Vision Empower & XRCVC

Teacher Instruction KIT

Light, Shadows and Reflection

Syllabus: NCERT
Subject: Science
Grade: 6
Textbook Name: NCERT- Science Textbook for class VI
Chapter Number & Name: 11. Light, Shadows and Reflection

1. OVERVIEW

1.1 OBJECTIVES AND PREREQUISITES

Objective

- To understand about transparent, translucent and opaque objects.
- To know about light and shadow formation.
- To understand about mirrors and reflections.

Prerequisite Concept

- Concept of luminous objects
- Transparency , Grade 6, chapter 4: Sorting materials into groups

Content Index

*Kindly Note: Activities marked with * are mandatory*

2. LEARN

2.1 KEY POINTS

Light travels in a straight line but is reflected and bent in certain conditions.

Reflection: it is the phenomenon of light bouncing back striking a smooth polished surface.

Transparency:

- Transparent: materials through which things can be seen clearly.
- Opaque: materials through which things cannot be seen at all.
- Translucent: materials through which objects can be seen but not very clearly.

2.2 LEARN MORE

- http://www.wonderbaby.org/articles/introduction-to-light-for-blind-children

3. ENGAGE

3.1 INTEREST GENERATION ACTIVITY

Light

Activity 1: Light

Materials Required: light bulb

Prerequisites: None

Activity Flow

- Begin a discussion with the students and ask them what they understand by light and learn their eye condition.
  NOTE: A blind or low vision student has some light perspective or none at all. Each individual's eye condition varies.

- Ask the students if they have ever felt a very bright light hurting their eyes that made them want to blink.
- If the student is totally blind and has never experienced light, discuss with the student if he/she has heard his/her family members speaking about switching on the lights after they enter the room in order to move about and find their way. Or that they are no longer able to see the objects in front of them and may bump into them during a power cut and so on.
- Ask the students to stretch out their hand and feel the warmth of the sun rays on the window sill.
- Or bring the student's hand close (at a safe distance) to the light bulb and have them feel the heat from it when it is on and the difference when it is off. (Or take the students hand to quickly touch the light bulb while it is lit. Hold the students hand when doing this to avoid any accidents.)
- Tell the students that today we are going to learn more about light.

Or

Materials Required: None
Prerequisites: None

- Take the children outside in the sunlight and then ask them, do they feel any difference when they are sitting inside the class and when they are outside?
- Then tell them that the sun is a natural source of light. Similarly torches, candles, and bulbs are some artificial sources of light.
- Discuss with the children that light is a form of energy detected by the sense of sight and makes things visible.
- Light can be different colors, and the absence of light is what we refer to as the "dark."

3.2 CONCEPT INTRODUCTION ACTIVITIES

Light travels in a straight line

Activity 2: Light travels in a straight line

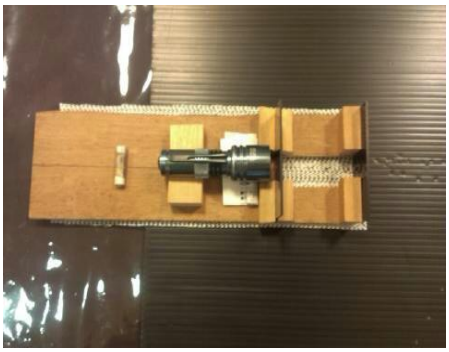
Materials Required: straight pipe, bent pipe, parchment sheets, rubber mat, stylus, light probe (if available)
Prerequisites: None

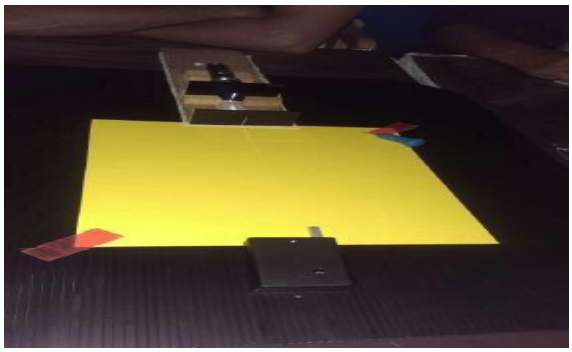
Activity Flow
(For a low vision student)

- Have the student look at a light source through a straight pipe and then try the same with a bent pipe.
- The low vision student could be asked to stand close to the light source so that he/she is able to see it. Discuss why the student was unable to see to the light through the bent pipe.

(For completely blind students)
- Using parchment sheets on rubber mats have the student draw a circle depicting the source of light. And from the circle guide the student to draw straight lines coming out of it. Tell this student these lines of light are not always visible for all sources of light but that this is how light travels in straight lines. This is also why we draw the rays of the sun as straight lines and never curved lines.
- Hand over the straight pipe and the bent pipe to the totally blind student and let him/her touch and see what it looks like.
- Verbally describe to the student what this light looks like.

Experiment: Light travels in a straight line
- An experiment can also be conducted by using a light probe. Set up for the experiment is shown below.





Transparent, translucent and opaque objects

Activity 3: Transparent, translucent and opaque objects

Materials Required: book, tactile diagram showing opaque, translucent and transparent objects, transparent, translucent and opaque objects.

