

ANNEXURE II

BRIDGE MONTH PROGRAMME

Grade 6



SCIENCE

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BRIDGE MONTH PROGRAMME

Science- Grade 6

First Edition

April 2024 Vaisakha 1946

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Research and Training, 2024**

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

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Curriculum Transition Implementing NCF-SE 2023

Bridge Month Programme For Grade 6

Science

Science aims to develop an understanding of the natural and physical world through systematic inquiry. Learning Science also builds important capacities such as observation, analysis, and inference. This in turn enables the meaningful participation of individuals in society and the world of work with scientific temper, critical and evidence-based thinking, asking relevant questions, analysing practices and norms, and acting for necessary change (NCFSE 2023, p. 295).

Learning Science involves more than memorising theories and facts; it's about connecting conceptual learning to real-life scenarios, developing scientific inquiry skills (NCFSE 2023, p. 295), and applying them practically. Students are naturally curious and explore their surroundings. It results in many observations and questions. A stick falling faster than a leaf is an effect which is observed. Asking a question to find out the cause of this effect leads to questions to be investigated. For example, they might have a question: why does a stick fall faster than a leaf? They can provide possible reasons (hypotheses) for that. Once the hypotheses are provided, those can be tested collaboratively or individually. One of the hypotheses can be—heavier objects fall faster than lighter ones. Can this hypothesis be challenged by demonstrating something, like, if two similar papers are taken and one is formed into a ball? According to the current hypothesis both should fall at the same time as both have the same mass. But it doesn't happen. In this way we can see that this activity challenges the provided hypothesis. By all these opportunities, students develop the reasoning abilities that form the basis of scientific thinking, through practical experiences. Similar opportunities can be provided to students.



Facilitators play a critical role in aligning pedagogy with student learning styles, fostering curiosity, encouraging questions, and providing opportunities for hands-on activities and discussions. Science pedagogy is guided by principles emphasising active engagement, communication, making connections between knowledge domains, and fostering values outlined in the NEP 2020 and National Curriculum Framework for School Education (NCF-SE), 2023.

Recommended pedagogical approaches span various settings, including the classroom, field, and laboratory — selected based on the concept being taught and the desired learning outcomes. For example, field visit is a better choice for concepts related to biodiversity. These approaches include hands-on science, discovery, inquiry, project-based learning, etc. They aim to provide dynamic learning experiences that cater to diverse learning styles and promote holistic understanding in science education. For example, a class might demonstrate which materials dissolve in water and which do not, engaging students in observing and discussing phenomena. By combining multiple pedagogical approaches, educators can create enriching learning environments that encourage curiosity and critical thinking in science education.

Objectives of the Programme

On the basis of NCF-SE, 2023 new books are under the process of development. The newly developed textbook will have more focus on the process of learning and skills rather than solely on acquisition of knowledge, experiential learning, inclusion, etc. The objective of this bridge programme is to introduce students with experiential learning including inquiry-based and discovery-based learning in a joyful environment, so that they can smoothly transition from Grade 5 to Grade 6 curriculum.

Week-wise timetable

Science has been given around 4 hrs 40 minutes in a week. Accordingly, a timetable may be set for conducting the bridge programme in science.



Week	Time Available in Hours	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	4 Hr. 40 Minutes	Science	Science	Science	Science	Science
		Science		Science		
Week 2	4 Hr. 40 Minutes	Science	Science	Science	Science	Science
		Science		Science		
Week 3	4 Hr. 40 Minutes	Science	Science	Science	Science	Science
		Science		Science		
Week 4	4 Hr. 40 Minutes	Science	Science	Science	Science	Science
		Science		Science		

Week-wise Activity Plan

Following is a week-wise plan for preliminary activities to be undertaken in and around classrooms to enable children obtain the basic understanding about processes in science which would assist them in exploring the essentials in science covered in the Grade 6 textbook:

Week	Competencies to be addressed	Activity-1	Activity -2	Activity- 3	Activity- 4	Activity-5
Week 1	Observing Questioning Comparison Classifying Creativity Observes, compares, analyses and distinguishes the characteristics of living organisms from non-living things	W1.1	W1.2	W1.3	W1.5	W1.6
		W1.1		W1.4		

