

6-8
years

pri-sci-net



inquire
investigate
evaluate
connect

Science Content:

Physical Science: Sounds

Target Concepts/Skills:

Making sounds, listening to sounds

Target Age group:

6 -8 years

Duration of activity:

3 teaching hours (a two hours session 90 , followed by an optional one hour session, 45)

Summary:

Children working in groups of 4-5 are given a box with common, everyday materials, such as pieces of plastic wrap, straws, pieces of string and plastic or foam cups, pieces of paper, plastic ruler, etc. and are asked to produce sounds using these materials. In groups children are expected to explore the materials in order to create sounds. Later, they present the materials/objects they used and the sounds they made. They are asked to discuss what they think produces sounds and how the objects behave as sound sources. Then they construct a paper flute and explore the way it creates sounds. The children then formulate an operational definition of what creates sound in vibrating materials. An optional activity that could be added includes inquiry about sound produced by a small radio playing in low volume, within an insulated box (with some foam). The children are expected to propose ways to improve the sound for better listening. Children in groups can use a couple of cylinders (rollers, tubes and/or rolled corrugated paper) in a "V" angle, with the small radio and some reflecting surfaces (e.g. plastic mirror, piece of plywood, a piece of sponge or foam etc.), in order to investigate how they could listen to it through the cylinders. They are expected to formulate an operational definition of what reflecting or absorbing

surfaces can do to sounds.

Objective:

By the end of the activity children should be able to:

- Use everyday materials to produce sound;
- Carry out systematic explorations combining properties of vibrating materials;
- Formulate an operational definition of how sounds are created;
- Investigate how sound is reflected by different surfaces; and
- Find the best angle and surface for the reflection of sound.

Resources:

For each group of children:

- Plastic wrap; straws; pieces of string and paper;
- Plastic/polystyrene cups, pieces of paper, plastic ruler or knitting needle, elastic bands, a cardboard box, and a small radio;
- Rather tall cardboard box and a reflecting surface;
- Some cylinders e.g. rollers, tubes or rolled corrugated paper;
- Some reflecting surfaces e.g. top of a cardboard box, plastic mirror, as well as absorbing surfaces such as sponge.

Making Sounds

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Making Sounds

Lesson plan (with inclusion of teacher notes) - Description of activity (describe underneath what children have to do and how the teacher guides the activity)

Activity 1 [introduction] (10 minutes):

The teacher brings to class a number of trays and or boxes with materials such as: pieces of plastic rap, straws, pieces of string and plastic or foam cups, pieces of paper, plastic rulers, elastic bands, small carton boxes etc. S/he distributes one box or tray to each group and invites them to play and investigate the materials in order to make sounds out of them. She may also give the tip that the material may be combined as well, instead of being used in a single way. The teacher may also invite the children to make as many sounds as they can, out of the available materials and later compare the sounds each group has made.

Activity 2 [inquiry] (30 minutes):

The children work in groups exploring the various materials in their attempts to produce sounds. The teacher may ask the children to note which materials they used and the sounds they made. Children will have the opportunity to test their ideas and try to produce sounds using single objects, combination of objects, beating, scratching, heating, vibrating them and/or blowing through them etc. Children will be able to experience how the different objects may combine to produce sounds, like rubber

