Vision Empower & XRCVC

Teacher Instruction KIT

Winds, storms and Cyclones

Syllabus: NCERT Subject: Science Grade: 7 Textbook Name: NCERT- Science Textbook for class VII Chapter Number & Name: 8. Winds, storms and Cyclones

1. OVERVIEW

1.1 OBJECTIVES AND PREREQUISITES

Objective

- To understand features of air.
- To understand what is Thunderstorm and a Cyclone.
- To know the destruction caused by cyclones and the safety measures for the same.
- To understand the reasons for generation of wind currents.

Prerequisite Concept

• Composition of air Grade 6, chapter 15- Air around us

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*Kindly Note: Activities marked with * are mandatory*

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2. LEARN

2.1 KEY POINTS

Air moves from the region where the air pressure is high to the region where the pressure is low. The greater the difference in pressure, the faster the air moves.

On heating the air expands and occupies more space. When the same thing occupies more space, it becomes lighter. The warm air is, therefore, lighter than the cold air. That is the reason that the smoke goes up.

The equator gets maximum heat from the Sun. The air in these regions gets warm. The warm air rises, and the cooler air from the regions in the 0-30 degrees latitude belt on either side of the equator moves in. These winds blow from the north and the south towards the equator. At the poles, the air is colder than that at latitudes about 60 degrees. The warm air at these latitudes rises up and the cold wind from the Polar Regions rushes

in, to take its place. In this way, wind circulation is set up from the poles to the warmer latitudes.

Thunderstorms develop in hot, humid tropical areas like India very frequently. The rising temperatures produce strong upward rising winds. These winds carry water droplets upwards, where they freeze, and fall down again. The swift movement of the falling water droplets along with the rising air create lightning and sound. It is this event called a thunderstorm.

Before cloud formation, water takes up heat from the atmosphere to change into vapour. When water vapour changes back to liquid form as raindrops, this heat is released to the atmosphere. The heat released to the atmosphere warms the air around. The air tends to rise and causes a drop in pressure. More air rushes to the centre of the storm. This cycle is repeated. The chain of events ends with the formation of a very low-pressure system with very high-speed winds revolving around it. It is this weather condition that is called a cyclone. Factors like wind speed, wind direction, temperature and humidity contribute to the development of cyclones.

Tornadoes: In India they are not very frequent. A tornado is a dark funnel shaped cloud that reaches from the sky to the ground. Most of the tornadoes are weak. A violent tornado can travel at speeds of about 300 km per hour. Tornadoes may form within cyclones.

2.2 LEARN MORE None

3. ENGAGE

3.1 INTEREST GENERATION ACTIVITY

Interest generation activity

Activity 1: Strong winds Materials Required: None Prerequisites: None

Activity Flow

- Ask the students of places where they felt very strong winds.
- You can also have pieces of paper scattered on a table, let the student feel them and start the fan at high speed and let the student notice what happens to the papers, they tend to fly away.
- Discuss that just like this, when in nature very strong winds blow they tend to create cyclones and thunderstorms that cause destruction to things on land and they would learn more about winds and storms.

3.2 CONCEPT INTRODUCTION ACTIVITIES

Air exerts pressure

Activity 2: Air exerts pressure

Materials Required: Soft plastic bottle, hot water, running water Prerequisites: None

Activity Flow

- Take a plastic bottle with a cap. Add hot boiling water in it.
- Pour the water out after 10-15 seconds and immediately close the bottle with its cap tightly.
- Now, carefully put this bottle into a bowl with fresh water or keep it under running water in the sink.
- The bottle gets crumpled and distorted.
- This activity can be done with the help of a sighted peer or a sighted teacher.
- The whole process can be demonstrated and children can touch the bottle in the beginning of the activity as how it is and at the end when it is compressed.

INFERENCE: As water is poured over the bottle, some steam in it condenses to water, reducing the amount of air inside. The pressure of air inside the bottle decreases, and the pressure exerted by the air outside the bottle is now higher. Hence, the bottle gets distorted.