Week 2	Formulating possible solution, investigation and experimentation, analysis, conclusion, application, communication Formulates questions using scientific terminology	W2.1	W2.1	W2.2	W2.3	W2.3
		W2.1		W2.2		
Week 3	Comprehension, analysis, scientific values, indigenous practices, conservation of seeds, create simple graphs, visualising a change in a graph, data collection, building a model, Observes and appreciates the diversity of living things observed in the natural surroundings Collects data as evidence Designs and builds simple models to demonstrate scientific concepts Knows and explains the significant contributions of India to all matters	W3.1	W3.2	W3.3	W3.4	W3.5
		W3.1		W3.3		
Week 4	Questioning, countering each other's explanation, arguing scientifically, communication, developing mind maps. Observes and explains the phenomena Uses scientific vocabulary to communicate Science	W4.1	W4.2	W4.3	W4.4	
		W4.1		W4.3		

Details of Activities

ACTIVITIES FOR WEEK-1

Activity W1.1

Nature Walk: Let us walk and explore nature with an elderly community person: Invite an elderly person in the community or a botanist as a resource person in the school. Organise a **nature walk** and interact with the resource person on the plants in the surroundings or in a biodiversity park/ herbal garden/ nearby jungle/farm etc. Write all the observations and questions that arise from this nature walk. Take a note-pad and pen and record your observations in the table given below:

S.N.	Name of the plant	Height of Plant			Texture of Stem		Medicinal uses or other uses
		Small	Medium	Tall	Soft	Hard	
1.							
2.							
3.							
4.							
5.							

Relate height with the texture of stem and categorise plants in herb, shrubs and trees.

Give learners an opportunity to provide possible explanations for their questions. Have a discussion and summarise your observations in the following table.

S.N.	Plants varieties observed	Total number
1.	Herbs	
2.	Shrubs	
3.	Trees	
4.	Millets	

5.	Cereals	
6.	Pulses	
7.	Vegetables	
8.	Fruits	
9.	Forest produce	
10.	Medicinal plants	
11.	Others	

Discuss with peers about your experiences.

Activity W1.2

Observation Walk: Take the children on a short walk around the school or outside. Encourage them to observe things that are moving, such as cycles, cars, birds, or leaves blowing in the wind. Ask them to observe the things which are moving and which are not moving. After returning to the classroom students may be asked to write their observations in the following table.

Objects which were moving	Objects which were not moving
Birds	Trees

Ask students to compare their observations with the observations of other students. It is also possible that some students have kept the same thing in different columns for example a student might have observed a bicycle which was moving and other students have observed another bicycle which was not moving and accordingly they may have placed in the column first and second respectively.

Activity W1.3

Role-Play: Students may be asked to mimic the different types of motion exhibited by different things around them, for example, motion exhibited by a frog, a bicycle, a cow or a swing, etc.

Teacher may also create a simple scenario where the different types of motion can be demonstrated. For example, students may be asked to pretend as they are toys in a toy store, and they come to life when the shop is closed. This allows for creative exploration of various types of motion in a playful context.

Encourage the students to act out their roles and demonstrate how their characters move. For example, the rolling balls can roll across the floor, the flying birds can flap their arms and soar through the air, etc.

Encourage students to observe the differences in the motions exhibited by different things.

As the children engage in the role play, observe their movements and encourage them to describe what they are doing. Ask questions to prompt discussion about the different types of motion they are portraying and how they are similar or different.

With the help of these activities, the teacher may formally introduce the concept of rest and motion to students and also the different types of motions exhibited by different objects.

Carrying out the activities and questioning during the activities will help them in better understanding of the concept and simultaneously assessment of students can also be done.

Competencies: Observations, generating new exploration by changing something in the existing exploration/activity, comparison

Activity W1.4

Solubility of different materials in Water and Oil: Take different materials like salt, sugar, sand and mix them in separate glass of water and list them as soluble and insoluble materials. Now repeat the activity taking oil in place of water. Did you find any difference in your observation? Let students note down their questions based on their observations.