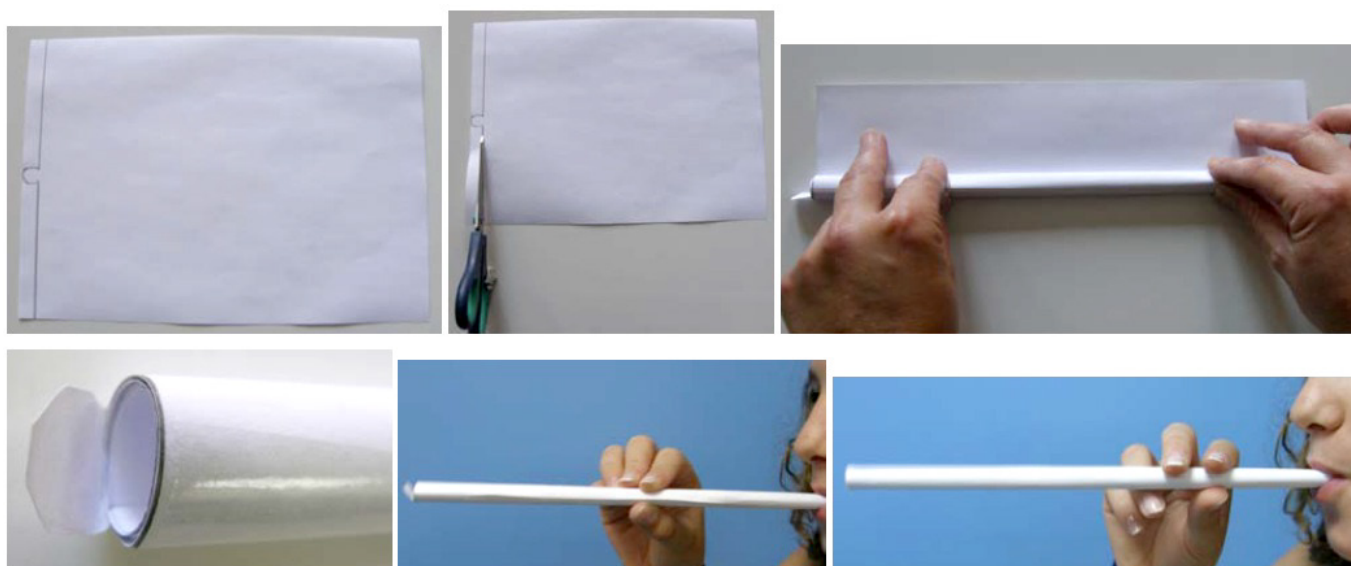
bands and cups or boxes and straws etc. The teacher needs to move among the groups, facilitate and guide children during this activity and encourage them to test the ideas they came up with. The teacher asks children to discuss and express verbally the steps of the procedure they follow in the production of sounds.

Activity 3 [project work, could be optional] (30 minutes):

The class can move on to construct the “flapping flute”, a simple sound instrument out of a piece of paper.

Version 1:

All the children are given a piece of paper (e.g. A4 size), with a drawn flap at one of its ends. They cut the flapping shape and then roll the paper up in its length, using a pencil or a straw. Glue the paper to keep it rolled and slightly bend the flap towards the shaped paper pipe. Now, they can suck air through the pipe and produce a vibrating sound, coming out of the flap, or they can put the flapping end in their mouth and blow out some air accordingly, producing another sort of vibrating flap movement (see photos below).



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Version 2

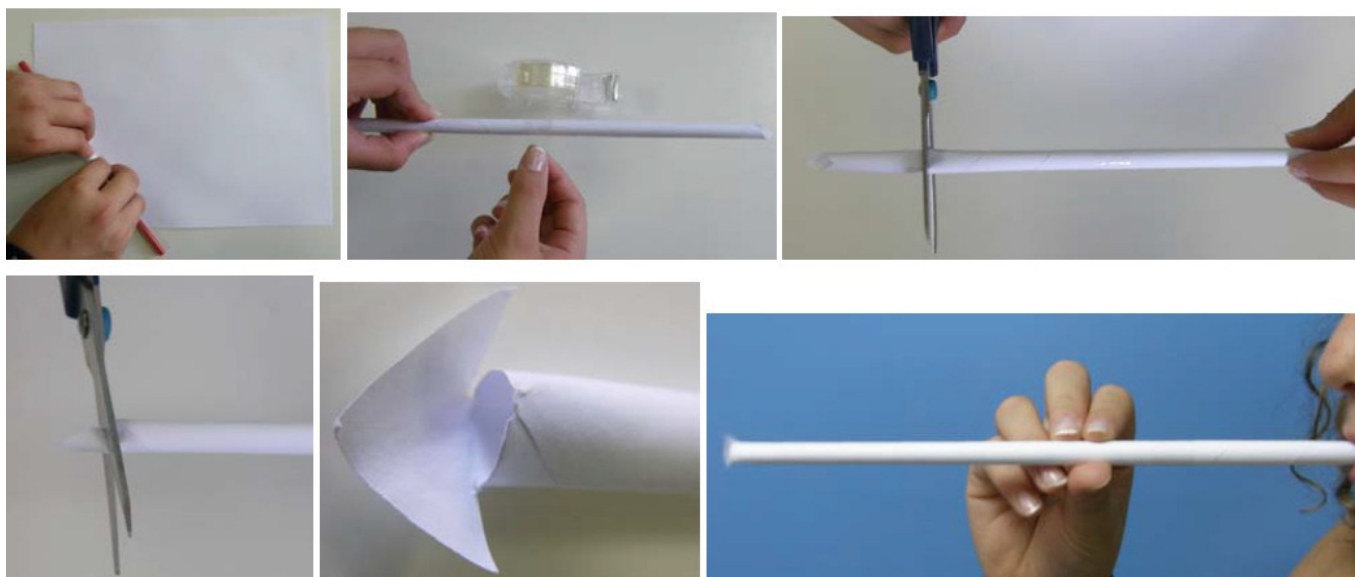
An A4 page is rolled diagonally over a pencil or a straw and then cut one edge off entirely and the other slightly in order to form the flap. They can suck or blow air in the paper tube and make a vibrating sound source (see photos below).

