outcomes:** These are also the objectives of the lesson plan. So why use the word 'expected' instead of student? The NC-ECE charts out learning outcomes that young children are *expected* to achieve. Given the diverse developmental levels, learning styles and pace of learning, many children may not achieve all the outcomes (objectives) at the end of the lesson or even in the one year that they are in the ECE/pre-primary class. Therefore, the outcomes for this age level have been termed as "Expected" and educators and supervisors should not be overly concerned about children completing all the activities or meeting each and every outcome. This however does not mean that teachers should not support children's curiosity and learning, but that they should not force them to learn something they are not yet ready to learn. It is the process and not a 'perfect' product that's more important at this age and stage.

**3. Prior Knowledge:** Studies show that learning progresses primarily from prior knowledge, and only after that from the materials we present to students. Think about this. We teachers spend so much time gathering materials, which is important no doubt, and necessary too for good teaching, but only if we build on children's prior knowledge. Many of us are also guilty of hurrying through teaching some concept or skill, and not taking the time to slow down or ask the children what they already know about the concept or topic. So if we want to ensure that children make important mental connections about the content we are about to teach, we must build on prior knowledge.

**4. Resource Requirements & Preparation:** This part of the LP will tell you what materials you will need to implement the lesson plan. To make it easier for you, it clearly indicates what you will need for the Three Phases of the LP: the Beginning, Middle and Conclusion (BMC phases) and what you need to prepare beforehand so that you don't waste any time during class. If the LP requires pictures of food, buildings, uses of water, anything at all, you can find pictures in calendars, diaries, newspapers and magazines. Don't forget to look online too. Whenever possible, please recycle! Save old magazines, newspapers, greeting cards and invitation cards and use these to make instruction cards and slips for group work. Empty biscuit and tea boxes and *gatta* are also handy for making resources. Empty shoeboxes are extremely handy for storage and they stack well too.

**5. Methodology:** Each LP is divided into three distinct phases based on a BMC Model. Here is a brief explanation on what each phase entails:

The **Beginning** Phase: In this phase, you can ask children to think about or ask questions about the topic. This phase will help you to:

- Informally assess what the children already know including any misconceptions
- Set the purpose for learning
- Focus attention on the topic

The **Middle** Phase: In this phase, you will lead children to explore the topic in more depth. They will engage in finding out, making sense of the material, answering their prior questions and finding new questions. This phase will help you and the children to:

- Revise expectations or raise new ones
- Identify the main points
- Make inferences about the material
- Make personal connections to the lessons

The **Conclusion** Phase: During this phase you will give children the opportunity to reflect on what they have learned, reflect on how their thoughts have changed and think about application of the new knowledge. This phase will help you and the children to:

- Summarize the main idea
- Share opinions
- Think about application

**6. Assessment:** This part will suggest ways in which you can assess what the children have learnt and evaluate whether the SLOs or objectives have been met. The assessment strategies suggested here are not traditional paper and pencil tests, but please do try out a different way of assessment.

\* **Extension Activity:** In this section, you will find some activities you can engage the children in at a later stage. As the heading suggests, these activities will help children explore the ideas in the LP in different ways thereby helping them understand the concept better.

\* **A Note for the Teacher:** Under this heading you will find tips to help you understand how to address the topic with young children or how you can work on the same concept throughout the year.

### **CT Questioning Techniques**

Throughout the LPs you will see a reference to CT questioning techniques. In the questions below some names of girls and boys have been used. Needless to say, these are only examples; replace these names with names of children in your class. Try and make sure that you address each child over the course of a few days so that nobody feels left out. You can follow these steps to involve children in thinking critically.

**Ask open-ended questions:** These are questions that invite more than one plausible answer. They have no right answer and no wrong answer either. You need to listen to and 'accept' all answers. Open-ended questions allow the formulation of any answer, rather than a selection from a set of possible answers in the questioner's mind.

**Ask follow-up questions:** These are questions you will ask after one child has responded to a question, for example, "What can you add Nida?" or "What is your opinion, Omar?"

**Provide feedback that neither confirms nor denies children's responses:** If you provide this kind of feedback, then the discussion remains open. For example: "That is very interesting ... I hadn't thought about that before."