Allow them to provide possible explanations and have a discussion on it. The difference in the properties may be related with the nature of the substance and nature of the liquid in which it is dissolved. Allow them to change something further in this activity to generate new explorations.

Activity W1.5

Am I living? Take a notebook and a pen and walk around your school campus. Observe the different things that you come across such as wood, plants, trees, fallen bark of tree trunks, dry leaves, seeds, ants, butterflies, birds, etc. Find out which of those are living and which of those are non-living. Do you think dry leaves are living? How do you decide whether they are living or non-living? Write down your other observations and questions arise from those observations too. Make a table as shown in the following Table and fill your observations.

S.No.	Name of thing	Living or Non-living	Reasons
1.	Dry leaves	Non-living	They cannot grow
2.	Ants	Living	They walk They move their body They eat
3.			
4.			
5.			
6.			

Did you find that some features are common in all living things? Did you also find something common in all the non-living things? Discuss with your friends and ask them what they found. Compare your table with their table. Are they similar in some way?

Let's answer

1. Write Yes or No
2. Living things die.
3. Living things grow.

4. Non-living things breathe.
5. Non-living things grow.
6. Living things need food.
7. Non-living things move

Activity W1.6

Separation of different materials on the basis of shape and size etc.

Competencies addresses in this activity: Observation, comparison

- Under the observation of facilitators, learners should visit any construction site near their schools.
- Learners may take some sample of sand/pebble/gravel and observe and try to separate those based on their similarities and dissimilarities. They can choose their own ways for separating or they can choose aspects like mass/weight, shape, size, etc.
- Some other similar type of separation /classification from surroundings may be discussed in the class such as sieving of flour, filtration of the leaves from tea, etc.

ACTIVITIES FOR WEEK-2

Activity W2.1

Separation of Substances: Filtration— A Method of Separation

The facilitator may divide class into groups of two each. The key reasons for encouraging group work are to develop social and collaborative skills. Learners not only learn to interact with each other but also to resolve conflicts. The exchange of ideas helps them to think critically. Group work fosters a sense of responsibility among students, ultimately creating a joyful, positive, and more inclusive classroom.

Activity W2.2

Seeds that grow: Take 20-30 seeds of boiled, roasted, and normal green gram (*Moong*). You can use other seeds as well such as chickpea (*Chana*), black gram (*Urad dal*), etc. Wash them and put them in different bowls which have moist cotton cloth as shown in Fig. 1. Cover the seeds with

the clothes. Keep them in a place where it will not be disturbed. Do not keep them inside the fridge or near the gas stove or fire. Make sure that the clothes remain moist by sprinkling water on it regularly.



Fig. 1. Seeds kept in moist cloth

Observe the seeds once a day to see for any changes. Note down your observations in a table as shown in the following Table.

S.No.	Type of Seed	Day 1	Day 2	Day 3	Day 4	Day 5
1.	Boiled seeds	No change	No change			
2.	Roasted seeds	No change	No change			
3.	Normal seeds	No change	Some change at the tip of the seeds in case of chickpea			

What did you observe? You must have found that some seeds sprouted after a day or two. Some seeds did not sprout at all. Discuss with your

friends what they observed. Did they use the same seed? Compare your table with their table. Can you find out the difference in your observations and their observations?