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Some other experiences which can be discussed with the children:

- Air is filled into the bicycle tube to keep it tight and keeps it in shape.
- Leaves of trees, banners, or flags flutter when the wind blows, due to pressure exerted by air.

High speed winds are accompanied by reduced air pressure

Activity 3: High speed winds are accompanied by reduced air pressure

Materials Required: Empty water bottle, piece of paper *Prerequisites: None*

Activity Flow

- Take an empty water or soda bottle and lay it down horizontally on a table. Roll a piece of paper into a small ball about half the size of the opening.
- Let the student feel the size and opening of the bottle and size of the paper ball. Ask the student to blow the ball into the bottle.
- Let the student feel that despite how hard they try the ball will not go in.

• Explain how when you blow the wind reduces pressure and hence the air pressure at the back of the bottle keeps pushing the ball in front.

Air expands on Heating

Activity 4: Air expands on Heating

Materials Required: Balloon, tube, glass with hot and cold water. Prerequisites: None

Activity Flow

- Take a balloon and tie it over one end of a tube/plastic roll with both ends open.
- Immerse the tube/roll in a glass of hot water and let the student feel how the balloon expands and put the same in a glass of cold water and see the balloon deflate.
- Let the student feel the glass with water, the tube/roll and how the balloon is tied over it and encourage the student to tie it independently as well after being shown. The student can also be shown to place the tube in the glass through the hand over hand technique and let the student feel the inflation and deflation with one hand as he/she places the tube in the glass with the other hand.
- Explain the property of expansion of air on heating.

Hot air moves up and is lighter than cold air

Activity 5: Hot air moves up and is lighter than cold air

Materials Required: Hot water in a container, paper cups, wooden stick, and thread. Prerequisites: None

Activity Flow

- Place steaming water on a table in a container. Let the student feel the air all around the container, the steam can only be felt upwards and not any other direction. Thus, showing that warm air moves upward.
- You can also hang two paper cups in an inverted position on two ends of a thin stick and place it just above the steam. The piece of paper that comes in touch with the stream will move up, indicating that hot air is lighter than cold air cup at the other end moving down.
- Guide the students hand over the steam and the moving hanger using the hand over hand technique to ensure that the student feels the movement and the steam.

Wind currents are generated due to uneven heating on the Earth

Activity 6: Uneven heating between the poles and the equator

Materials Required: Tactile globe Prerequisites: property of air

Activity Flow

- Use a tactile globe or in absence of its availability a regular ball. Orient the student using hand over hand technique the top, bottom and the centre of the globe/ball. As the students feel, explain the concepts of north and south poles and the equator.
- The student already knows the properties of air and knows hot air rises and is lighter. Explain how there is more sunlight around the equators and hence the air there is warmer making it rise and create space as against the poles where air is colder and hence air rushes in from poles towards the equator, generating winds.
- You can demonstrate this movement through hand placements and movements. Have the student's one hand placed on the centre and one at either of the poles. As you explain hot air moves upwards, ask the student to move his/her hand on the centre of the ball u p, and slide his/her hand on the pole towards the centre. Explain that movements of winds happen the same way.

Activity 7: Uneven heating of land and water

Materials Required: A Tactile India Map or any other country Map Or two separate books by laying them on a table. *Prerequisites: None*

Activity Flow

- This concept can again be explained by using multiple aids.
- -A Tactile India Map/Any other country Map
- Two separate books by laying them on a table.
- If using a tactile map using the hand over hand technique let the student feel the country boundary and explain the area that is land, and let the student feel the open space around the country boundary where ocean is and explain the area of different seas and oceans.
- If you are using two books just for explanation purposes, lay them side by side explaining the student let us consider one as land and one as the sea.
- Again by placing the students' hand on both land and water, as you explain concepts of when air is hotter on land v/s water and how winds move in those seasons let the student raise the hand and slide in hands as explained in the earlier activity.

