Practical Approaches to Teaching Sound and Light at KS2
Welcome to the Crypt Teaching School training session.

The focus of this session is on practical (and hopefully enjoyable!) classroom activities for teaching sound and light. I have not assumed previous subject knowledge or experience of teaching the subject.

This pack provides some student worksheets, and useful web links for teachers.

I have included some level 4 science SAT questions.

The last thirty minutes of the session will be a chance for delegates to discuss the activities and how they might fit into their school curriculum.

**Sound Topic**

(1) Sound is caused by vibrations. Explaining vibrations to the class using rulers and elastic bands.  
   Bigger vibrations = greater noise.  
   Faster vibrations = higher pitch.

(2) Sound travels through solids, liquids and gases.  
   The power of the air-zooka  
   Storytime: the humming railway tracks on a foggy morning.

(3) Circus of activities – what is causing the sound? What makes the sound change?  
   Tin can telephone  
   Music box on and off a table  
   Bottles with different amounts of water  
   Guitar strings  
   Bongo drums  
   The slinky spring light sabre  
   Moo-boxes

(4) Classifying cut and stick activity – musical instruments

(5) Science and Technology – making your own musical instrument.

(6) SATs questions
Teaching Light

(1) We see objects because (i) they emit light or (ii) they reflect light. The light travels into our eyes.

(2) Scientists discovered that light travels in straight lines. Using cardboard arrows and red wool to show the direction light is travelling.

(3) Shiny smooth objects reflect light. Demonstration – smooth tin foil has a mirror effect, rumpled tin foil doesn’t. Student classroom investigation to classify objects.

(4) Shadows are formed when light is blocked by an object. Student investigation.

(5) White light is a mixture of different coloured light. Rainbows form when sunlight is split. Student practical, make a colour wheel.

(6) Light travels in straight lines. Yr 6 Students make a periscope.

(7) Level 4 SATS questions on light.
Sound and Vibrations

Simple Definition of vibration

: a continuous slight shaking movement : a series of small, fast movements back and forth or from side to side.

Science GCSE definition: a periodic motion of the particles of medium in alternately opposite directions from the position of equilibrium when that equilibrium has been disturbed (as when a stretched cord produces musical tones or molecules in the air transmit sounds to the ear)

(Teacher training resource: https://www.youtube.com/watch?v=VYMRRaKMntY
Science teaching alive – 5 min youtube video

Elastic Band Investigations

<table>
<thead>
<tr>
<th>Vary the tension</th>
<th>Pitch of the twanging sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low tension</td>
<td></td>
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<tr>
<td>Mid tension</td>
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<tr>
<td>High tension</td>
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</table>

<table>
<thead>
<tr>
<th>Vary the thickness</th>
<th>Pitch of the twanging sound</th>
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<tbody>
<tr>
<td>Small thickness</td>
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<tr>
<td>Mid thickness</td>
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<tr>
<td>Large thickness</td>
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<tr>
<td>Vary the length</td>
<td>Pitch of the twanging sound</td>
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</tr>
<tr>
<td>Short length</td>
<td></td>
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<tr>
<td>Mid length</td>
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<tr>
<td>Long Length</td>
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</tbody>
</table>

**Air-Zooka Investigations**

<table>
<thead>
<tr>
<th>Distance from candle</th>
<th>Observations – what you saw happened</th>
<th>Correct?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long Length</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Object</strong></td>
<td><strong>Observation</strong></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Wind-up music box</td>
<td>What happens to the <strong>volume</strong> when it is put on a table? Why?</td>
<td></td>
</tr>
<tr>
<td>Tin can telephone</td>
<td>What happens to the volume when the tension in the string is high? Why?</td>
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<tr>
<td>Moo boxes</td>
<td>How do these make a sound?</td>
<td></td>
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<tr>
<td>Water bottles</td>
<td>Which water bottle has the highest pitch? Why?</td>
<td></td>
</tr>
<tr>
<td>Bongos</td>
<td>Will the large or small drum make the sound with the greater volume?</td>
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<tr>
<td>Light sabre</td>
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</tbody>
</table>
Sound Travels

When you bang a drum the vibrating drum makes the air near it ________________. The vibrations in the ___________ travel to the ___________, and you hear the sound.

Sound cannot travel in ___________ because there is no air for the vibrations to travel through. Space is a ___________. That is why astronauts need to use ___________ to talk to each other.

Air is a ___________. Sound can travel through gases. Sound can also travel through ___________ and ___________. In air, sound travels at ___________ per second, but speeds up in water to ___________ per second.

Dolphins communicate with each other under the _____. The sound can travel for hundreds of ___________.

Sound travels even more ___________ through a solid metal than through the air or water. Standing near a railway line, a ___________ from the rails can be heard several minutes before the train itself can be heard.