Let's answer

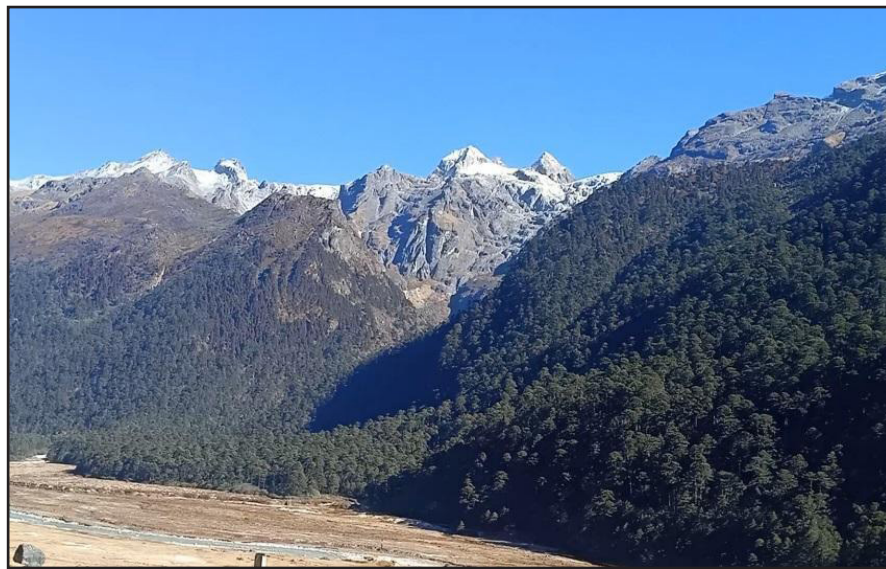
1. Did all the seeds sprout? Which seeds did not sprout?
2. If you want to grow plants from seeds, which type of seed will you choose?
3. Will you use boiled seeds, roasted seeds or normal seeds?

Activity W2.3

Landforms and water bodies around me: The surface of the Earth is uneven and not smooth if you observe carefully. It is mainly covered with water, land and ice with different shapes and sizes. There are hills, valleys, lakes, rivers and large areas with little or no plants or trees in them. Let us find out what these features are? In this section, we will study different land features and water bodies that are there on the surface of the Earth.

Landforms

Let us find out about different land features that are around us. Look at the Figure below and identify various land features.



Mark and label mountains and valleys in the figure given above.

Can you think of other land features on the surface of the Earth? List some of the land features you have seen and draw it in the Table.

S. No.	Landform	Draw the picture
1	Hills	
2		
3		

From this activity, we have identified various land features like hills, plains, deserts, valleys, mountains, etc. These natural features of land on the surface of the Earth are called landforms. Various landforms on the surface of the Earth such as hills, mountains, plains, valleys, etc. differ in shape and size.

Question

Collect pictures of different landforms from newspaper/magazine/internet sources and past them in your notebook. Write one or two sentences on each one of these landforms next to the picture.

Water bodies

You have learnt about the importance of water in your earlier classes. List some purposes for which you require water in your daily life.

- (a) Cooking food
- (b)

(c)

(d)

Where does your family get the water you require? Do you get it from the tap in your house or do some members of the family bring it from the public tap or from a well in your locality? List some common sources from where people get water in their locality.

S. No.	Sources of water	Draw/sketch the picture of the water sources
1	Ponds	
2		
3		
4		

There are various other sources from which people get water besides the ones you have listed. Try and get to know these sources from your teachers or elders in the family.

We have many natural water sources like ponds, lakes, and rivers. We also find water in the sea and ocean. All these features that contain water are called water bodies. The sources of water on the surface of the Earth like ponds, streams, rivers, lakes, seas, oceans, etc., constitute water bodies.

Competencies: Comprehension, analysis, scientific values, indigenous practices, conservation of seeds, reflection, questioning,

ACTIVITIES FOR WEEK-3

Activity W3.1

Diversity in Living World: Let us hear from Community Role Models: A Case Study

Today is a very special day. The teacher has announced that on the occasion of Earth Day on April 22, the school has invited Lahari Bai, the brand ambassador of millets in India for interaction with the

students. Students were highly excited to meet Lahari Bai. As soon as she entered the school premises students were eager to catch a glimpse of her. Their eyes were fixated on the door of the school hall, awaiting Lahari Bai's entrance. They pondered on, 'how a young woman from a small village could rise to become a prominent figure?' As soon as she entered the school hall, all welcomed her with cheers and a big applause for her appearance. Lahari Bai very calmly and gracefully greeted all with folded hands. She was looking so modest even after reaching such a height. She is so simple and gentle while interacting.

