Science Unit: ***The Earth Around Us: Air, Water & Soil***

Lesson 8: ***What is air?***

School Year:	2009/2010
Developed for:	L'École Bilingue, Vancouver School District
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Grade level:	Presented to grades 1 - 2; appropriate for grades 1 - 7 with age appropriate modifications.
Duration of lesson:	1 hour and 20 minutes

Objectives

1. Learn that air is all around us on earth even though we can't see it.
2. Discover that air has mass.
3. Create an instrument (a windsock) which can detect the movement of air.

Background Information

Air is a precious resource that most of us take for granted and is important for almost all life on Earth. Air supplies us and many animals with oxygen, which is essential for our bodies to live. Without air, we would survive only for a few minutes. Plants need other gasses from the air to perform photosynthesis.

The atmosphere surrounding Earth, and all about us, is filled with air. The air in our atmosphere is made of molecules of different gases. The most common gases are nitrogen (about 78%) and oxygen (about 21%). There are other types of molecules in the air as well, but only in very small quantities. Additionally, there can also be varying amounts of water vapour present in the air around us. Each day, you breathe in about 11,000 liters of air, which is about 20,000 breaths! In your lifetime, you will take over 625 million breaths of air!

Vocabulary

Air:	An invisible and odorless mixture of gases that surrounds the earth and each one of us, and is required for breathing.
Molecule:	The smallest unit of a substance that can exist alone and still retain the character of that substance.
Mass:	A property of matter which, in everyday usage, means weight.
Wind:	The bulk movement of air.
Windsock:	A tube-shaped object, made of fabric or paper, designed to indicate wind direction and relative wind speed.

Materials

- meter stick
- string
- 2 balloons
- tape
- pin
- paper bag
- stickers
- tissue paper
- glue stick
- crayons

In the Classroom

Introductory Discussion

1. Begin by wondering aloud about air. Ask students to hold out their hands and then ask what is in their hands. With their hands still out, ask students to puff up their cheeks and then ask what is in their cheeks. Ask students to blow into their hands and ask what it is they are blowing. Be explicit in pointing out that you can't taste or smell air but, under the right circumstances, you can feel it (e.g., in your cheeks or on your hands) or hear it (e.g., as you blow it out or hear the wind) or even see it (e.g., through the leaves of a tree).
    - What is air?
    - How is air connected to the weather?
2. Ask questions which review the pre-lesson topics.
    - What is a balance? How does a balance work?
    - What is mass? Can you name some things that have mass?
    - What happened when an empty bottle was submerged under water? What does that mean about what was in the bottle?
3. Briefly describe the air mass experiment and the windsock activity.
4. Describe the processes of science on which the students will focus.
    - Start with a question: does air have mass?
    - Think about your personal experience with air to come up with an hypothesis.
    - Set up an experiment to test this question.
    - Make your observations.
    - Collect data, record and examine results (think about why things happened the way they did).
    - Make conclusions and explain results (compare results to predictions to help you think deeper).
    - Communicate results and conclusions. Student hypotheses and results will be recorded in their science worksheets.

Science Experiment

Experiment Title: Does air have mass?

Purpose of Experiment: To demonstrate that air does indeed have mass.

Experimental Observations: The response of a balance with an equally inflated balloon on either end will be observed as the air is removed from one of the two balloons.

Prediction or Hypothesis: Before making your prediction (or hypothesis), it helps to start with a question (or to make observations and then ask a question). Use your prior experience with air to predict what you think will happen to the balance when one of the two balloons has its air removed. Record your prediction based on the following question: What do you think will happen to the balance when one balloon is deflated?

Methods and Instructions:
Set-up prior to experiment: None is required. Inflating the balloons and preparing the balance can be done quickly and while engaging the students. As you construct the balance, have the students raise their arms to their sides and pretend to be a balance themselves. Get them to move the way a balance would if they had a feather in their right hand and a rock in the other. Come up with various scenarios that confirm that students understand how a balance work (i.e., when it tips and what that means, when it doesn't tip and what that means).

