

Unit 5F Changing sounds

ABOUT THE UNIT

Through this unit children learn that sounds are produced by vibrations and that these vibrations travel from the source through a variety of materials. Musical instruments are used to illustrate the range of ways of producing sounds and how pitch and loudness can be altered.

Experimental and investigative work focuses on:

- turning ideas into a form that can be investigated and making predictions
- deciding whether the evidence is sufficient to support the prediction.

Work in this unit also offers opportunities for children to use scientific knowledge and understanding about sound to explain familiar phenomena and to relate this to their understanding of musical instruments.

Hearing impaired children will need particular support in this unit. This will be helped by visual demonstrations of the properties of musical instruments and by attention to the vibrations as sounds are produced. It is important for teachers to help children to be sensitive to those who are hearing impaired.

This unit takes approximately 12 hours.

WHERE THE UNIT FITS IN

Builds on Unit 1F 'Sound and hearing' Children will not have learnt about sound in science during Key Stage 2. However, work in music will have extended their knowledge. It is therefore particularly important at the beginning of this unit to find out what children know and think.

Links with Units 4D, 5C and music and design and technology.

VOCABULARY

In this unit children will have opportunities to use:

- words related to sounds *eg pitch, loudness, vibration, muffle, tuning*
- near synonyms *eg quiet, soft, noise, sound*
- nouns and related adjectives *eg loudness, loud, tension, tight*
- expressions of contrast *eg this sound is loud and high, this is loud and low*
- generalisations about relationships between variables *eg if I tighten the drum skin the pitch will go up.*

RESOURCES

- selection of musical instruments *eg drum, recorder, triangles, xylophone, castanets, stringed instrument*
- tuning fork or forks
- clamp to attach a ruler to a desk or table
- buzzers/ticking clocks
- variety of materials *eg foam sheeting, bubble wrap, woollen fabrics, newspaper, furry fabrics*
- video of orchestra/band, or observation of school band/orchestra
- tuned drum
- wide-necked bottles
- secondary sources *eg CD-ROMs, reference books providing information about aspects of sound*

EXPECTATIONS

at the end of this unit

most children will:

generalise that sounds are produced when objects vibrate; suggest how to change the pitch and loudness of the sounds produced by a range of musical instruments; recognise that sounds travel through solids, water and air, suggest how to investigate how well sound travels through different materials and say how good their evidence is

some children will not have made so much progress and will:

suggest ways of producing sounds; distinguish between pitch and loudness, and suggest how to change the sound made by an instrument

some children will have progressed further and will also:

describe ways in which the pitch of a sound made by a particular instrument or vibrating object can be raised or lowered and identify what is vibrating in a range of musical instruments

LEARNING OBJECTIVES

POSSIBLE TEACHING ACTIVITIES

Review children's existing ideas by providing a 'circus' of short activities eg *trying out musical instruments which make sounds by banging, shaking, plucking, blowing; tapes of high, low, loud and quiet sounds; tapes of sirens approaching and going away; pictures of dogs or other animals pricking up their ears* accompanied by questions eg

- How do these instruments make a sound?
- Which of these sounds is high, low, loud, quiet, going away, approaching?
- Why do dogs and cats move their ears?

Discuss children's answers with them.

LEARNING OUTCOMES

POINTS TO NOTE

This activity is intended to find out about children's existing knowledge and understanding of sound. Teachers will need to take this into account in their short-term planning of later activities.

 **SAFETY** – Children should be warned that loud sounds, including loud music, can damage the ears.

CHILDREN SHOULD LEARN

- that sounds are made when objects or materials vibrate
- to make careful observations
- to draw conclusions about sounds from their observations

- ◆ Demonstrate to children a number of examples of sounds associated with visible vibrations eg *a drum skin with rice grains on it, a plucked elastic band, a tip of a vibrating turning fork placed in a beaker of water, a ruler clamped to a table and tapped at one end* and some sounds associated with vibrations they can feel with their fingers but not see eg *a cymbal that has been hit, a speaker for a stereo system, their larynx as they talk*. Ask children to record in writing or in drawings what they see and feel with their fingers and to state what is common to the sources of sound.