The children play for a while with their flapping flutes and the teacher asks them to express their ideas on what makes the sounds come out of their flutes, triggering their thinking by examining their toys carefully. It is expected that they will notice the movement of the paper flaps of their flutes and refer to it as “moving” “coming and going”, “flapping”, “trembling” and thus making all the sounds. Then perhaps this could be linked with other vibrating objects and/or materials produced to formulate some sort of explanatory pattern for the creation of sounds (i.e. flapping, shaking, vibrating, trembling, moving objects etc.).

Activity 4 [discussion] (20 minutes):

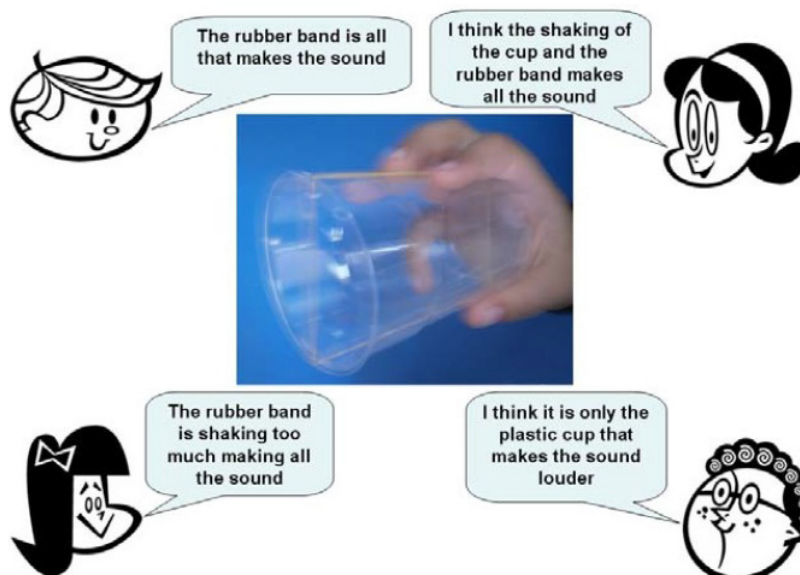
The teacher initiates a conversation with the children by asking questions about how they have created all of their sounds, and perhaps asks each group to report to the class the sounds they have managed to make so far. It is expected to identify the vibrating nature of sound sources and link it with sound production. At this stage, a concept cartoon could be projected and/or handed out in groups and perhaps later discussed in class, with the children arguing what makes a rubber band produce a sound rolled over a plastic cup (indicative main topic), which could be one of the sound sources they have constructed (see overleaf).

Finally, the children could be asked to formulate an operational definition on what they think makes all the sounds and perhaps what is characterized as a sound source. As an extension to this activity, the children could create a poster, putting down the sound sources they identified, in a pictorial form and/or in real objects and materials and perhaps describe or recreate the various sounds each source is making.





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Optional activity [inquiry & further discussion] (45 minutes)

A further activity includes the teacher holding a cardboard box with some foam insulation inside and a radio. She turns on the radio to play and makes sure everybody can listen to it. Then she turns the volume down and puts it in the insulated box. The sound of the radio can be barely heard now. She asks the children whether they can find a way to hear the radio again, even from the other end of the class (see photos below). A problem situation is presented, triggering children's interest and enthusiasm. They cannot touch the inside of the box and are asked if they can do something to the box in order to be able to hear the radio.