1. Inflate two balloons to as close to equal volume as possible. Attach one balloon each to either end of a meter stick using a small piece of tape.
2. Suspend the meter stick from above with a string tied to its center (the 50cm mark), such that it hangs horizontally. You will likely have to do some very fine-tune adjustments of where the string is tied to the stick so that the balance hangs as close to horizontal as you can achieve. It might also help to attache a small piece of tape at the knot so that it doesn't accidentally slip from that position.
3. Carefully pierce one of the balloons with a needle, near the knot, so that air can escape slowly. To help ensure that you don't burst the balloon, it helps to pinch and pull away a bit of rubber from the balloon which you intend to pierce. If done properly, the air will not start to escape from the balloon until you let go of the pinched rubber. It helps to practice this procedure a few times before trying it in front of the students. A carefully punctured balloon can take more than one minute to slowly deflate.
4. Observe with the students what happens to the balance as the air escapes the punctured balloon. At first, the balance might wobble around, as the escaping air will exert a force against the balloon (blowing it around). When you notice the balance tipping, be sure to ask the students how things have changed (explicitly prompt them to vocalize what they are seeing).
5. As always, student hypotheses and results should be recorded in their science worksheets.

Closure Discussion

1. What happened to the balance when the air came out of one of the balloons?
2. Which side is heavier, the full balloon or the empty balloon?
3. Confirm the students' answers and emphasize that air indeed has mass. In fact, the air in an averaged-sized room weighs about as much as one person.

Activity

Activity Title: Building a windsock

Purpose of Activity: To create a simple instrument that can detect the movement of air.

Instructions:
Set-up prior to experiment: Cut the string to length (about 30cm each) and have strips of tissue paper prepared (about 3cm wide and 20cm in length) for the students.

1. Cut three of the four bottom edges out of the paper bag. Demonstrate this step to the students with a paper bag of your own before getting them to do this step.
2. Use tape or glue stick to attach some strips of tissue paper to the bottom of the bag. Also have the children personalize their windsock with stickers and/or pencil crayon.
3. Obtain a length of string for the handle of your windsock. Use tape to attach both ends of the string to either side of the top of the windsock.

4. Go outside and raise your windsock. If there is wind, the windsock will move. If it is not windy, run around to get the windsock to react to its movement through the air.

References

1. Murphy, Bryan (translated by Hélène Costes). 1991. Mes expériences avec l'air. Pp. 4. Scholastic Canada Ltd.

2. Edited by Pan-Canadian Science Place © Scholastic Canada Ltd. (translated by Pierre Brault, Agnès, Lin Burman, and Karima Afchar). 2005. L'air et l'eau: Guide de l'enseignant. Pp. 39. Les Éditions Duval, Inc. and Scholastic Canada Ltd.

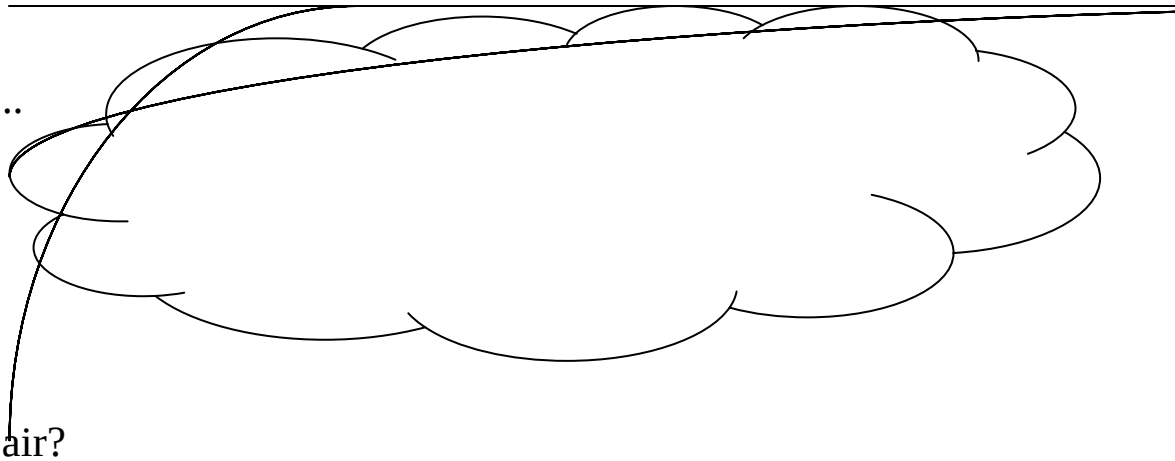
3. <http://www.global-garden.com.au/gardenkids_make6.htm#Making_a_Weather_Vane> 'Making a Weather Vane' [Global Garden website, which includes many other activities for children to make things related to backyard gardens and weather].