CHILDREN

- describe what they see or feel eg *the rice jumped up and down when the drum was hit, I couldn't see the turning fork vibrate but it made the water splash out of the beaker, I could feel my larynx (throat) vibrating when I talked*
- generalise that when a sound is made something is vibrating

At this stage children do not need to know about the structure of the ear.

- that vibrations from sound sources travel through different materials to the ear

- ◆ Ask children to listen carefully for sounds they can hear which are made outside the classroom. Include sounds which they regularly hear through walls/doors eg *school bell, children talking in the corridor outside*. Arrange for a loud sound to be made outside the classroom and ask children what it has travelled through eg *bricks, walls, wood, door, air* to reach their ears.

- state that a sound has reached them by travelling through solid eg *brick, wood* and gas (air)

Teachers may wish to contrast light and sound. Light does not travel through opaque solids eg *wood* whereas sound travels well.

Sounds can also travel through liquids. This is less likely to be shown through this activity.

- to make careful observations to identify the types of material through which sound travels

- ◆ Show children using a ticking clock or buzzer that sounds can be heard through a variety of materials eg *putting it in water, sand, a wooden box*. Extend children's experience with other activities eg *listening to a ticking clock on a wooden table by putting their ear to the table, putting their ear to a radiator and hearing the water circulating, using a 'string telephone'*. Ask children to make a table showing the materials tested and whether the sound travelled through them well and discuss what their results show.

- record eg *in a table* observations indicating how well sound travels through different materials
- generalise that sound can travel through solids, liquids and gases

Children may be familiar with sounds travelling through water through films involving submarines and the use of sonar or in the way whales communicate with each other.

 **SAFETY** – Check that radiators are not too hot.

- that some materials are effective in preventing vibrations from sound sources reaching the ear

- ◆ Discuss with children why sometimes it is important to prevent sounds travelling. Ask them to suggest how this is done eg *ear muffs, ear plugs, soft floor coverings*. Walk around the school to see where sounds eg *footsteps* are loud and where they are not. Ask children to describe what they observed.

- describe ways of reducing the level of sound reaching the ear eg *by having carpets, by using ear muffs, ear plugs*

Children may well have seen people using noisy equipment eg *road drills* and wearing ear protection. This could provide a stimulus for discussion.

 **SAFETY** – Warn children of the danger of putting objects in the ear unless they are specially designed for this eg *ear plugs*.

- to plan a test to measure or observe how well different materials muffle sound
- to use a prediction to help decide what evidence to collect
- to devise a fair comparison of different materials
- to decide how to use a sound source and a range of different materials to collect reliable evidence

- ◆ Present children with a range of materials eg *bubble wrap, foam sheeting, artificial fur, blanket material* and ask them how they could find out which would be best for muffling a sound eg *in ear muffs, soundproofing a model house*. Ask children to think about and suggest:
 - how they will make fair comparisons of whether the sound is muffled
 - what they will use as a sound source eg *a ticking clock*
 - what they will vary eg *the material, the number of layers of the material, the area of the material*.
 Help children to carry out what they planned to do.

- predict with a reason what they think will be effective eg *fur will be good because ear muffs are usually furry, a blanket won't be good for sound proofing because it's too thin*
- plan how to answer the question showing they are trying to keep the test fair eg *'I'll use one thickness of bubble wrap, one thickness of foam sheeting and sit two metres away from the clock and see if I can hear it ticking' or 'I'll start with one thickness of fur, then two, then three and see when I can't hear the clock anymore. Each time I'll sit in the same place and the clock will be in the same place'*

This activity offers children the opportunity to carry out a whole investigation. It may be helpful to focus on the aspects of investigation highlighted in the learning objectives.

