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Teacher Training Module:

Science

Learning Cycle Eleven

Sound

Sindh Technical Assistance – Development through Enhanced Education Programme (STA-DEEP)

Sukkur IBA University

THE AGA KHAN UNIVERSITY

School Education & Literacy Department (SE&LD)

Government of Sindh.

Introduction and Rationale of the Training

Dear Teachers!

Welcome to the School Education & Literacy Department (SE&LD) Government of Sindh's Teachers Continuous Professional Development (CPD) Program. This school Cluster-based Teachers' Continuous Professional Development (CPD) program has been developed and is being implemented under the revised School Clustering Policy of 2021 and CPD Model of 2022.

This Content-Based Learning Cycles (CBLCs) series, consisting of cycles 11 to 20, has been developed to further enhance your knowledge and skills in content-based classroom teaching practices. The initial 10 Learning Cycles (LCs) focused on improving pedagogical skills to create interactive, participative, and enjoyable classrooms for students. Building upon these skills, CBLCs 11 to 20 will provide learning opportunities in Mathematics, Science, English, Urdu, and Sindhi for students in grades 1-8 will equip you with modern teaching strategies and subject knowledge to effectively manage classroom situations.

CPD Program vision

The CPD program aims to improve the quality of teaching practices in schools all over Sindh so that students become active and collaborative learners, problem solvers, and critical thinkers who approach tasks creatively and confidently. These CBLCs would help students clearly understand the subject knowledge and connect learned knowledge and acquired skills to the world around them. To make this possible, teachers must be better prepared for the classroom teaching requirements of pedagogy and the subjects' content. Moreover, this program provides specialised training to teachers at the school level through School Cluster-based CPD to make an impact and substantially increase students' learning outcomes.

CPD Program Teaching Philosophy

The CPD training sessions, including this one, adhere to a participatory teaching philosophy. This approach encourages participants to actively engage in collaborative learning while fostering self-reflection and peer reflection, ultimately creating a community of practice. The main goal is to enhance teaching practices and promote an understanding of the subject content theory and the strategies that enable students to confidently and effectively apply the learned knowledge in their daily lives.

Supporting You

The training module is designed to support you in your classroom teaching instruction practices. It will introduce you to the subject content and some approaches for use in the classroom. This will make your teaching more manageable and help you grow as a skilled teacher.

Online CPD portal for teachers

An online CPD portal has been developed for teachers to ask questions to experts, exchange ideas, and share personal learning experiences and difficulties in rolling out the CBLCs. The online CPD portal would help teachers connect with other teachers from all the districts and subject experts to share and learn as a community of teachers. Online portal: https://stadeep-cpd.com/

Note: CBLCs have been developed in alignment with the School Education & Literacy Department (SE&LD), Government of Sindh notified curriculum and textbooks of English subject from grades 1-8 under STEADA and PITE supervision. English textbooks of Grade 1-8 have been used in this LC as a reference.

CBLCs: 1-20: Please refer to the last page of this LC to see the complete list of topics for 1-20 LCs.

Acknowledgement

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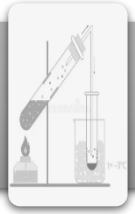
Sound

Learning Objectives: By the end of the session, the teachers will be able to:

Describe sound as a form of energy.



Investigate the speed of sound in different mediums; a variety of materials through which sound can travel and the function of a human ear