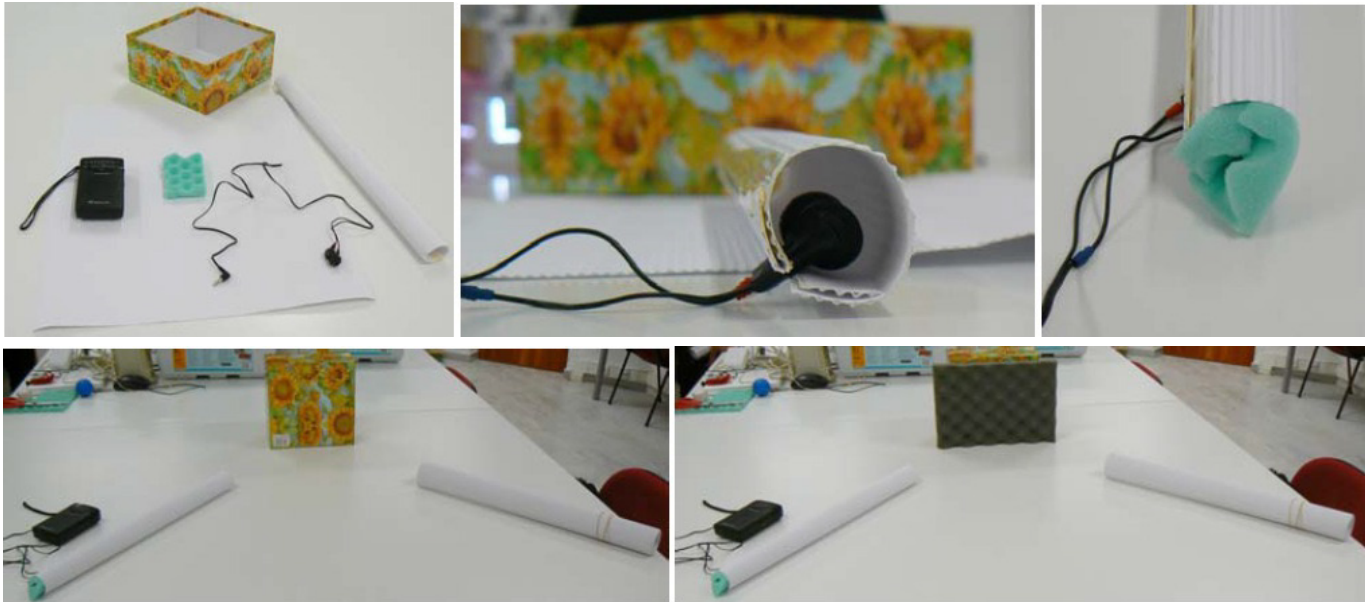
If no idea is suggested, even with some available materials on the table (like the box top, a plastic mirror, a piece of sponge or foam etc.), then an exploration can follow. Each group of

children is given a couple of cylinders (rollers, tubes and/or rolled corrugated paper), and asked to shape somehow (preferably in a "V" angle), and then place the small radio with earphones attached at the end of one of the tubes so that a low sound is emitted at the end of one tube. Place the tube at an angle to the reflecting surface and move the second tube through an angle until you hear it loudest. Repeat with different reflecting surfaces. They thus investigate the transmission of sound by putting "hard" and "soft" surfaces at the pick of the "V" shaped cylinders. It is expected to find out that "hard" surfaces like the plastic mirror, a piece of cardboard box or piece of plywood, allow the sound of the radio "to be heard" at the other end of the second cylinder (reflecting surfaces), whereas some "soft" surfaces like sponge or foam do not do that (absorbing surfaces). (see photos below)



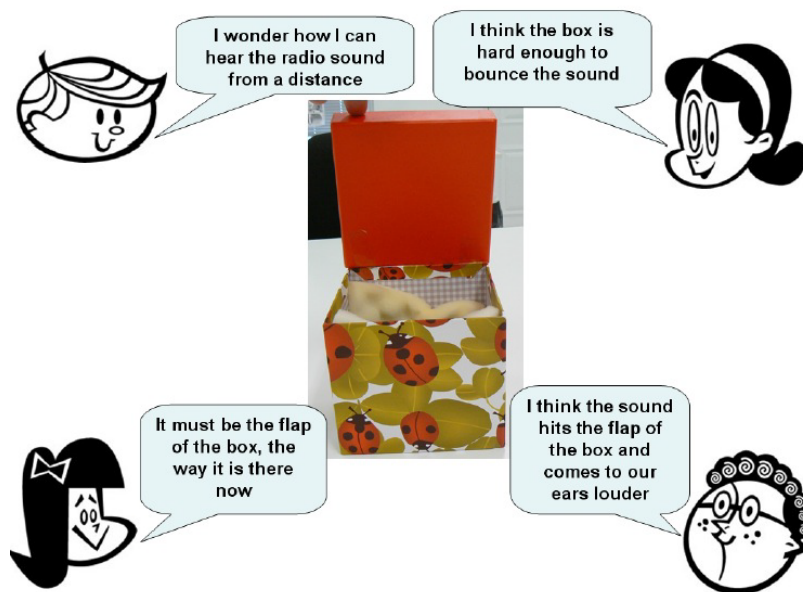


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After this activity, the class could return to the initial problem situation and propose some ideas for the sound of radio to be heard at the other end of the class, when playing in low volume inside the insulated box. After testing all appearing ideas, the children could vote for the most efficient one. The discussion can

move ahead with the role of hard and soft surfaces on hearing sounds and perhaps raise some arguments with another concept cartoon (i.e. discussion about the top of the box attached to it as a flap and the effect this has on the sound of the radio). (see concept cartoon below).