**Survey the other children:** This kind of questioning also takes place after a child has responded to a question. Rather than you saying that it is correct or incorrect, survey the children by asking, "Who agrees with Ali?" "Who disagrees with him?" "Why?" Tell them it is okay to agree or disagree as long as we don't hurt anyone's feelings and do it in a polite way. It does not mean we don't like the person we disagree with.

**Encourage children to direct questions to other children:** You can do this by saying, "Omar, ask Komal if she can add something to your response?"

**Use think-aloud:** When a child comes up with a solution to a problem that has been posed as part of the lesson, you can ask, "How did you figure out that answer Tariq?"

**Call on all children:** Involve the entire class, not only those who raise their hands. But move on quickly to another child if someone chooses not to answer.

**Assure the children that there are no wrong answers:** Encourage everyone to have a go at answering a question by saying, "There are many possible answers to this question. Come on, give it a try!"

**Encourage the children to be imaginative:** Quite a few LPs suggest this approach. You can use it in other LPs too. Just relate it to the topic and say, "Imagine what would happen if...?"

## Which Part of a Plant did I Eat Today?

### ECE

**Curriculum Link:** National Curriculum for Early Childhood Education, 2007. Key Learning Area: The World Around Us, Competency 3, pages 32 – 33.

**Competency 3:** Children will recognise the plants and animals in their environment and explore their basic features and habitat.

### Expected Learning Outcomes

By the end of the year children will begin to develop the attitudes, knowledge and skills to:

- c. Recognise plants and explore their basic features
- d. Talk about the significance of animals and plants for human beings
- e. Explain how to take care of animals and plants
- f. Take actions to demonstrate a caring attitude towards plants and animals

Please note that the activity that follows will address only the plants part of the above mentioned expected learning outcomes.

### Prior Knowledge

All the children have seen plants, though they may not have observed them closely unless someone in their family loves plants or is in the plants business. Most children will know that plants need sunlight and water and soil to grow.

### Teaching Material & Preparation

**Beginning:** Different plants in their pots and pictures of the parts of a plant, which are not visible right away, such as the roots

**Middle:** Pictures of familiar food from newspapers or old magazines

Children's snacks that they have brought from home to eat during break time

**Conclusion:** Sheets of paper and crayons for each child and the lyrics of the song, '*channa kis ne boya?*'

### Methodology

- *Beginning:* Help children recognize the main parts of a plant, such as, root, stem, leaves, flowers and seeds and compare the parts of various plants. Give them the opportunity to touch, smell and feel the different textures of different plants, and talk about similarities and differences.

- *Middle:* Then show children the pictures of different dishes of food and discuss what they are, which dishes are cooked on a daily basis, which dishes on special occasions and which are children's and their families' favourites. Share your own favourites too.

You can begin by asking the children the following questions in a gentle, conversational tone:

- "Does anyone know what goes into these dishes? What are the ingredients we use to cook these dishes?" With the children make a list of ingredients that goes into, say, beef biryani. Make a list on the chalkboard as the children respond.
- Now look at the list you have made with the children and ask them questions about the parts of the plants that went into making their favourite food. For example, if one of their favourite foods is *beef biryani*, discuss all the ingredients including the spices and talk about which part of a plant it came from. Also ask the children about the beef. Where does that come from and what does the cow eat to stay alive ... again, the cow's food also comes from plants.
- Ask them to bring their snack boxes to the table/floor wherever they are seated and open their boxes. Then ask them to think about which parts of a plant has gone into making their snacks. Listen to the children and prompt them where necessary.

- You can sum up the discussion by stressing the importance of plants in our lives and saying that either directly or indirectly plants are responsible for our food. Our bread, rice, lentils and vegetables all come from different parts of plants. The animals we eat depend on plants for their food. So we can trace our food back to flowers, leaves, roots, stalks and seeds.

- *Conclusion:* Sing a song or poem about food, for example, '*channa kis ne boya?*' along with actions. Hand out the paper and crayons to the children and say to them, "You can draw your favourite dish and then think about all the ingredients that went into making it and draw those too. We should encourage them to express their thoughts in whatever way they like. When they are done with their drawings display them in the classroom and talk to them about their drawings over the next couple of days.

**Extension Activity:** Encourage children to reflect on and share ideas about actions which are harmful for plants, for example, pulling off flowers and leaves from their stems. Discuss ways of showing respect and care for plants. Talk to children about organisations and people who love and protect plants. Find out about these organisations from the Internet or your local Nazim.