Word bank: gas quickly vibrate liquids humming 340m space sea ears
<table>
<thead>
<tr>
<th>Castanets</th>
<th>Guitar</th>
<th>Oboe</th>
</tr>
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<tbody>
<tr>
<td>Harp</td>
<td>Cymbals</td>
<td>Sitar</td>
</tr>
<tr>
<td>Trumpet</td>
<td>Bagpipes</td>
<td>Drum</td>
</tr>
<tr>
<td>Flute</td>
<td>Glockenspiel</td>
<td>Banjo</td>
</tr>
<tr>
<td>Triangle</td>
<td>Violin</td>
<td>Saxophone</td>
</tr>
</tbody>
</table>

- castanets
- guitar
- oboe
- harp
- cymbals
- sitar
- trumpet
- bagpipes
- drum
- flute
- glockenspiel
- banjo
- triangle
- violin
- saxophone
Write the title and date then divide your page into three sections and label them:

1. These instruments make sound by moving air.
2. These instruments make sounds by moving strings.
3. These instruments make sounds through something being hit.

**Muffling Sounds Investigation**

Some jobs require protective ear equipment to muffle or deaden sound. Some materials are much better than others at muffling sound. You are going to test a range of materials to see which seems to be best for this purpose.

What will you measure?

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What equipment will you use?

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BEFORE YOU START

List the materials you will test in this table and then make a prediction of which you think will muffle the sound best.
Number them 1-4 with 1 being the best and 4 the least effective.

<table>
<thead>
<tr>
<th>Material</th>
<th>Prediction</th>
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Method

Describe how you have set up the experiment and what you are doing.

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Results

Record your results in this table.

<table>
<thead>
<tr>
<th>Material</th>
<th>Noise Level</th>
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What can you say now about which materials are best at muffling sound?

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Practical – Make a Musical Instrument [https://www.tes.com/teaching-resource/teachers-tv-investigating-sound-6046748]

http://www.redtedart.com/2012/10/15/musical-instrument-crafts-for-kids/
SATS Questions

Q1. **Sounds**

Some children were playing musical instruments.

(a) Give **ONE** way a drum makes a sound when it is hit.

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......................................................................................................................

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1 mark

(b) The windows were closed. The children working outside could still hear the sound of the drums.

![Diagram of children playing musical instruments]

The sound reached these children’s ears by travelling through the air and through the:

......................................................................................................................

1 mark
Q2. **Sounds**

(a) Two girls put different amounts of coloured water in four bottles. They made sounds by blowing across the top of each bottle.

When they blew, which bottle made the highest note?

Bottle ........................ made the highest note.  

(b) The girl plucked an elastic band. It made a sound.

Explain why the elastic band made a sound when it was plucked.

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.............................................................................................................................................. 1 mark
Q3. **Sounds**

(a) Ann clamped a ruler to a desk.

She pressed down on the ruler and then let it go.

Why was there a sound when Ann let go of the ruler?

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1 mark

(b) Jack heard the sound.

What did the sound travel through to reach Jack’s ears?

......................................................................................................................

1 mark

(c) Ann shortened the length of the ruler sticking out from the desk.

She let go of the ruler from the same position as before.

Describe how the sound was different.

......................................................................................................................

1 mark
Teaching Light

Yr 3 – the sun is the main source of light,
Dark is the absence of light
The sun can damage your eyes.

This educational charity website has full schemes of work.
- **Good points** – lots of web-links and across-the-curriculum teaching ideas
  - Night Monkey, Day Monkey by Julia Donaldson, ISBN: The Owl who was Afraid of the Dark by Jill Tomlinson, or The Dark by Lemony Snicket, websites
    http://www.bbc.co.uk/education/clips/zw9rkqt - excellent short educational film
  - **Drawbacks:** - Introduces more complicated science content e.g.
    - refraction where light bends.
    Some of the practicals will not work (e.g. ‘catching rainbows’ in a glass of water or getting a diffraction pattern from a Perspex triangle).

Example lesson plan:
**Whole class teaching:** Ask children to cover their eyes with cupped hands with fingers pressed close together & then slowly spread their fingers apart. **What happened? Could they see their hands when their fingers were together? What enabled them to see their hands as they spread out their fingers? Light! We can see things when there is light. Where is the light coming from? Could be the Sun or lights (or both) in the classroom. Tell children that the Sun and lights are **sources** of light – they give out light (source – a place, person or thing from which something originates). Are there any other light sources in the classroom? E.g. computer screen, desk lamp, torches, etc. Together go through the 5 pages at http://resources.hwb.wales.gov.uk/VTC/light/eng/Introduction/default.htm & identify the light sources. Then watch the short video clip at http://www.bbc.co.uk/education/clips/zw9rkqt & ask children to note down any light sources that they see. Discuss what they identified & ensure that they realise that the moon & road signs are reflecting light; they are not a source of light. Children will find out more about reflected light in the next Session. **Which light source was the brightest?** The Sun. **Which was the least bright?** The candles.