Making Sounds

1. Engage (Forming hypotheses)

*Decide which question to investigate (= the challenge)
What do children already know? What are their ideas? (make the question to investigate meaningful for the children)*

The children are familiar with sounds and most likely with making and hearing sounds. What they may have not identified so far are sound sources and that sound is produced by vibrating (moving, shaking, trembling, flapping etc.) materials. Thus, we start from what the children already know and through the activities we engage them in explorations and further hands-on inquiry, in order to identify the nature of sounds and how they are produced.

The teacher provides the children with a variety of common everyday materials and asks the children to make sounds by combining the materials. Questions that the teacher can use: Which materials can make sounds? / How can we say that a material makes a sound? / What combinations of materials can we use to make sounds? How is sound produced? etc.

Children may revisit the question stated above at the end of the activity.

2. Inquiry

1) How can we say that a material/object makes a sound?
The children work in small groups. Each group is given tray or box of materials and the children are asked to make sounds out of them. They are invited to interact with the materials and with combinations of them so as to produce a variety of sounds. They are encouraged to test how the various materials/objects make sounds when treated in particular ways. They are expected to use their observations (sound making or even sound stopping) as a basis for generating a functional definition of what a sound may be and what could be identified as a sound source. Each group makes as many sounds as possible and then compare sounds with other groups in a whole class session. They are expected to express clear ideas of how sounds are made and they are always encouraged to clarify their arguments and refine their ideas. The

teacher has a facilitating role, encouraging inquiry at all times.

2) Children are asked to remain in groups and make a simple “paper flute”. They make the flute and play with it for some time. They are invited to notice what makes the flute produce a sound. They are likely to focus on the moving flap and feel its vibrations. Children are expected to link the production of sound to vibrations. This activity engages children with a set of instructions for project work and elicits discussion on how it works under in view of observations or evidence (the trebling flap).

3) Further inquiry involves investigating and identifying the behavior of sound on reflection and absorption.

3. Evaluation

Conclusion: use data to construct knowledge and generate evidence.

Demonstrate understanding of concepts and/or ability to use inquiry skills

The teacher keeps returning to the initial questions of the activities encouraging the children to express their ideas further and value them under the light of new evidence coming out of investigations and/or project work. She keeps on asking questions

like: What makes a sound? / How do you know? / How can you be sure? and/or How can you hear a sound in a better way? / What could make a sound more silent? etc. Evaluation is more likely to happen in a formative way, within children’s discussions and children’s argumentation in whole class sessions and/or with the aid of indicative concept cartoons, coming out of particular instances or situations investigated in class.

Materials in attachment:

<http://www.arvindguptatoys.com/toys/paperflute.html> (for the “paper flute”)

<http://www.arvindguptatoys.com/toys/roaringcup.html> (for the “roaring cups”)

http://www.ehow.com/how_7811811_build-music-sound-box-yourself.html#ixzz29wewlsOU (how to build a music box)

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Bibliography

- Beverley, B. & Cowie, B. (Eds.) (2000), *Formative assessment and science education*, Dordrecht: Kluwer Academic Publishers.
- Harlen, W. (2003), *Enhancing inquiry through formative assessment*, Institute for Inquiry, Exploratorium, San Francisco, California (URL: < www.exploratorium.edu/IFI >).
- Keogh, B. & Naylor, S. (1997), *Starting Points for Science*, Sandbach, UK: Millgate House.
- Keogh, B. & Naylor, S. (1997) *Thinking About Science: a set of eight A3 posters*, Sandbach, Cheshire: Millgate House.
- Keogh, B. & Naylor, S. (1999), *Concept Cartoons, teaching and learning in science: an evaluation*. *International Journal of Science Education*, Vol. 21(4), pp. 431-446.
- Naylor, B., Naylor, S. & Mitchell, G. (2000), *The Snowman's Coat*, London: Hodder Children's Books.
- Naylor, S. & Keogh, B. (1999), *Constructivism in the classroom: theory into practice*, *Journal of Science Teacher Education*, Vol. 10 (2), pp. 93-106.
- Naylor, S. & Keogh, B. (2000), *Concept cartoons in science education*. Sandbach: Millgate House Publishers.
- Newton, P., Driver, R. & Osborne, J. (1999), *The place of argumentation in the pedagogy of school science*. *International Journal of Science Education*, Vol. 21(5), pp. 553-576.
- Wellington, J. & Osborne, J. (2001), *Language and literacy in science education*. Buckingham: Open University Press.