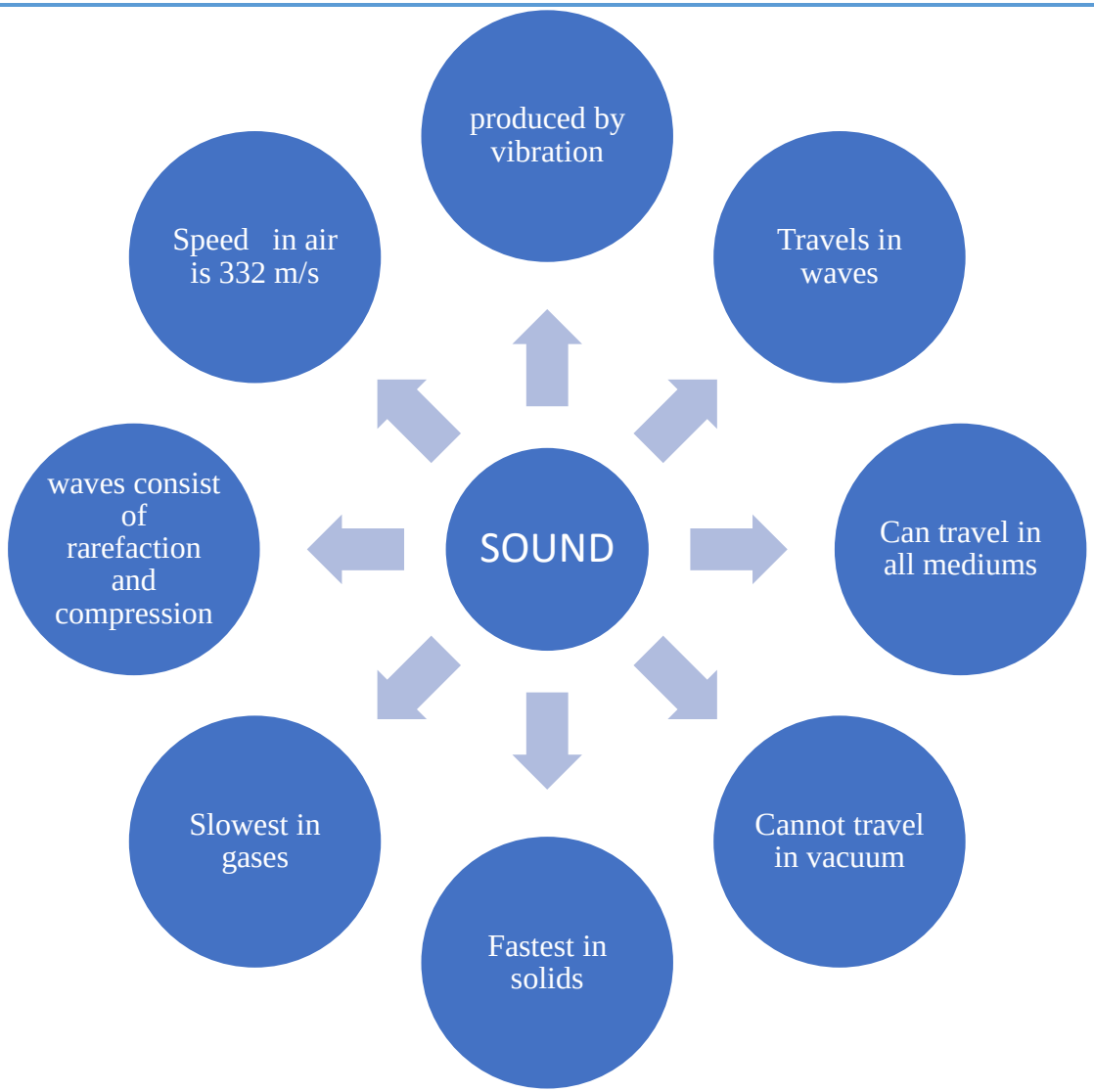
Session Plan

Instructional strategies/activities

Time	Objective/purpose of the activity	Activities/learning experiences	Materials/resources
 10 mins	**Welcome** 1. Remind the rules of the workshop. 2. The facilitator will help teachers connect with their experience of the last learning cycle	1 Quick recall of the rules of the workshop. 2 Ask each teacher to share one key takeaway from classroom implementation of the previous learning cycle.	Sticky notes/paper chits
 10 mins	**Warm-up**  The facilitator aims to trigger teachers' understanding of the concept of Sound	Facilitator will present two situations and ask teachers to think-pair-share: 1. Recall the rules of the hide-and-seek game where a blindfolded person catches the remaining players. • How is the blindfolded person able to guess which player is closer to him/her? 2. Have you ever played with a balloon? Blow one up and then pinch the end with your figures and let the air out. • What do you feel? • What do you hear? • Can you produce different sounds?	Paper, Pencil, charts and Multimedia, Thumb pin, Tape, Balloon, Blind fold

20 mins	**Input**  The facilitator will engage the teachers in connecting with the concept of 'Sound'.	1. The facilitator will elicit teachers' understanding of "Sound" by showing figure 1 and asking:   • What is common among these two instruments? Figure 1. Visual showing two device/instrument producing sound **Probable Response:** a). A microphone is a device that converts sound (acoustical) energy into electrical energy. When the sound waves strike the diaphragm, it vibrates. These vibrations are converted into an electrical current which becomes the audio signal. b). Hitting the skin of the drum causes it to vibrate and create sound waves. When the sound waves reach your eardrums, they vibrate too. 2. Now, facilitator will demonstrate the 'dancing rice' activity and ask teachers: • Why did the rice grains dance when facilitator hit the baking tray with a wooden spoon? • What does this demonstration show? • Can you replicate the concept demonstrated through 'dancing rice' with another activity?	Multimedia, Board Marker, speaker

