

Bees buzz, bumblebees hum, and butterflies ...?

Acoustics for primary schools

Perceiving sound

Generating sound

Exploring sound

Sound and health

Section 1: Perceiving sound

All I can hear is sound.



Students are shown a small plastic bucket covered with a silicone cover. On the other side is a hole in the bottom of the bucket. The cover is plucked. The students hear a sound.

Discovery 1:
I can hear something.

Perceiving sound

Hidden timer

Card 1



Teacher experiment

- A kitchen timer is hidden in a room.

Task

- There is a sound hidden in this room. All those who recognize the sound, raise your hands.
- Can you hear it better if you close your eyes?
- What direction does the sound come from?

Perceiving sound

Hidden timer
Card 1



Solution/Discovery

- I can hear and recognize sounds.
- If I know a sound, I perceive it earlier.
- I can hear directions.

Perceiving sound

Ear as a sound funnel

Card 2



Student experiment

(compulsory experiment in the curriculum)

- Go into the corridor.
- Place a ticking timer onto a chair.
- Listen carefully to the sound, then go so far away from it so you can't hear it anymore. Mark the spot.
- What can you hear?
- Now take a sound funnel to make your pinna bigger (see photo). Stand next to the timer again and move away from it. What do you notice?

Perceiving sound

Ear as a sound funnel

Card 2



Solution/ Discovery

- A big acoustic horn can capture sounds and noise better and direct them into your ear. Therefore, you can hear better.
- With an arched hand in front of the ear, you can enlarge your pinna and thus hear better.
- Our pinna is an enlarged acoustic horn.
- Our ear can distinguish between **loud** and **quiet**.

Perceiving sound

Acoustic tube and pen
Card 3



Students experiment (partner work) *(compulsory experiment in the curriculum)*

- Student 1 holds the tube openings to their ears (as on photo).
- With the pen student 2 **carefully** taps on different places on the tube.
- With a show of their hand student 1 indicates whether they heard the sound with their right or left ear.
- What can our ears perceive?
- Question: What happens if student 2 taps exactly onto the middle of the tube?
- Take turns!
- *Extra: What happens if only one end of the tube is placed to an ear?*

Perceiving sound

Acoustic tube and pen
Card 3



Solution/ Discovery

- When we tap on the tube the sound goes to the right and left at the same time.
- The ear closer to the sound hears it first because the path of the sound is shorter.
- We need two ears to determine the direction the sound is coming from.
- Our ears can distinguish between **right** and **left**.

Perceiving sound

glass harp
Card 4



Student experiment

- Fill two glasses with different amounts of water (see photo).
- Run your moist fingertip around the rim of the glass in a circular motion.
- Can you hear a sound?
- Try this with the other glass. What do you notice?
- What can your ears perceive?
- *Alternative: Instead of stroking the rim of the glass you can tap the side of the glass lightly with a spoon.*

Perceiving sound

Glass harp
Card 4



Solution / Discovery

- The less water in the glass, the higher the sound.
- The more water in the glass, the lower the sound.
- Our ears can distinguish between **high and low** sounds.

Perceiving sound

Bell ball
Card 5

Student experiment (group work)

(2-4 pupils)

- Sit close together on the floor.
- Close your eyes.
- One pupil begins by rolling the bell ball to another child.
- When the ball reaches you take it and roll it back or to another child.
- What can our ears perceive?



Perceiving sound

Bell ball
Card 5



Solution / Discovery

- There are wooden beads in the ball which make noise when you roll the ball.
- Our ears help us with spatial orientation. The sound waves reach our ears at different speeds and from that our brain calculates the direction the sounds come from.
- We need 2 ears to determine the direction.
- Our ears can differentiate between **near and far**.

Perceiving sound

Sorting sounds
Card 6



Hearing and sorting sounds (partner work)

- Both partners take an iPad, earphones and the exercise material.
- Round 1: Listen to the recording and follow the instructions.
- Round 2: Listen to the next recording and follow the instructions.
- Now exchange ideas with your partner.
- Can you find differences? Think about the reasons for the differences.

Perceiving sound

Sorting sounds

Card 6



Solution / Discovery

- We all have a different feeling for which sounds are pleasant or unpleasant.
- Sometimes loud sound is unpleasant to us and quiet sounds are pleasant or vice versa.
- Our ears can differentiate between **pleasant and unpleasant**.

Perceiving sound

Hearing training A
Card 7



Hearing training A (partner work) Finding sound pairs

- Shake the little tins and listen carefully.
- Now find two tins that belong together (= that sound the same).
- Memory games: The player who begins shakes two tins. If they sound the same the player keeps them and continues. If the tins do not sound the same it's the next player's turn. Who finds the most pairs?

Perceiving sound

Hearing training A
Card 7



Solution / Discovery

A - 4

B - 2

C - 7

D - 1

E - 3

F - 6

G - 5

Perceiving sound

Hearing training B Card 8

Hearing training B: What's inside?

- In front of you are seven little tins with different substances inside:
 - rice, semolina, beans, lentils, paperclips, glass marbles, aluminium balls*
- Shake the tins and listen carefully.
What's inside the tins?
- Open the tins and check the content if you're sure about all of the them.



Perceiving sound

Hearing training B Card 8



Solution / Discovery

- Some materials are easy to recognize. But you have to listen carefully to some materials.
- The lighter the material is, the quieter the sound is.

Perceiving sound

Hearing training 3 Slide 9



Hearing training 3 (partner work) How many beans are in the tin?