Take the children for a walk in the neighbourhood for a 'Plant Hunt'. Before you set out make a list of the plants and parts of the plant that you want to identify. When you are out and about on your walk, wait for the children to point out a tree, leaves, stem and roots and whatever is on your list. Take some small magnifying glasses along with you and encourage the children to look carefully at the veins on the leaves, the patterns and textures on the barks of the trees, small buds and seeds and also insects and bugs that plants are hosts to.

**A Note for the Teacher:** Use every opportunity to talk to children about caring for plants. Everyone does not have a special love for plants but we can still be respectful towards them. They are living things and of great value and help to us and we should use food with care and eat only as much as we really need.

## Root-Top Gardens

### Class 1

**Curriculum Link:** National Curriculum for General Knowledge. Grades I – III, 2007. Things Around Us. Plants and Animals. Page 18.

#### Students' Learning Outcomes

- Recognize that plants and animals need water, food and air to live.
- List ways in which they can take care of things around them.

Please note that the activity that follows will address only the plants part of the above mentioned expected learning outcomes.

#### Prior Knowledge

By the time children reach Class 1 they have seen plants in more than one setting; their homes, schools, neighbourhoods, market places, malls, parks, roadside, fields, in short, everywhere. They can recognize plants and have explored their basic features through observations and even by imitating the role models they see interacting with plants. They may have even heard some adults talking about plants and how they need to be looked after and cared for by us.

In the past few weeks during the theme on *Plants and Animals*, they have come across a variety of plants, can recognize the differences between some plants that they see around them and also identify some plants in their surroundings. They know the importance of plants in our daily lives as a source of food, shade and shelter and can even identify some things that are made out of plants.

#### Teaching Material & Preparation

- Beginning: Some potted plants of various kinds, only if you don't have access to a garden or a park
- Middle: The tops of root vegetables like carrots, turnips and beetroots, which we usually throw away; four large plates; enough pebbles for four root-top gardens and water in two bottles
- Conclusion: Notebooks, pencils and crayons

#### Methodology

• **Beginning:** Take the children for a walk in the school courtyard, a nearby garden, park or nursery. If there isn't any natural greenery in the neighbourhood, use potted plants. Ask the children to observe the plants closely and carefully. Tell them to touch and feel the plants carefully and gently. Ask them to name the different parts of a plant. Show them the roots of a plant too.

When they have finished observing and naming the parts of plants, have a brief discussion with them about what plants need to grow and flourish. Help them make a connection to themselves and their family that just like them, plants are also living things and need food and water and sunshine and a home to live in. Some children may talk about plants like a cactus and you can talk about how a cactus needs very little water to grow. Ask questions such as:

- I wonder where plants live! Do you think their homes are like ours?
- Do you know what might happen to the baby plants if we place the seeds too close together? Would they be able to grow?
- I wonder what might happen if we keep plants in a dark closed room?
- Who would like to tell us what kind of food plants need to grow and be healthy?
- If you had a little plant, how would you look after it?

• **Middle:** Have all the children sit in a circle on the floor and sit with them. Tell them that they are going to make root-top gardens, which they will have to look after over the next couple of weeks. Show them all the root vegetable tops plates and pebbles you have brought and tell them that they will work in groups and must all give each other an opportunity to handle the materials.

Divide the children into four groups and give each group a plate, some of the tops of the root vegetables and some pebbles. Two groups can share one bottle of water.

Tell the children to put the root-tops in the plate leaving some space between them. Then they should add a little water, just enough to cover the bottom. Then they can fill the spaces between the root-tops with the pebbles. Next the plate needs to be kept on a sunny windowsill or in some other sunny spot.

Have the children sit down again in a circle on the floor. Sit with them and discuss the root-top garden. Let them ask any questions they may have and go over a list of what they need to do to look after their root-top gardens. In a few days they will see little shoots starting to grow and in about two or three weeks they will have a lovely leafy garden.

1. Growing plants need plenty of water, so they will have to check everyday and water their little gardens.
2. Make sure that the root-tops are getting plenty of sunlight.
3. See if the pebbles need some gentle cleaning.
4. Make sure no animals or insects disturb the roots or baby shoots.

**Conclusion:** In their notebooks, the children can draw and colour the root-top garden that they have just planted.

This can be an on-going activity and as the shoots and then leaves start growing, the children can record the growth by observing and drawing in their notebooks how the roots look on that particular day. Encourage them to look at the differences in the leaves coming out of the different vegetables roots.