		3. Facilitator will lead teachers to connect the demonstration with the big idea of energy.	
45 mins	**Practice**  The facilitator will engage Teachers in the investigation, discussion, reading, and presentation of the concept of sound.	1. The facilitator will divide teachers into three groups. Provide handout 11.1 and assign investigation task to each group: Group # I: How is sound produced? Group # II: How does sound wave travel through various mediums? Group # III: How does the human ear receive sound? 2. Ask groups to investigate the task, prepare a presentation, and share it with rest of the teachers. 3. Provide them 30 min to investigate the task. 4. Afterwards, invite each group to present their investigation.	**Handout 11.1** **Materials:** Wooden, plastic, metallic ruler, rubber band, Bucket or Tub, Bell, Water, Wooden Ruler. Human Ear Structure, Aluminum foil, card stock or construction paper, straw, Ping pong ball or Balloon, Container of water.
15 mins	**Conclusion**  The facilitator will conclude the learning cycle with the help of presentation and questioning	1. The facilitator will conclude the session by highlighting with the following characteristics of sound:	Multimedia, Sticky notes/paper chits


SOUND
produced by vibration
Travels in waves
Can travel in all mediums
Cannot travel in vacuum
Fastest in solids
Slowest in gases
waves consist of rarefaction and compression
Speed in air is 332 m/s

20 min	**Assessment**  This will support the teachers in applying their learning experience to fill out the worksheet.	The facilitator will assess the Teacher's learning through **Handout** 11.2 (Worksheet on Sound)	**Handout 11.2**

Handout# 11.1

Investigation Tasks

GROUP-1: INVESTIGATING SOUND IS PRODUCED BY VIBRATION

What I need:
Wooden, plastic and metallic rulers, rubber band.

What I did:

1. Fasten a rubber band to a doorknob, pull it and pluck it and record your findings in the given table.
2. Place half of the metal ruler on the desk or table with your palm with the ruler extending over the side.
3. Pull the ruler down and let go and record your findings in the given table.
4. Repeat steps 2 & 3 with the plastic ruler and wooden ruler.
5. Ask teachers to share their findings with the whole class.
6. Discuss what happens when the rubber band is plucked.
7. Discuss what happens when the ruler is let go.

What I observed:

Wooden Ruler	Metal Ruler	Rubber Band	Plastic Ruler

What I conclude:

_____

_____

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GROUP-2: IDENTIFYING THE MATERIAL THROUGH WHICH SOUND TRAVELS

What I need:
Bucket or tub, bell, water, wooden ruler

What I did:

1. Take a bucket and fill it with clean water.
2. Take a small bell in one hand. Shake this bell inside the water to produce sound. Make sure that the bell does not touch the body of the bucket or the tub.
3. Now listen to the sound. How is the sound from bell reaching your ear? Which medium are the sound waves travelling to reach your ear?
4. Record your finding.
5. Now take a meter scale or a metal rod and hold its one end to your ear.
6. Ask your friend to gently scratch or tap the other end of the scale.
7. Record your finding in the given column.

What I observed:

When the bell is rung in the water	When the ruler is scratched

What I conclude:

_____

_____

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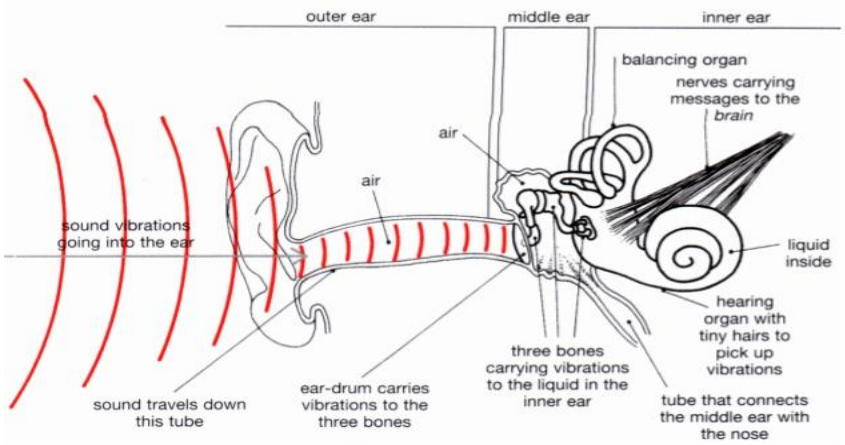
Group-3 HOW DOESTHE HUMAN EAR RECEIVE SOUND