LEARNING OBJECTIVES

CHILDREN SHOULD LEARN

- to decide whether their results support or do not support the prediction or whether the evidence is not good enough

- that the term 'pitch' describes how high or low a sound is

- that the pitch of a drum depends on its size and the tightness of its skin
- that high and low sounds can be loud or soft
- to suggest how to change the pitch and loudness of drum sounds and to carry out simple tests of these

- that the pitch of a stringed instrument depends on the length, thickness and tightness of the string
- to suggest how to change the pitch and loudness of the sounds of stringed instruments

- that sounds can be made by air vibrating
- to suggest how to alter the pitch of a sound made by air vibrating and to test the prediction
- to listen carefully to sounds made, to record results in a suitable table and decide whether these support the prediction made
- to describe how the pitch of notes on a recorder (or other wind instrument) can be altered by changing the length of air column vibrating

- to relate their understanding of sound to a range of musical instruments
- to explain an application of sound using scientific knowledge and understanding

POSSIBLE TEACHING ACTIVITIES

- ◆ Ask children to describe to others in the class what they did and what they found out. Encourage children to question each other about the chosen method.

- ◆ Ask children to demonstrate playing a range of musical instruments or show children a video of a band or orchestra playing. Talk with children about sounds made by individual instruments and help them to describe the pitch of sounds using terms *eg high, low* and the loudness of sounds *eg loud, soft*.

- ◆ Ask children to play a number of drums to show how the pitch of a drum varies with size and, if possible, how it can be changed by tightening the skin. Ask children to suggest how to make particular sorts of sound *eg a high, loud sound* and test their ideas.

- ◆ Ask children or others to demonstrate differences in the strings of a stringed instrument and how the note from a particular string can be changed by changing the length of the string or tuned by altering its tension. Illustrate the variety of pitch and loudness by asking children to suggest how to change a sound *eg make the string longer and pluck it harder* and to test their ideas.

- ◆ Show children how to make a sound by blowing across the top of a bottle and ask them to suggest what is vibrating. Ask them to suggest how to change the pitch of the sound *eg if you put more water in the bottle the sound will get higher*, to test out their predictions, and to record observations in a suitable table or chart. Discuss with children whether the results they collected supported the prediction. Ask children to play high or low notes on a recorder (or other wind instrument) and to describe what they do to alter the pitch. Ask them to relate this to the length of the air column vibrating.

- ◆ Ask children to use secondary sources *eg CD-ROMs, reference books* to find out about other aspects of sound *eg other musical instruments, soundproofing* and to present information to the class. Ask the children questions and encourage them to ask questions of others about the information presented.

LEARNING OUTCOMES

CHILDREN

- describe what they did and explain whether they were satisfied that the evidence they collected allowed them to answer the question
- suggest ways in which their work could be improved *eg I should have used a quieter buzzer, it would have been easier to tell if the ear muffs worked*

- identify high, low, loud and soft sounds produced by musical instrument(s) and recognise in any piece of music that there is a variety of sounds of differing pitch and loudness

- state that small drums have a generally higher pitch than larger drums and explain that the screws on the sides of the drum tighten or loosen the skin to change the pitch

- suggest ways of changing sounds made by a stringed instrument *eg if I increase the length of the string the sound will be lower*

- recognise that the air in the bottle is vibrating, predict *eg putting more water in the bottle will make the note higher* and decide whether the prediction was correct *eg every time I added more water the note got higher. I was right*
- describe *eg on an annotated drawing* that when the length of the air column in a recorder is altered the pitch varies

- present information relating to, and ask questions about, applications of sound and relate these to scientific knowledge *eg of vibration, pitch, changing pitch, sounds travelling*

POINTS TO NOTE

-  **SAFETY** – Care needs to be taken when strings are stretched. If over-stretched, strings may break and flick back painfully.

Sounds can be made with bottles or other containers partly filled with water by blowing across the top or by tapping. If more water is added the sound made by blowing gets higher in pitch because it is the air column vibrating and this gets shorter. The sound made by tapping gets lower because it is the water which vibrates and the water column is longer.

-  **SAFETY** – LEA/school guidelines on the use of glass must be observed. Year 5 children should normally be mature enough to handle glass objects *eg bottles* safely. However in some classes *eg mixed age classes* or if supervision is difficult, alternatives may be necessary.



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