**Assessment:** To assess children's understanding observe how they care for their root-top gardens and also look at what kinds of leaves they draw in their notebooks.

## *We Need Plants to Survive*

### *Class 2*

**Curriculum Link:** National Curriculum for General Knowledge, Grades I – III, 2007. The Natural Environment. Plants. Page 24.

#### **Students' Learning Outcomes**

- Identify the ways in which plants are used (food, clothing, shelter, etc.).

#### **Prior Knowledge**

By the time children reach Class 2 they have heard, studied and experienced plants in a variety of ways. They can recognize the differences between the plants they see around them and know the importance of plants and trees as a source of food, shade and shelter. They have talked about how plants, like all living things need water, food and air to live and have discussed ways in which they can take care of them. In this class, they've already learned more about plants. They can name most of the plants that grow in their surroundings, can identify and list functions of major parts of a plant and recognize that soil and water is needed to grow a plant. These newly acquired concepts need reinforcement and practise for the children to master them.

#### **Teaching Material & Preparation**

- Beginning: Board and chalk

- Middle: Four sets of objects, one for each group: a pencil, eraser, sharpener, plastic ruler, an empty medicine strip, a rubber band, some yarn, strands of wool, a piece of cloth, some pulses, a slice of bread, some spices, writing paper, a lump of mud and a couple of small plastic toys, some stones, a key and some buttons. You can add more or take away some items based on what is easily available. Board and chalk

Plants Comparison Table Please see page 10. A sheet of paper, one for each group and space to display the group work

- Conclusion: The Squirrel's Home. For the story, please see page 10

#### **Methodology**

- *Beginning:* When all the children are comfortably seated, begin the class by putting the word '*plants*' on the board and say to the children, "We have been talking about plants for the last couple of days, let us put down everything we remember about plants on the board." "Please raise your hand when you recall something about plants and give me a bit of time to write it down. Okay?"

As the children recall and respond, make a list on the board. When children are done with sharing what they remember use their responses on the board to sum up the discussion.

- *Middle:* Say to the children, "First I will divide you into groups. Then I will give you some objects to examine. Some of the objects are related to plants and some are not. You are going to examine the objects carefully and decide which are plant-related and which are not. Everyone in the group must contribute and make a decision together about each object. Then I will give each group a sheet of paper. On the paper, one person from the group will copy the table that I will make on the board. Then you will fill in the table by writing the names of the objects in the correct column. If you just can't figure out which column to put any of the objects in, you can write it in the 'Do not know' column and we will discuss it later. For this activity you will get 20 minutes. I hope everyone has understood what to do. Do any of have any questions?"

Divide the children into groups and hand them the set of objects for this activity. As they get busy with the task, you should circulate amongst the groups and support them in their discussions.

When the children are half way through the activity say to them, "You have ten minutes left. After another ten minutes are over, one person from each group will have to return the materials you are working with. You will then display your sheet on this board and then each group will talk about the objects and the columns you've put them in and explain why you put them there. If there are no further questions you can carry on with your work. When your 20 minutes are over I will let you know."

When the time is over inform the children. Let them put up their sheets on display and get each group to share their work, one at a time. You will need to manage the discussion here by asking the groups their reasons for putting a certain object in a column. Make sure the children who want to speak get a turn.

Conclude this activity by discussing the objects that the children have written in the 'Do not know' column.

• *Conclusion:* Now it is time for a story. Say to the children, "I'm going to tell you a story about a squirrel who lives in a tree in a park. Listen carefully and then we will have a discussion on it. Let me know when you are all ready and I will begin." Read or tell the story 'The Squirrel's Home' to the children. Then ask children the following questions such as:

- How do you think the tree helps the squirrel stay alive?
- What do you think will happen to him if his home is taken away from him? I wonder what we could do if our home is taken away from us?
- Do you have any ideas that could help Sarim save the squirrel's home?
- Imagine that one morning when you wake up you find out that there are no more trees and plants on the earth. All the greenery has been destroyed. What do you think might happen to us, our families and to the planet?

**Assessment:** Ask children to make a list of the things that they use on a daily basis which are made from plants. You could ask them to illustrate their list.

