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SKY WATCHERS



Weather Learning Stations

Grades 4, 5 and 6



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Quick Reference Guide

These stations engage students through six 30-minute learning stations designed to introduce key Canadian curricular weather concepts in a variety of learning styles. From storytelling to experimental design, this collaborative learning experience is hands-on, creative, real-world and involves technology. Science topics include fronts, properties of air, energy from the sun, weather instruments, weather reports and air pressure.

						
Station	1: Wind Inspectors	2: What a Wacky Winter!	3: Click!	4: Lights, Camera, Weather, Action	5: Is Air Really There?	6: Under Pressure
Summary	Students design and construct an instrument for measuring wind speed.	Students design an experiment and experience a more realistic scientific method.	Students analyze different sources for weather information and consider how weather may have shaped key events of our times.	Students transcribe cold and warm fronts onto the Sky Watchers Weather Map and identify three areas of changing weather conditions.	Students create an activity that proves that air has mass.	Students use storytelling and exploration with suction cups to learn about relative air pressure.
Page	3	7	13	21	25	29
Materials	<ul style="list-style-type: none"> • Sewing needle • Thread • Ping pong balls • Protractor • Sky Watchers Weather Observation Wall Chart (order from Environment Canada's Inquiry Centre: enviroinfo@ec.gc.ca) 	Optional: <ul style="list-style-type: none"> • Soil • Sand • Gravel • Water • Lamp(s) • Lightbulbs • Containers • A plant or grass • Piece of asphalt / brick • Thermometer 	<ul style="list-style-type: none"> • Computer with Internet access • Sky Watchers Weather Observation Wall Chart (optional) (order from Environment Canada's Inquiry Centre: enviroinfo@ec.gc.ca) 	<ul style="list-style-type: none"> • Sky Watchers Weather Map (order from Environment Canada's Inquiry Centre: enviroinfo@ec.gc.ca) • Washable markers • Pencils • Paper 	<ul style="list-style-type: none"> • Metre stick or dowling • Scissors • Masking tape • Tack or pin • Balloons • String 	<ul style="list-style-type: none"> • Suction cups (at least two) • Optional: CD/tape player
Preparation	<ul style="list-style-type: none"> • Order Sky Watchers Weather Observation Wall Chart • Student Instruction Sheet • Handout 	<ul style="list-style-type: none"> • Student Instruction Sheet • Handout 	<ul style="list-style-type: none"> • Order Sky Watchers Weather Observation Wall Chart • Bookmark the websites indicated • Handout • Local newspaper 	<ul style="list-style-type: none"> • Order Sky Watchers Weather Map • Student Instruction Sheet • Handout 	<ul style="list-style-type: none"> • Student Instruction Sheet • Handout 	<ul style="list-style-type: none"> • Student Instruction Sheet • Handout A • Handout B • Optional: Pre-record story on tape
Curricular Theme	Measuring and Describing Weather (Weather Instruments)	Sun's Energy Reaching the Earth: Warming	Measuring and Describing Weather (Weather Reports)	Properties of Air: Warm and Cold Fronts	Properties of Air: Takes Up Space, Has Mass, Expands	Movement of Air: Low and High Pressure

Introductory Activity: Rain Circle (5 minutes)

Summary

The class joins together to create the sounds and music that result from a rainstorm. The group creates a wind, it gathers up some rain and turns into a thunder shower, which thrashes and blows until it quiets again to a gentle rain, a soft breeze and then a quiet day.

Before you start

- 1 Gather the class together in a circle, either standing or sitting.
- 2 Explain that you are going to pass an action on to the person beside you without stopping that action yourself. The next person will pass it to the next person, who will do the same until the action continues its way throughout the circle. Soon, everyone will be doing the same action.
- 3 Explain that when the action returns to you, you will switch to a new action and pass it on to the next person in the same way.

References

Andrew Fleugelman (ed), *The New Games Book* (Garden City, New York: Dolphin Books/Doubleday & Company, Inc. 1976).

Creating the Storm: Actions

Silence

Rub hands (Wind)

Pat thighs (Light rain)

Snap fingers (Rain showers)

Clap hands (Heavy rain)

Stomp feet and clap hands (Thunder)

Clap hands (Heavy rain)

Snap fingers (Rain showers)

Pat thighs (Light rain)

Rub hands (Wind)

Silence



TIPS: How to Use Learning Stations

How to set up the stations

Set up six stations in your classroom where students can form groups. Place the Student Instructions and copies of the Student Handouts at each station.

Assessment summary

The independent nature of the learning stations will allow the teacher to circulate throughout the space to provide input and ongoing assessment of student progress.

For evaluation purposes, handouts are provided in each station and a summary score sheet is provided at the end of this document.