What I observe:



Look at the diagram of human ear. As we have studied the parts of the human ear, sound waves enter the ear canal and make the ear drum vibrate. This action moves the tiny chain of three bones in the middle ear. The last bone in this chain is, stirrup, 'knocks' on the membrane window of the cochlea which contains hair cells and makes the fluid in the cochlea move. The fluid movement then triggers a response in the hearing nerve. Thus, we sense a sound.

What I designed:
Taking inspiration from the diagram of human ear, design a model* of the ear using common household materials (see page 13).

What I need:

- Aluminium foil pie pans
- Card stock or construction paper

- Straws (bendable straws preferred)
- Ping-pong balls or balloons
- Container of water
- Tape
- Drawing of activity and ear model* (for reference on page 13).

What I do:

1. After constructing the model, group members will make different sounds to demonstrate how the human ear works and reflect on the effects loud sounds have on different parts of the ear.
2. Test out the model by making a variety of sounds and noises at different levels near the plastic wrap. [Reminder: Examine how each sound affects the straws, Ping-Pong ball, and water surface.
3. Create a chart and record the effects of sound and noise levels on their model. Teachers should note the type or source of sound and impact on the model. Think about how this may relate to hearing loss.

What I conclude:

Based on the following guiding questions conclude your findings:

- What happened when you made sounds near the pie pan?
- Did the model react differently when you made loud sounds versus soft sounds?
- What parts of the ear might the different parts of the model represent?
- Imagine the small parts in your ear that this model mimics. If a similar reaction can occur inside your ear when you hear loud sounds, could this cause a problem? Why?

My conclusion:

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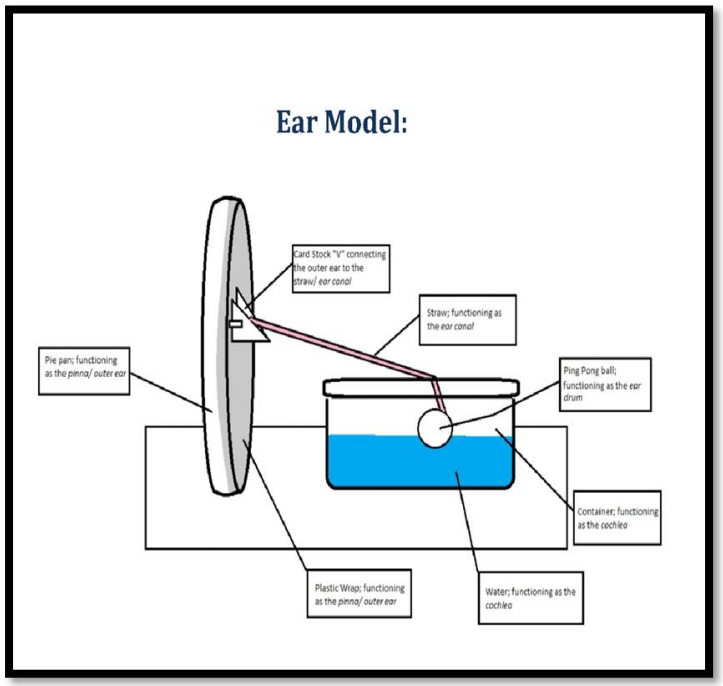
***A Sample of Ear Model (along with chart indicating role of each part of ear)**



Parts of Human Ear - Chart

Part of Human Ear	Its Function
OUTER EAR/ PINNA	Acts as a funnel on the outside of the ear that directs sound into the ear
EAR CANAL	A tube running from the outer ear to the middle ear to transmit sound
INNER EAR/ COCHLEA	A hollow tube in the inner ear of higher vertebrates, usually coiled like a snail shell where sound waves are transformed into electrical impulses which are sent on to the brain

Reference : https://www.nyc.gov/assets/dep/downloads/pdf/environment/education/l4-sound-noise-how-ear-works-elem.pdf

Handout# 11.2

WORKSHEET

Time: 20 MIN

Q1. **Tick the correct answer.**

1) In which of the following, the speed of the sound is maximum?
   a) Sea water
   b) Air
   c) Gold
   d) Space

2) When sound travels through air, the air particles
   a) vibrate along the direction of wave propagation
   b) vibrate but not in any fixed direction
   c) vibrate perpendicular to the direction of wave propagation.
   d) vibrate and move in a straight line.