**Plants Comparison Table**

From plants	Not from plants	Do not know

**Story: The Squirrel's Home**

Not far from Sarim's school is a park, one that has been closed to the public and neglected by the authorities for a long time. Sarim lives next to the park, very close to his school.

One day, on his way home he goes into the park. Not expecting to find anyone inside, he is surprised when he sees a squirrel dart past him and up into a nearby tree.

He hides behind a bench so that he doesn't frighten the squirrel. After a while he peeps out looking towards the tree and sees the squirrel doing the same. When Sarim and the squirrel realize that they are both afraid of each other, they slowly come out to have a look.

"Hello Squirrel! My name is Sarim. I was on my way home when I slipped in through that broken gate to have a look inside the park. What is your name?" A bit shy and tongue tied the squirrel speaks up, "I don't have a name. No one has visited this park for a long, long time and I got scared when I saw you. I thought you were here to chop down my home."

"Your home! Where is your home and why would I chop down your home?" said Sarim, in a surprised tone. "But that is what some people are planning to do. They have closed the park and have ignored everything here for such a long time because they want to build a shopping mall and some high rise apartments here," replied the squirrel. "My home is this tree. You can see that tiny hole up there, that is where I live." Sarim was a bit surprised and shocked to hear that. "So what will you do when your home is chopped down? Where will you sleep, where will you stay? Have you looked for another home?"

The squirrel, a bit sad and upset said, "No I have not looked around because there are no trees close by. I don't even know if I can find another home. Do you think you can help me?"

## Living Things Change

### Class 3

**Curriculum Link:** National Curriculum for General Knowledge, Grades I – III, 2007. The Earth as a Living Planet. Changes in Living Things. Page 29.

#### Students' Learning Outcomes

- Interpret diagrams of the life cycles of animals and plants to identify the different stages
- Sequence the stages of the life cycle of a plant/ animal
- Illustrate the life cycle of an animal and a plant

Please note that the activity that follows will address only the plants part of the above mentioned expected learning outcomes. For this activity, it is best if you do the planting when you begin this module so that some changes can be observed during the week.

#### Prior Knowledge

Children at this age level are aware of all the living things that grow around them including plants. They know that plants have certain needs to grow like soil, water and sunlight. They are also aware that with time, plants change in terms of their growth and appearance. However, they may not be aware of the sequence of that growth.

#### Teaching Material & Preparation

- Beginning: Mustard seeds (germination time: 1 day), bean seeds/ sunflower seeds (germination time: 3-6 days), jar or bottom half of a plastic bottle, paper chits for nametags, pencils and soil and water.

- Middle: No materials required

- Conclusion: A4 size blank paper, pencils and colour pencils for each child and a stapler to make a mini booklet on the Life Cycle of a Plant.

#### Methodology

• *Beginning:* When the children are settled, begin a discussion about the life cycle of human beings going from a baby to an elderly person. Talk about the growth patterns and changes we see and the different appearances and abilities that we develop at different ages and stages of life.

Next relate this example to plants and ask the following questions:

- Do you think plants, which are also living things undergo such stages and changes in their life cycle?

- What kind of changes do you think they go through?

- Do you think they also begin to look different like we look different at different ages?

- What about their functions? Do these also change?

You can sum up the discussion and say "Let's observe these changes first hand by growing plants." Divide the children into small groups of about three children. Give each group a jar or bottom half of a plastic bottle, about 5-6 seeds (sunflower, beans or mustard) and some soil and water and paper for the nametags and pencils

Tell them how to sow the seeds and then water the soil gently and keep the bottles in a sunny place. Tell them that they will observe it over the next couple of days. Ask them to check the soil and see if it is dry and needs water.

• *Middle:* Let the children observe closely what has happened to their seeds throughout the week. Encourage them to observe their own and the other seeds as well. If you have a garden in the school or a nearby park take them there to observe the different stages that plants are at.

When you return and all the children are seated and you have their attention, discuss their observations about their own seeds asking questions such as, "What changes did you observe in your seeds?" "Are all the seeds at the same stage of growth?" If any of the seeds have not germinated then talk about the possible reasons for that. Bean and sunflower seeds have 3-8 days of germination.

Some children's seeds may have moved to the seedling stage while some may not have any observable changes, as they need more days to germinate.