Prerequisites: None

Activity Flow
- Explain to the students how objects affect the path of light. Depending on the object the path of light may change or may not.
- In order to explain the concept of transparency and translucency, make the student do a similar experiment with sound first.

- Make the student go behind a thick wall and shout out something. Bring the student to the open door and speak, make the student go behind a shut thin glass door/window and shout something. Explain to the student how behind the wall one could not hear anything; behind a glass door hear something and when the door is open could hear clearly. Similarly through wood you cannot see anything, through oiled paper can see partially and through glass can see clearly. Explain the concept of seeing through by taking a book and placing it between you and the student that seeing through means someone on the other side of the separator can be seen.
- Explain transparency also by letting the student feel the warm sun rays through a glass window as against not being able to feel the warmth next to a wall. Explaining that glass is transparent and walls are not.
- After explaining, give them the tactile diagram showing opaque, translucent and transparent objects. Also the teacher can show them the real transparent, translucent and opaque objects.
- Transparent material: Materials through which light can pass completely. Example: glass, water, etc. In the tactile diagram of transparent material there is the same line passing through the transparent object.
- Translucent material: Material through which light can pass partially. Example: waxed paper, butter paper, frosted glass, etc. In the tactile diagram of translucent material the width of the light has reduced which indicates that, through translucent objects, light passes partially.
- Opaque material: material which does not allow light to pass through it at all. Example: wood, metals, books, etc. In the tactile diagram of opaque material there is no line after the object which indicates that no light passes through an opaque object.

Light and shadow formation

Activity 4: Light and shadow formation

Materials Required: None

Prerequisites: None

Activity Flow

1. Shadow:

- Match your right hand to the left hand of the person standing in front of you.
- The other person's hand represents the shadow, so if you move your hand, that person's hand would also move in the same way.
- This is similar to shadows, as we move our shadow also moves in the same way.
- But the size varies as per the light and direction of light.

2. **What happens when you hold an opaque object in the sun?**

- A dark patch which has the same shape as that object is seen on the ground. This is the shadow of that particular object.
- A shadow is a dark area or shape produced by a body (a person or an object) coming between rays of light and a surface.
- When we stand in the shade of a tree, we don't feel the direct sunlight because of the shadow of a tree, similarly opaque objects block the light and a shadow of that opaque object is formed. Have them go outside and stand in the shade of a tree or in the shade of the building
- Teachers can also ask low vision children to observe their shadows and then share what they see and experience with other students.
- In order to see a shadow, we need a source of light and an opaque object.
- Apart from these things, we also need a screen, which acts as a surface for the shadow to fall on. Different surfaces act as screens - the ground, the walls of a room, and buildings are some examples of them.

Mirror and Reflection

Activity 5: Mirror and reflection

Materials Required: sound rubber ball, tactile diagram showing reflection of light, tactile diagram showing light reflected from a mirror

Prerequisites: None

Activity Flow

Reflection of light:

- Tell the student that light bounces back when it hits something and that is known as reflection of light.
- To explain this, ask the students to take a sound/regular rubber ball in their hand and to throw it at the wall while standing a bit close to the ball. Discuss with the students how the ball bounced back off the wall.
- Discuss that light bounces back like the ball when it hits something.
- And that light that has bounced back hits our eyes and we are able to see things because of that.
- Present a simplified tactile diagram showing reflection of light. Direct the student to touch and observe the path of reflected light.

Reflection of light from a plane mirror:

- Explain to the students that when we look into a mirror or clear water we see our own image. This image is called a reflection. We also see the reflection of other objects in mirrors.
- A mirror is a flat piece of glass with one surface coated with a substance which reflects light; so when you look at it you can see yourself reflected in it.

- After explaining this, give them the tactile diagram showing light reflected from a mirror. A mirror changes the direction of light that falls on it.

3.3 LET'S DISCUSS: RELATE TO DAILY LIFE*

- Mirrors
- Telescopes, cameras

Some real world examples of opaque objects used –

- Most doors of cupboards, rooms etc.
- walls, many bags and suitcases because of which the contents of the bags can't be seen,
- most fabrics,
- most curtains,
- screens,

Some real world examples of transparent objects used–

- Glass windows in buildings, houses etc.
- The glass screen in the front and back of a car through which you can see through.
- Show cases in museums, homes and schools that may hold many trophies, in libraries etc.
- Window displays at many shops and restaurants through which you can see what's in the shop before you step in.
- Glass windows in trains and busses.
- The glass on top of a wall clock or a wrist clock through which we can see the hands of a clock
- Shopkeepers usually prefer to keep biscuits, sweets and other eatables in transparent containers of glass or plastic so that buyers can easily see these items and buy them.

NOTE: For each of the above objects you could discuss with the student why it is practical to use opaque and transparent objects.

4. EXERCISES & REINFORCEMENT

4.1 EXERCISES & REINFORCEMENT

Sources of Light

Activity 6: Sources of light

Materials Required: None

Prerequisites: Luminous objects

Activity Flow

- Discussions on sources of light (especially outdoor sources) during the night time and day time like the sun, moon, street lights, light from shops, windows of houses etc.
- Have the student find out the number of and different luminous objects in his/her house.

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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