She introduced herself that she belonged to Baiga tribe. She resides in Silpudi village of Dindori district of Madhya Pradesh. She continued that her village has a hilly terrain and therefore jungles are natural on sloppy land. The soil is red and loose. Average rainfall is less. She told the audience that her ancestors were so powerful and healthy due to their consumption of millets in their daily diet. Due to change in their daily dietary practices, they started consuming other cereals and they were facing illnesses. She learnt from her grandmother that the ancient grains have disappeared gradually because now they were not in use and people have left growing those grains. Therefore, she started growing millets. According to her, growing millets in their areas is easy. The varieties of millets grown by her does not require much water for irrigation. Millets grow in rainfed land with other vegetation in the jungle. Growing millets does not require technology of ploughing and hoeing. It is a traditional *bewar* farming technique in which grains are spread over and thrown by hands onto land. She told all that in the beginning she started collecting seeds of different millet varieties from other community farmers in the nearby villages and with 2-3 seeds she started multiplying the grains of each variety of millet. Now she has seed banks for more than 150 varieties with her and she is supplying seeds to all farmers in nearby villages. She has stored these traditional grains in traditional containers. She claims that the seeds have longer shelf-life in this traditional storage method.

Read the above-mentioned case study and initiate discussion in the class by posing following questions:

1. List the diversity of crop plants grown in the farms.
2. What are the essential conditions for growing millets?
3. What is the contribution of Lahari Bai?
4. A lady from a small village became a brand ambassador of millets in India. Give possible reasons for her success.
5. What are the scientific values infused in the above-mentioned case study?
6. Discuss the indigenous practices mentioned for farming and conservation of seeds?

Temperature and its Measurement Competencies: create simple graphs, visualising a change in a graph, data collection

Teaching school children about temperature and its measurement can be an engaging and informative process. Teachers' role as a facilitator in the classroom may initiate discussion(s). Teachers can advise children to touch different surfaces and objects surrounding them, maybe inside the room or outside the classroom – in the open or in the school corridor, etc.

It is advised to start the discussion about the children's experiences on different surfaces. They might find some colder, some hotter or some at the same temperature as their bodies are. This is yet a qualitative description; it might not lead to an answer: how cold or how hot? This would lead to a need of describing observations in quantitative terms. Now comes the concept of temperature!

Children may be asked questions like what is temperature? What do we use it for? How does it affect us?

Children may easily recall the device that measures the temperature is the thermometer.

Temperature Sensations: Discuss how we perceive temperature and the differences between hot and cold. Encourage students to share their experiences with different temperatures.

Temperature of an object is the quantity that tells how hot or cold an object is with respect to some standard.

It is expressed by a number that corresponds to a degree mark on some chosen scale.

How do we choose scales for the purpose?

Almost all matter expands on heating and contracts when cooled. A common thermometer measures temperature by showing the expansion and contraction of a liquid, usually coloured alcohol or mercury in a glass tube using a scale.

Teachers now can introduce the concept of different temperature scales, such as Celsius and Fahrenheit. The freezing and boiling points of water on each scale and how they differ can also be introduced.

Celsius Scale: On this most widely used temperature scale, the number 0 is assigned to the temperature at which water freezes, and the number 100 to the temperature at which water boils (at sea level). The gap between 0 (freezing point) and 100 (boiling point) is divided into 100 equal parts, called *degrees*.

Fahrenheit Scale: On this scale, the number 32 designates the freezing point of water and the number 212 is assigned to the temperature at which water boils (at sea level).

Teachers are advised to make a reference to the Kelvin Scale of temperature also. Zero on the Kelvin scale corresponds to -273°C on the Celsius scale. It is the lowest possible temperature—absolute zero.

The conversion of temperatures from one scale to another may also be introduced.

$$C = (F - 32) \times 5/9$$

Here C represents the temperature in Celsius scale and F represents the temperature in Fahrenheit scale.

Activity W3.2

Using the simple mathematical relation for converting the readings between Celsius and Fahrenheit scales. Provide examples and practice exercises for them to try.

S. No.	Temperature in Celsius scale ($^{\circ}\text{C}$)	Temperature in Fahrenheit scale ($^{\circ}\text{F}$)
1	10	
2	12	
3	14	
4	20	

5	25	
6	30	
7	40	
8	50	
9	60	
10	70	
11	80	
12	90	
13	100	

Activity W3.3

Children may be provided temperature data from different times or locations and help the students create simple graphs to visualise the changes in temperature over time or between locations. Children may also be envisaged to collect this data from the news-papers or from the internet.