Thunderstorm, Cyclone and Tornado

Activity 8: Thunderstorm, Cyclone and Tornado

Materials required: electric kettle/vessel with hot water, tray/plate, tactile diagram of a Tornado, cone *Prerequisites: States of water*

Activity Flow

Thunderstorm

- Have water warmed up in an electric kettle of gas till vapor rises. As the vapor rises, hold a cold empty cold plate/tray above in a way that the vapor touches. Let the student be guided to feel the hot vapor rising and touching the cold tray and feel the droplets that form and the drops falling down if kept for a while.
- Explain the concept of thunderstorms, as winds with water droplets rising up from land freezing on top and falling down clash with the rising vapor, creating thunderstorms.

Cyclone

- Prior knowledge of states of water necessary to start this explanation.
- As water takes up heat when vapor is formed, when it changes back into water droplets (rain) it releases heat, making the air warm and lighter making it rise up, and decrease pressure. During a storm when this happens more air tends to rush to the centre of the storm and the cycle continues to create a cyclone. Low pressure systems with high speed winds around it.
- You can use a top and rotate it to explain to the student the nature of circling winds in a cyclone. Rotate the top and let the student feel the circling to explain how high speed winds rotate in a cyclone

Tornado

- Use a tactile diagram of a Tornado and let them compare it to a cone to understand how its shape is bigger on top and narrower at the bottom.
- Explain to the students the shape of a tornado as a large cloud on top which funnels down as a small line all the way to the ground. Explain the formation in relation to the sky on top where the large cloud remains and the ground below, till where the thin line stretches.

Destruction caused by cyclones and safety measure

Activity 9: Destruction caused by cyclones and safety measure

Materials Required: straws, sticks, paper cups, model of anemometer *Prerequisites: None*

Activity Flow

- You can explain the various kinds of destructions that are possible with cyclones and storms: Primarily theory/verbal description based on content.
- Make the students get into the ground squatting position to explain how to keep safe during a tornado. You can either first squat and let the student feel your position or you can give verbal instructions stating "kneel on the ground, put your head down as well with your hands on your neck" and then correct the position of the student.
- To explain an Anemometer, you could take multiple straws and stick them into a working model with the circulating straws being stuck with paper cups at the end. You can then explain the concept of the anemometer and how it works. Using hand over hand technique let the student feel the standing pole and the rotating cross straws with the cups at the end.
- Add the following points as an action on the part of the people:
 - We should not ignore the warnings issued by the meteorological department through TV, radio, or newspapers.
 - We should make necessary arrangements to shift the essential household goods, domestic animals and vehicles, etc. to safer places; avoid driving on roads through standing water, as floods may have damaged the roads; and keep ready the phone numbers of all emergency services like police, fire brigade, and medical centres.
- Some other precautions, if you are staying in a cyclone hit area
 - Do not drink water that could be contaminated. Always store drinking water for emergencies.
 - Do not touch wet switches and fallen power lines.
 - Do not go out just for the sake of fun.
 - Do not pressurize the rescue force by making undue demands.
 - Cooperate and help your neighbours and friends.

3.3 LET'S DISCUSS: RELATE TO DAILY LIFE*

- Winds at a sea shore, monsoon storm.
- Smoke comes down in winter, as cold air does not rise up. Clouds are formed with steam rising up. Car tires need lesser air pressure in summer because air expands when hot, increasing air pressure to cause the tires to burst.

4. EXERCISES & REINFORCEMENT

4.1 EXERCISES & REINFORCEMENT

Reinforcement

Activity 10: Properties of Air

Materials Required: None *Prerequisites: air and its features*

Activity Flow

• Ask the student to quickly list out the uses of air and properties of air as a quick recap.

4.2 IMPORTANT GUIDELINES*

Exercise Reading

It is very important that the children practice their learnings as well as their reading. Hence have the children read out the newly learned concepts from their textbooks or other available resources.

Perform Textbook Activity

It is good practice to have the children perform the textbook activities. Your textbook activities might not be accessible hence go through this resource to learn how to make textbook content accessible.

Provide Homework

To evaluate their understanding and to help the student revise and implement the new learnt concept ensure to provide them with homework. Students should perform one or two of the questions mentioned above or from the textbook exercises with the teacher in Class and the remaining may be given for homework. Also, ensure that the student knows their special skills linked to independently using their accessible books as it will be critical to doing homework independently

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