Point out that darkness is an absence of light. Read a book about darkness at night time, e.g. Night Monkey, Day Monkey by Julia Donaldson, The Owl who was Afraid of the Dark by Jill Tomlinson or The Dark by Lemony Snicket, to start a discussion about children’s feelings/fears about darkness. **Where is it really dark?** In a cupboard, in a tunnel, in the cellar, down a well, under the bed clothes, in a cinema, etc. Talk about times when children have been outside in the dark – there is usually some light, e.g. street lights, moonlight (reflected light!), shop lights, car headlights, bicycle lights, advertising displays, stars, torches, fireworks & bonfires, etc. Briefly talk about how our eyes adjust to the dark (children can observe each other’s pupils in light/dark situations). Use a globe to explain how when the part of the world where we live turns away from the sun, that’s when it gets dark - night time (there’s no light). Watch short video clip at http://www.bbc.co.uk/education/clips/zrd9wmn. Explain that although it looks as if the Sun is moving in the sky every day, it is actually the world turning as they saw in the video (they will revisit the relationship between the Sun, Moon & Earth in Year 5). Talk about how at night we can see the moon, stars and planets in the sky. Point out that at night the temperature also changes – it becomes colder, because the Sun provides us with heat as well as light. When it is getting dark (after Sunset), we call it dusk or twilight, and it starts to get light again (before Sunrise) in the morning at dawn. (The Sun’s light is reflected off the atmosphere, but the
children do not need to understand that!) Show video clip at [http://www.bbc.co.uk/education/clips/zwspyrd](http://www.bbc.co.uk/education/clips/zwspyrd) to see children having fun in the dark!

**Group activities:**

**Adult-led activity:** Take children to the hall or playground or clear an area in the middle of the classroom. Spread the children randomly around the area (or a group of children if in the classroom). Blindfold a child so they cannot see anything (in the dark). Challenge the child to get across the room either using touch (time them) – so they feel for the other children & make their way around them, or using hearing – other children make a noise, e.g. hum when child is near them, so they know to avoid someone, or using both senses. Time how much more quickly they can get across the room if they can see!


**Independent activity:** Visit [http://www.bbc.co.uk/education/clips/zfp6n39](http://www.bbc.co.uk/education/clips/zfp6n39) & identify light sources in a dark bedroom at night.

**Independent activity:** Children investigate a Dark Box (see session resources) & answer the questions (session resources). Set up extension activity.

**Independent activity:** Children try ‘Turn on the Lights’ challenge (others will be tackled in later sessions) at [http://www2.bgfl.org/bgfl2/custom/resources_ftp/client_ftp/ks1/science/colour_and_light/start.cfm?userid=229845](http://www2.bgfl.org/bgfl2/custom/resources_ftp/client_ftp/ks1/science/colour_and_light/start.cfm?userid=229845).

### Yr 6 – Light travels in straight lines

Model with red wool in the classroom

Shadows are formed when light is blocked by an object.
Shadow Puppets.

Put your results in the table below.

<table>
<thead>
<tr>
<th>Distance from puppet to screen / cm</th>
<th>Height of the shadow / cm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Analysis and evaluation.
How does the distance between the screen and the puppet affect the size of the shadow?

What Patterns can you see in your results?

What is the best distance for a large, clear shadow?

Was your experiment a fair test, did you have any odd results?

How could you make your experiment better?
Student Activity – Make a Periscope

https://www.stem.org.uk/elibrary/resource/31673/periscopes
Sun and Light

This is a plan of a room.

There is a mirror on the wall. The Headteacher can see only Huw, Raj and Ian, without looking in the mirror.

(a) Draw an arrow on the picture to show how light travels from Raj to the Headteacher.

(b) Which **TWO** people can the Headteacher see only by reflection in the mirror.

(i) .................................................................

(ii) .................................................................

(c) Which **TWO** people can Colin see only reflected in the mirror?

(i) .................................................................

(ii) .................................................................
Q2. Light

(a) Tim and Sue have a torch and a shadow puppet. What does the light from the torch shine on? Tick TWO boxes.

- the front of the puppet
- the back of the puppet
- the shadow of the puppet
- the screen

1 mark

(b) Explain how a shadow is formed.

...................................................................................................................................................
......................................................................................................................................................
Q4. **Light**

(a) The things below all make shadows in light.

Draw **ONE** line from each object to the shadow it could make.

Use each shadow **ONCE**.

(b) Jenny investigates which materials allow light to pass through. She holds different materials out in the sun.

Complete the table below to predict Jenny’s results. Tick **ONE** box in each row. One has been done for you.

<table>
<thead>
<tr>
<th>Material</th>
<th>Some light passes through</th>
<th>No light passes through</th>
</tr>
</thead>
<tbody>
<tr>
<td>tissue paper</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>glass</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>