Activity W3.4

Teachers may innovate a few interactive games incorporating temperature-related games or quizzes to reinforce learning. For example, teachers could have a quiz where students guess the temperature based on clues or images.

Students must be informed about the importance of safety when dealing with temperature-sensitive materials or devices, such as hot liquids or thermometers containing mercury.

At the end of the activities, students may be encouraged to reflect on what they have learned about temperature and its measurement. They should also be asked to share any new insights or questions they may have.

These activities are expected to provide a good foundation for understanding the basics of temperature and how it is measured.

Activity W3.5

Discuss real-life applications of temperature measurement, such as weather forecasting, cooking, and medical applications. Show how temperature measurements are used in these contexts.

ACTIVITIES FOR WEEK-4

Activity W4.1

Space and Stars

Competencies: building a model, communication, questioning

Building a model of Solar System

This activity is intended to introduce children to the solar system and its components. Besides learning about the solar system, this activity also encourages creativity, teamwork, and research skills. This engaging and hands-on experience would leave a lasting impression on children.

This activity would require a number of different-sized balls. These would be required to represent different planets. For example, a lawn-tennis ball may be chosen to represent earth; a football for representing the Sun; a table-tennis (or ping pong) ball for representing the mercury, etc. In addition to the balls, items like paints or markers, Styrofoam or cardboard, string or wire, glue, and scissors are also needed. It is also envisaged that children would use informational resources about the solar system such as books, websites, posters, etc.

Teachers are advised to begin the discussion on the solar system with the children. Teachers are envisaged to explain what it consists of, including the Sun, planets, satellites (that move around planets and sometimes also called moons of the particular planet), asteroids, and comets. Children may be suggested to see the pictures and diagrams to help them visualise.

Teachers may like to assign each student or group of students a planet to focus on. They may be provided with information about their assigned planet, including its size, distance from the Sun, surface features, and any other interesting facts.

Assigning the Planets: Using the materials provided, children may be facilitated to mark the balls as models of their assigned planets. They may be assigned to create Styrofoam balls or cardboard cut-outs according to the sizes of the respective planets assigned to them. These identified (or marked) planets' models may be taken as the base. These may be painted to draw the surface features of the respective planets. Encourage them to be creative and accurate in their representations. The largest size ball should be marked as the Sun. (Remember the Sun is the largest object in our solar system!) Children may paint it reddish-yellow as it appears in the sky.

Activity W4.2

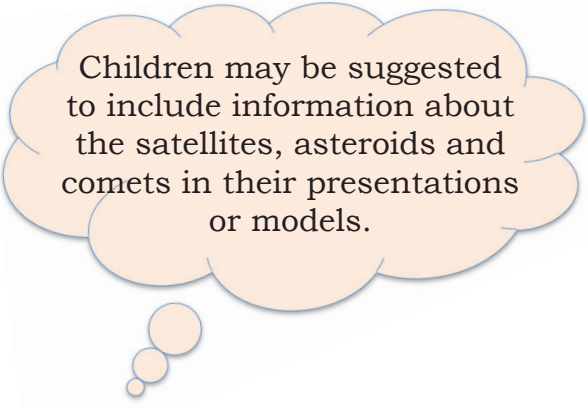
Constructing the Solar System: Once all the planets are ready, teachers are advised to gather the children together to assemble the solar system model. Strings or pieces of wire may be used to represent the orbits of the planets around the Sun. (*Remember that there are no pathways appearing in the solar system; these strings just represent how the planets move around the Sun.*) Hang the Sun in the centre and attach the planets at their appropriate distances from the Sun.

After completing the model, each child or each assigned group may be allowed to present their planet to the class. They can share interesting facts they learned during their studying from the informational resources and explain the features of their planet's model.