Then discuss what they observed outdoors about how a plant grows, what happens to a seed, what comes next and how it progress. Then draw the life cycle of a plant on the board to help children see the sequence. Encourage them to direct you on what to draw next. Also discuss the other methods of plantation. Ask the children questions such as "Do you think it is only seeds that lead to the growth of plants or are there other methods to grow a plant as well? Discuss these other ways with them.

- *Conclusion:* Give the children the paper, pencils and colour pencils and tell them to make a mini booklet. Then they can illustrate and write about each stage on a different page in sequence. Remind them to leave the first page as their cover and encourage them to create a title for it. Once they are done with their work ask them to share their booklets with each other.

**Assessment:** The children's mini booklets will help you assess their understanding of the life cycle of a plant.

## Life Cycle of a Plant

### Class 4

**Curriculum Link:** National Curriculum for General Science. Grades IV – V, 2007. Characteristics and Needs of Living Things. Page 28.

#### Students' Learning Outcomes

- Draw and label key stages in the life cycle of a plant and an animal.
- Conduct a simple experiment to show growth in plants.

Please note that the activity that follows will address only the plants part of the above mentioned expected learning outcomes.

#### Prior Knowledge

Plants and trees are part of our environment and children are aware of the different plants and trees in their surroundings. They can identify the food that comes from the plants as well as other things that we get from plants, such as wood, paper, rubber, gum, oil, herbs. In the previous classes, they have studied about the different parts of the plants and their jobs. They have also studied about the ways to take care of the plants. They are aware of what plants need to grow and make their own food.

**Note:** One week or ten days before conducting this lesson, organise a germination activity with the children. Germinate different seed in glass jars, cups or pots. Encourage children to observe and take care of these seeds/saplings. Get them to record the growth of these plants in their notebooks, either in written or pictorial form. Remind them to note down the date for each entry.

#### Teaching Material & Preparation

- Beginning: Plants grown by the children
- Middle: Paper and pencil
- Conclusion: Paper and pencil

#### Methodology

- *Beginning:* Bring in all the pots, jars and cups in which the seeds were sown. Let children look at them and talk about those plants. If any of the seeds didn't sprout, discuss the reasons. Ask questions such as:

- I wonder why these seeds did not sprout? What could the reasons be?
- Does anyone know what actually did help the seeds grow into plants?
- Look at how the leaves grow upwards towards the sun? Why do you think plants need light?
- Does anyone know what would happen to the plants if we water it excessively?
- What do you think would happen if the seeds were put in sand instead of soil? Why do you think there is so much soil attached to the roots?

Carry out this discussion in a conversational tone and do give children time to think about a question before going to the next. Remember to use the critical questioning technique. Also create an interest in them as little scientists and encourage them to observe and record changes in different kinds of plants, trees, shrubs, flowers and grass in their environment during winter, summer, spring and autumn.

- *Middle:* Begin with a whole class discussion by asking children to share their observation records of the germination activity and the growth of the plants.

As the children share their observations, ask them to describe how plants change as they grow. What happens to their size? What happens to their shapes and their different parts?"

Building on their responses, you can reinforce the concept that plants have a life cycle that includes sprouting; developing roots, stems, leaves and flowers; reproducing and eventually dying.

After this discussion, ask children to draw the life cycle of a plant by saying: "Now in your notebooks, draw a life cycle of any one plant of your choice. You need to draw the different stages in

sequence and then label them. Do you remember that you did a similar activity in Class 3? This time you need to add more details.”

Give children time to draw and label the life cycle of a plant.

- *Conclusion:* Now, ask them to write the autobiography of the plant that they drew. Ask them to imagine that they are the plant they drew and labelled and write their own story about how they were born and how they grew and what they felt during the process.

Encourage children to incorporate the class discussions on plants into their creative writing.

When they are done, ask them to share their story with the person sitting next to them and see what they wrote about. Give them time to review their work with their partners.

**Assessment:** Children’s individual drawings and creative writing will help you to assess their learning. You can also give them time to write at least five most important or interesting pieces of information that they learned about plant life.

## Germination of Seeds

### Class 5

**Curriculum Link:** National Curriculum for General Science Grades IV – V, 2006. Seeds: Structure and Germination. Page 33.

#### Students' Learning Outcomes

- Identify the conditions necessary for germination.
- Predict what would happen to plant, if conditions necessary for germination are not fulfilled; Conduct an investigation to assess your prediction.