Extension of Lesson Plan

1. While a windsock can detect the presence of wind, a weather vane can tells us the direction from which the wind is coming. Children can make their own weather vane at home (see reference 3).

What is air?

I think...



Can you see air?

Can you hear air?

Can you taste air?

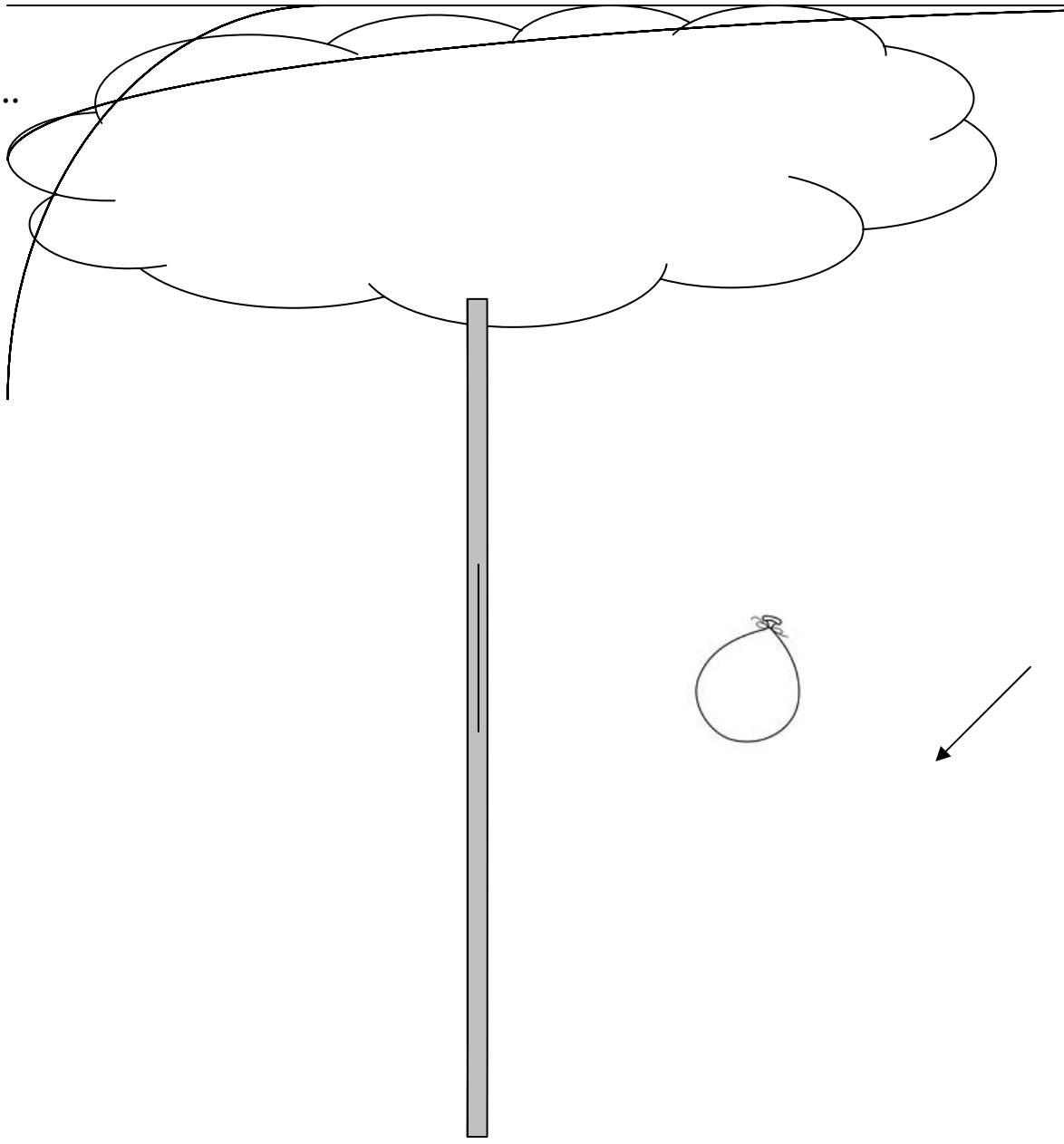
Can you hold air?