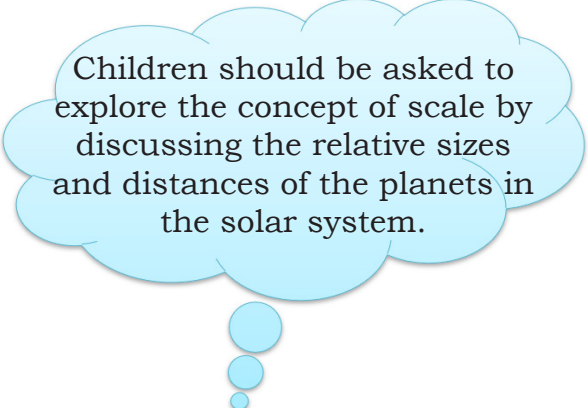
Children need to be encouraged to ask questions about each planet as they are presented. This will help reinforce learning and allow children to engage with the material on a deeper level.

Once the presentations are done, the solar system model may be displayed in the classroom to observe throughout the course or as a reference for future lessons.

Extensions that can be taken further:

A light orange thought bubble with a smaller one below it, containing text about suggesting children to include information about satellites, asteroids, and comets in their presentations or models.

Children may be suggested to include information about the satellites, asteroids and comets in their presentations or models.

A light blue thought bubble with a smaller one below it, containing text about asking children to explore the concept of scale by discussing the relative sizes and distances of the planets in the solar system.

Children should be asked to explore the concept of scale by discussing the relative sizes and distances of the planets in the solar system.

Activity W4.3

Observations, Questions and Discussions related to water

Competencies: Observation, questioning, countering each other's explanation

Drying of water: For the introduction of “Evaporation”, motivate students to share their daily life **observations** and experiences about drying of water from different things like wet clothes. Provide opportunities to students to raise **questions** such as why do clothes take longer to dry during rainy seasons? Allow students to think of possible reasons for these and discuss with each other. Allow learners to take a very little water in a plate and find out the ways in which we can make it dry faster.

Activity W4.4

More observations and questions related to water: Take two glass tumblers of the same size. Fill one with tap water and other with water and some ice. After keeping it for some time, encourage learners to note down the observations. Give them the opportunities to allow them to note down the questions led by their observations. Now discuss and provide possible explanations for the appearance of small water droplets on the outer surface of a glass tumbler containing water and ice. Let them discuss with each other and agree and disagree with each other's explanations with reasons.



5. Assessment (Holistic)

Though in this bridge month focus is on learning rather than formal assessment, however, teachers need to ensure the progress in learning keeping in view the following principles of assessment in Science across Stages (NCFSE, 2023, p. 316):

- Students must be assessed for understanding of concepts and for the ability to use the scientific method, i.e., observe, ask questions, hypothesise, predict, experiment, collect data, infer, predict, analyse, decide, and evaluate.
- Students must be assessed through a variety of ways, e.g., answering good questions, designing, and conducting experiments, developing models, and participating in debates and discussions.

In the following table, an exemplar rubric is given for assessing a competency at this stage. These kinds of rubrics can be prepared by teachers for assessing students' progress in the bridge month programme.

Teacher can also keep record of learning outcomes/competencies achieved by students after the completion of this programme, this will help teachers to provide specific support to the child, if she observe some gaps while teaching the new textbook.

Major Learning Outcomes mapped with the competencies given NCF-SE	Exemplar Rubrics for Assessment	Progress of Students
Categorise plants in herb, shrubs and trees	<p>Activity W1.1</p> <p>The following stages represent the learning levels of students in realising the targeted Learning Outcome.</p> <p>S1: Child is yet to form observations. They are at stage 1.</p> <p>S2: Child is able to make independent observations and identifies similarities and differences. They are at stage 2.</p> <p>S3: Child identifies most similarities and differences, and is also able to make connections. They are at stage 3.</p> <p>S4: Child identifies most similarities and differences, and is also able to categorise. They are at stage 4.</p>	Teachers using the proposed rubrics ensure students' progress of learning during this process, and may note their strengths and gaps (if any) and provide support children to fill the gap
Identifies local diversity plants		
Distinguishes between living, dead, and non-living things		
Investigate the phenomenon of evaporation using scientific process		
Asks questions related to their observations and experiences.		
Communicates observations and processes through drawings, and models.		
Collects data as evidence		

Assessments should be conducted in a manner that does not burden students. These assessments need to be carried out without informing students that they are being assessed.



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