#### Prior Knowledge

Children have learnt a lot about plants in the previous classes. Earlier on in this class they have studied about the classification and characteristics of plants (flowering and non-flowering plants), the classification of flowering plants (monocotyledonous and dicotyledonous) and characteristics of monocot and dicot plants. They are familiar with the different parts of plants such as seeds, roots, shoots, flowers and its parts. They have been studying about how plants grow from class one onwards and have even experienced growing seeds and seeing tiny shoots sprout from them. They also have a basic understanding of the conditions necessary for germination to take place.

#### Teaching Material & Preparation

- Beginning: Chalk and board
- Middle: A blank sheet of paper, one for each group. Pencils, rulers and markers
- Conclusion: 8 plastic cups, a roll of cotton wool, a handful of peas, plastic sheet, a little cooking oil, water and some freezer space. Prepare the experiment according to the instructions below.

**Instructions for the Experiment:** You need to prepare for this lesson one week before conducting it. For this experiment, you have to put seeds in four pairs of plastic cups and store them in different locations under different conditions. This set up will be used to experiment and test the conditions necessary for germination.

In the first pair of cups:

- Put some peas over some cotton wool in one cup and cover it with a plastic sheet with a few holes pricked in it. Don't add any water.
- Put some peas over some cotton wool in the second cup and add enough water to cover the cotton but not the peas.

In the second pair of cups:

- Prepare both cups with cotton wool at the bottom and place peas on them. Put enough water in both cups to cover the cotton but not the peas.
- Add cooking oil to cover the peas in one cup.
- Cover both the cups with a plastic sheet.
- Make holes in the sheet covering the cup without oil.
- Do not make any holes in the sheet covering the cup, which has oil over the peas.

In the third pair of cups:

- Prepare them with the cotton wool, peas and water in the same way as done for the above two pairs and cover them with a plastic sheet.
- Place one cup in the freezer, at -18 degrees Celsius and one in a cupboard at room temperature.

In the fourth pair of cups:

- Prepare the cups in the same manner and keep one on a windowsill in a place with sufficient sunlight and one stored away in a dark place, with minimum light.

Let these cups sit for at least 3 – 5 days. Look at them from time to time to ensure the ‘conditions’ of the experiment are maintained.

### **Methodology**

- *Beginning:* Start a discussion about living things and what they need to grow and be healthy. Then focus the discussion on plants. Ask questions such as, “Does anyone know how a plant begin its life?” and “ What conditions are necessary in order for a seed to germinate or grow?”

As children answer the questions, write their responses on the board asking for clarification where needed. Use their responses on the board to sum up the discussion and introduce the group activity to the class.

- *Middle:* To start off the activity, say to the children, “We have already talked about the conditions that are necessary in order for a seed to germinate. You do remember these conditions, don't you?” Go over the conditions with them if necessary. Then say, “Now I will divide you into four groups. In your groups, you will talk about what will happen to a seed if these conditions for germination are not present. At the end of this discussion, each group will make a prediction list, which we will discuss in light of an experiment I had set up a week ago. You will be able to see if your predictions are correct or not. Is everyone clear on what needs to be done? For this activity you will get 25 minutes, after which we will start to share and compare our predictions with each other.”

As the groups get started with their discussion go to each group and hand them a sheet of paper on which they will jot down their predictions. Each group will jot down at least five predictions. Closer to the end of the allotted time, remind the children to finalise their prediction list and get ready to share.

- *Conclusion:* When the groups have completed their prediction lists, bring out the prepared experiment cups and ask the children to have a close and careful look at them. They need to compare their observations to their own list of predictions.

As they observe, compare and discuss, they will come to some conclusions about how correct or incorrect their predictions are. Remind them to discuss the observations they did not anticipate or those that were contrary to their predictions. Based on the children’s observations and conclusions bring the discussion to closure by summing it all up.

Then, bring up an imaginary problem so that the children can stretch their thinking skills: Scientists have told us that our planet Earth will be engulfed with a thick cloud of smoke for the next three years. What can we do to ensure that the conditions necessary for germination are met? Have a lively discussion as children share their ideas, however far-fetched they may sound.

**Assessment:** To assess the children, ask them to do the following work in their notes books: Write down any 2 conditions necessary for germination. Using the experiment shared in the class write down your observations and understanding of the importance of the two conditions you have listed.