Can you smell air?

Conclusion:

Does air have mass?

I think...

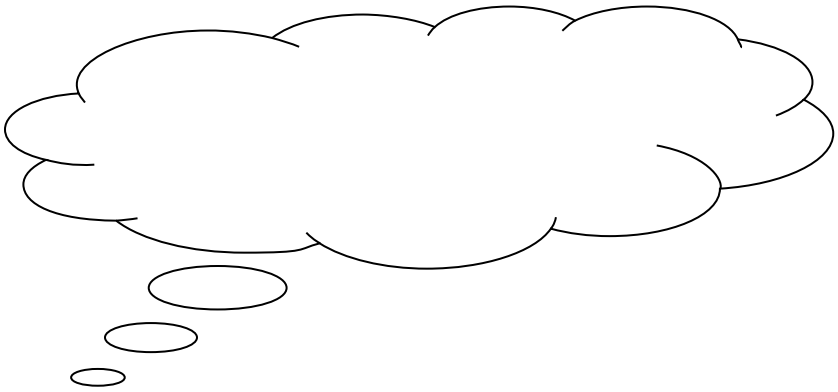


Experiment:

Conclusion:

Qu'est-ce que l'air ?

Je pense…



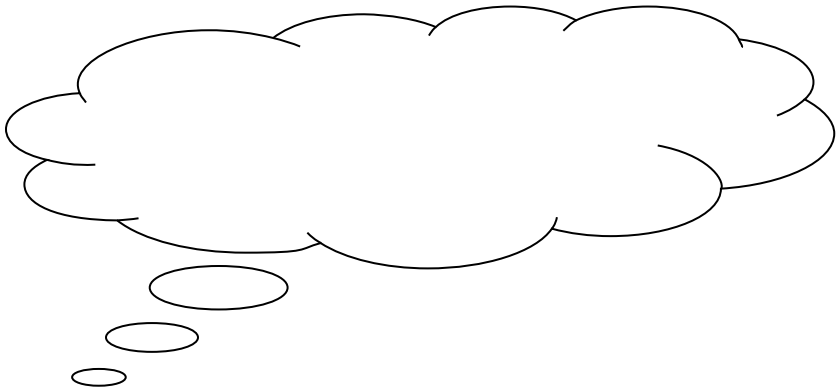
Est-ce que tu peux …

	 voir	 entendre	 gouter	 tenir	 sentir

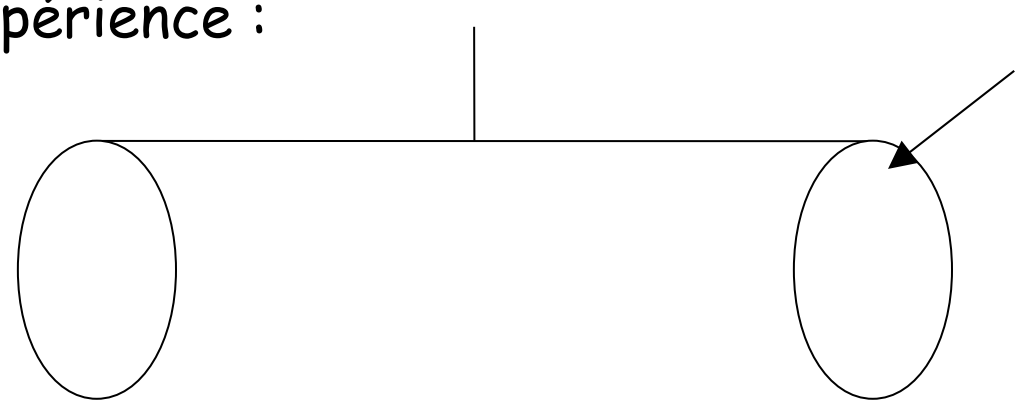
<u>Conclusion</u> :

Est-ce que l'air a une masse ?

Je pense…



Expérience :



<u>Conclusion</u> :