3) Sound waves first enter the
   a) ear drum
   b) ear canal
   c) cochlea
   d) stirrup

4) The speed of sound in air is
   a) 345 m/s
   b) 333m/s
   c) 332 m/s
   d) 354 m/s

5) When sound waves reach the ear drum,
   a) sound is sensed by the brain.
   b) small hairs in the cochlea detect the vibration from the ear drum.
   c) the auditory nerve detects the vibration and sends them to the brain.
   d) small bones that lie behind the ear drum carry the vibration to the liquid in the inner ear.

Q2. Describe the difference between the sound you hear when you tap on the table with your ear against it and the sound you hear when you tap on the table when you are sitting up?

Q3. Complete the flow chart showing the passage of sound wave when it enters in the ear canal and reach the brain.

Additional Resources

- https://www.nyc.gov/assets/dep/downloads/pdf/environment/education/l4-sound-noise-how-ear-works-elem.pdf
- https://www.nidcd.nih.gov/health/how-do-we-hear#:~:text=Sound%20waves%20enter%20the%20outer,malleus%2C%20incus%2C%20and%20stapes.
- https://www.bbc.co.uk/bitesize/topics/zgffr82/articles/zh9bydm#z8hpp4j
- https://youtu.be/LkGOGzpbrCk?si=6XpOI4xxYxFgMkNO
- https://letstalkscience.ca/educational-resources/backgrounders/what-sound-and-how-do-we-hear-it

For reference:

List of 1-20 LCs topics

Learning Cycles (LCs)	Topics
LC-1	Orientation to Science
LC-2	Food and Health
LC-3	Ecology
LC-4	Matter and its States
LC-5	Mixture and Compound
LC-6	Force and Machines
LC-7	Forms of Energy
LC-8	Heat and Temperature
LC-9	Earth and Space
LC-10	STEM
LC-11	**Sound**
LC-12	Electricity
LC-13	Atomic Structure
LC-14	Microorganisms
LC-15	Pollution
LC-16	Light
LC-17	Chemical Equation
LC-18	Cellular Organisation
LC-19	Human Organ Systems
LC-20	Technology in Everyday Life

For reference:

List of Resource Items for LCs (11-20)

Items	No. of items	LC-11	LC-12	LC-13	LC-14	LC-15	LC-16	LC-17	LC-18	LC-19	LC-20
Sticky notes	3 set	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
A4 Paper	1 set	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pencils	12	✓				✓	✓	✓	✓	✓	✓
Thumb pins	1 box	✓				✓					
Balloons	12	✓									
Wooden blocks	1	✓									
Blind fold ,	2	✓									
Board marker,	5	✓									

Speaker	**1**	✓									
Plastic ruler	**2**	✓									
Metallic ruler	**4**	✓									✓
Rubber band	**1 packet**	✓									
Wooden ruler	**2**	✓									
Human ear structure	**1**	✓									
Aluminum foil sheet	**7 meter**	✓					✓				
Card stock or construction paper	**12**	✓									
Straw	**24**	✓								✓	

Ping pong ball	**5**	✓									
Bell	**2**	✓		✓							
Bucket or Tub	**2**	✓									
Chart	**24**		✓	✓	✓	✓	✓				
Lemon	**6**		✓								
Paper clip	**2**		✓								
Copper wire	**1 fold**		✓								
Comb	**1**		✓								
Battery	**5**		✓								
Small bulb / Led light	**3**		✓								

Marker	**10**			✓	✓	✓					
Chart of atomic structure	**1**			✓							
Agar plates	**2**				✓						
Yeast	**1 small packet**				✓						
Tap	**2**	✓				✓	✓				
Clear plastic	**2 pieces**					✓					
Mirrors	**2**					✓					
Wax paper	**2 pieces**					✓					
Torch / laser	**3**					✓					
Paper bags	**4**									✓	
1 litter bottles	**2**									✓	
Cardboard	**2 box**										✓
Cutter	**3**										✓

Meter tape	**3**										✓

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