## *From Seeds to Plants*

### *Class: Multiage*

**Curriculum Link:** National Curriculum for General Knowledge Grades I – III, 2007.

Class 1: Things Around Us. Plants and Animals. Page 18.

Class 2: The Natural Environment. Plants. Page 24.

Class3: The Earth as a Living Planet. Changes in Living Things. Page 29.

**Curriculum Link:** National Curriculum for General Science Grades IV - VIII, 2006.

Class 4: Characteristics and Needs of Living Things. Page 28.

Class 5: Seeds: Structure and Germination. Page 33.

### **Students' Learning Outcomes**

- Recognize that plants and animals need water, food and air to live.
- Conduct a simple experiment to show growth in plants.
- Identify the conditions necessary for germination.

This activity will conclude after a week as the children will be sowing the seeds and then closely observing them over the week to track any changes they observe.

### **Prior Knowledge**

All children have seen plants in more than one setting and have heard about and experienced them in a variety of ways. Some of them know that plants are living things and just like other living things, need certain favourable conditions for their growth. All the children will not have the same amount of knowledge about plants, but that should not be seen as a problem. The younger children will learn and hear of new things from the older ones.

Since you have children of different ages in your class, you can conduct activities in which all of them are involved at the same time. Having younger and older children at different levels of development and understanding can be used as an advantage that allows the children to learn from each other.

### **Teaching Material & Preparation**

- Beginning: Some potted plants of various kinds, only if you don't have access to a garden or a park
- Middle: Mustard seeds (germination time: 1 day), bean seeds/ sunflower seeds (germination time: 3-6 days), jar or bottom half of a plastic bottle, paper chits for nametags, pencils and soil and water
- Conclusion: No materials required

### **Methodology**

- **Beginning:** Take the children for a walk in the school courtyard, a nearby garden, park or nursery. If there isn't any natural greenery in the neighbourhood, use potted plants. Ask the children to observe the plants closely and carefully. Tell them to touch and feel the plants carefully and gently. Ask them to name the different parts of a plant.

When they have finished observing and naming the parts of plants, have a brief discussion with them about what plants need to grow and flourish. Help them make a connection to themselves and their family that just like them, plants are also living things and need food and water and sunshine and a home to live in. Some children may talk about plants like a cactus and you can talk about how a cactus needs very little water to grow. Ask questions such as:

- I wonder where plants live! Do you think their homes are like ours?
- Do you know what might happen to the baby plants if we place the seeds too close together? Would they be able to grow?
- I wonder what might happen if we keep plants in a dark closed room?
- Who would like to tell us what kind of food plants need to grow and be healthy?

- **Middle:** Summing up the above discussion say to the children, “Let’s try growing plants ourselves and see what happens, if they all grow or not.” Divide the children into small mixed aged groups of about four to five children. Give each group a jar or bottom half of a plastic bottle, about 5-6 seeds (sunflower, beans or mustard) and some soil and water and paper for the nametags and pencils. Tell them how to sow the seeds and then water the soil gently and keep the bottles in a sunny place. Tell them that they will observe it over the next couple of days. Ask them to check the soil and see if it is dry and needs water.

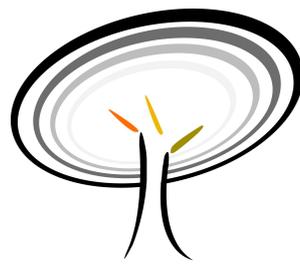
- **Conclusion:** Let the children observe closely what has happened to their seeds throughout the week. Encourage them to observe their own and the other seeds as well. Discuss their observations about their own seeds asking questions such as, “What changes did you observe in your seeds?” “Are all the seeds at the same stage of growth?” If any of the seeds have not germinated then talk about the possible reasons for that. In a conversational tone, talk about the conditions necessary for a seed to germinate. To conclude the discussion, say to the children: “What could we do if all the water and air on the planet got polluted? How would all the seeds germinate if the conditions were not favourable?”

**Assessment:** In order to assess children’s learning and understanding of the topic, you can ask them to do the following tasks individually.

Class 1: Draw the different parts of the plants that you have observed.

Classes 2 & 3: Show the growth of a plant starting from a seed. Label each stage and write a few lines on the process it undergoes.

Classes 4 & 5: Make illustrations and write a few sentences to show how a plant grows from a seed. Also write about the conditions that are required for germination.



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