- Shake one tin after the other.
- Place the tins in order. Begin with 1 bean, 2 beans...
- Shake the tins again and check if you have the right order.
- Check the bottom of the tin.

Game:

Take any one of the tins, shake it, and guess how many beans it contains. Your partner will check your answer on the bottom of the tin. If you're right you get one point.

Perceiving sound

Hearing training C

Slide 9



Solution / Discovery

Seven tins are filled with beans:

First tin: 1 bean

Second tin: 2 beans

Third tin: 3 beans ...

The number is on a sticker on the bottom of the tin.

- **The more beans there are in the tin, the louder the noise is when it's shaken.**

Perceiving sound

Summary

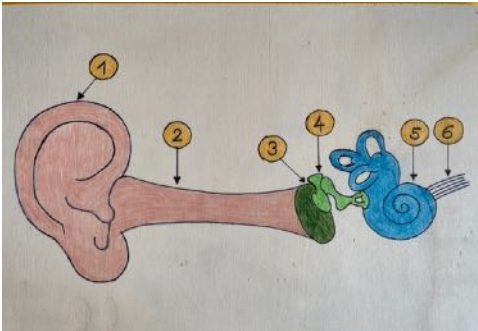


This is what I know now!

I can hear many sounds with my ears.

Because we have two ears we can identify the direction and distance sounds come from.

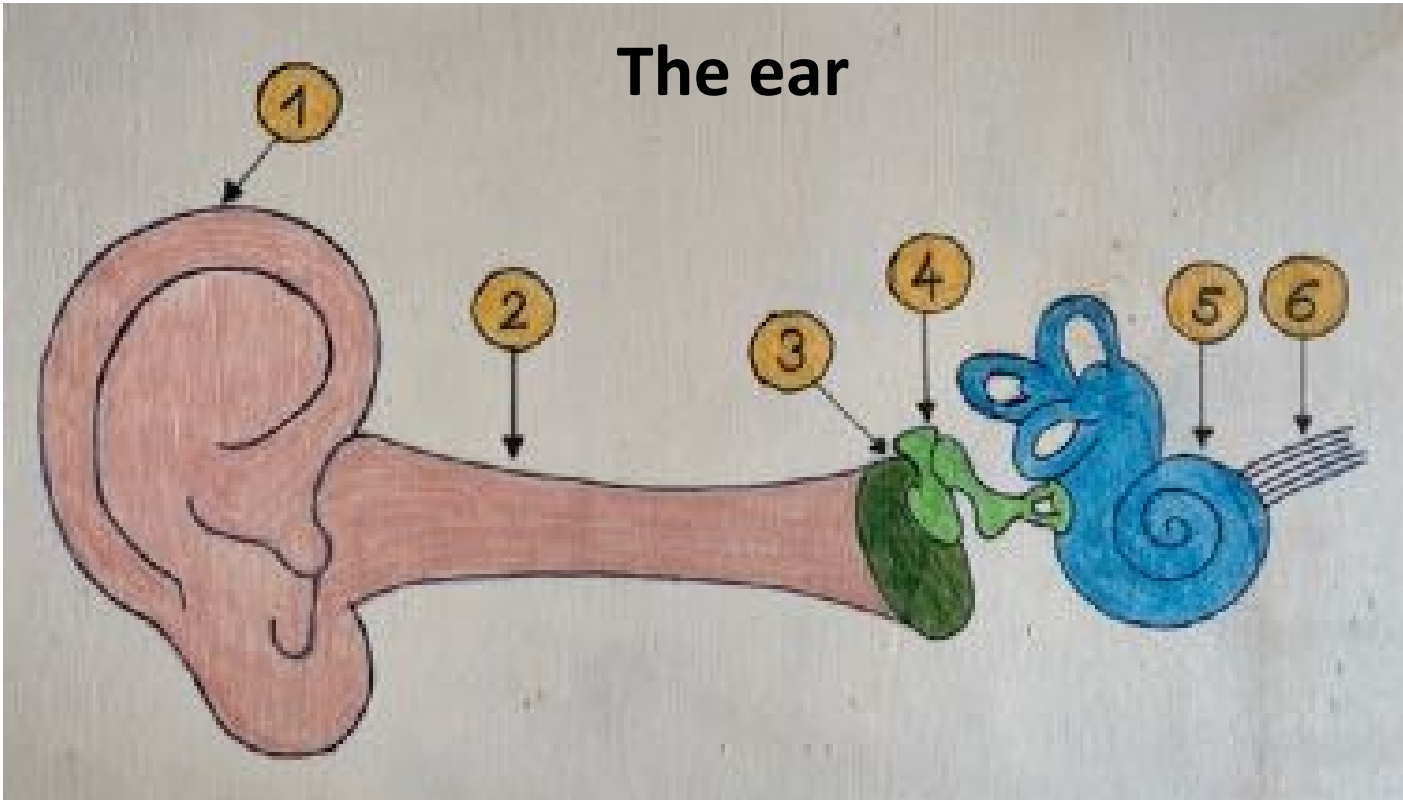
How can I hear sounds?



The _____ catches the sound waves and directs them into the _____ .

1 pinna, 2 ear canal, 3 eardrum, 4 auditory ossicle, 5 cochlea, 6 auditory nerve

The ear



1) pinna

2) ear canal

3) eardrum

4) auditory ossicle

5) cochlea

6) auditory nerve