A peer evaluation of group interaction and collaboration is also provided at the end of this chapter.

Environment Canada evaluation

Environment Canada relies on individual teachers to provide feedback for the Sky Watchers program. By submitting comments, each teacher can help Environment Canada in their commitment to the highest quality educational programs and resources.

Email comments to:

victoria.hudec@ec.gc.ca

Mail/fax the evaluation form at the end of this chapter to:

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 Sky Watchers National Coordinator
 Environment Canada
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1-416-739-4521



Station 1: Wind Inspectors

Summary

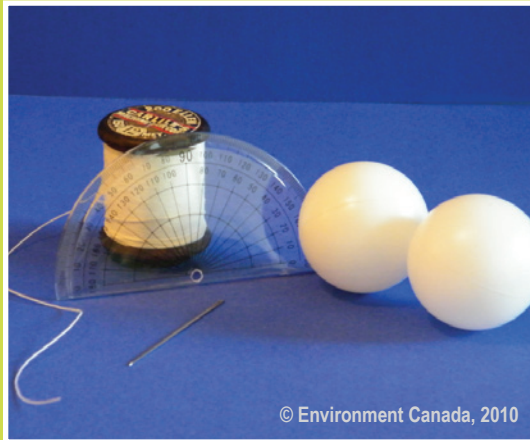
Students design and construct an instrument for measuring wind speed.

Real-world connection

- Wind speed can be measured using simple tools.
- Measurements can differ depending on who does the measuring and where it is done.

Preparation

- Order Sky Watchers Weather Observation Wall Chart from Environment Canada's Inquiry Centre: enviroinfo@ec.gc.ca
- Student Instruction Sheet, one per group
- Student Handout, one per group



Materials

- Sewing needle (large enough to pierce a ping pong ball)
- Thread
- Ping pong balls (two for each time the station is used)
- Protractor (one for each time the station is used)
- Sky Watchers Weather Observation Wall Chart

NOTE: Students will construct an anemometer and measure wind speed outdoors. *If adult supervision is not possible, students have the option of measuring an indoor wind speed (Step 5).*

Other weather observations to consider

- Temperature
- Pressure (indoor mounted barometer)
- Relative humidity (using sling psychrometer and conversion charts)
- Wind direction
- Weather phenomena (e.g. sky condition and precipitation type)

Instructions

See Chapter 1 of the Sky Watchers guide: www.ec.gc.ca/gge-ftg/default.asp?lang=En&n=2538CD87-1

Curriculum outcomes

Theme: Measuring and Describing Weather (Weather Instruments). For a complete list of curriculum outcomes, please go to the appropriate table at the end of this document.

References

Hislop, Theresa (2002, 09 28). Measuring Wind Speed. Retrieved December 12, 2008, from Utah Education Network website:

www.uen.org/Lessonplan/preview.cgi?LPid=2454

(2008). The Power of the Wind. Retrieved April 10, 2009, from National 4H Curriculum website:

<http://projects.4-hcurriculum.org/curriculum/wind/book1.aspx>



Station 1: Wind Inspectors – Student Instructions



Unusual events have been occurring around your school, both indoors and out. Students have noticed papers flying through the air, assignments suddenly missing, doors slamming shut, and weird whistling coming from around every corner. Is it just the wind blowing throughout the school, or could it be something more mysterious?

Your science teacher has thought of a way to find out the truth, once and for all. Today you are going to test for wind, or something else...

1 Cut a piece of thread about 20 cm long. Thread the needle and tie a large knot in the end of the thread.

2 Stick the needle into one side of the ping pong ball and out the opposite side. Draw the thread through until the knot at the other end stops the thread from moving.

3 Tie the thread to the centre of the straight base of the protractor (through the hole) so that the ball hangs below the arc of the protractor which has the angles marked on it. If the protractor is held level where there is no wind, the thread will hang still over the 90 degree mark. Now you have successfully made an ANEMOMETER, a scientific devise to measure wind speed.

4 OUTSIDE: *Do this step only if you can go outside with supervision and test your wind instrument!* Hold the wind instrument level and

face into the wind. The wind will blow the ball and when it does, watch to see the position of the thread on the protractor.

Record the angle that the ping pong ball has been blown and then use the chart below to convert the angle to a wind speed. Make sure you put your results on the Sky Watchers Weather Observation Wall Chart.

5 INDOORS: Have one student hold the instrument near any of the places where there may have been “ghostly appearances” or lots of wind. Check for wind near a window, closet, or above a radiator or vent. Try blowing a ghostly wind yourself on the ping pong ball. Watch the angle and then convert that number to wind speed using the chart on the next page.

6 If time allows take other weather observations and record them on the Sky Watchers Weather Observation Wall Chart.

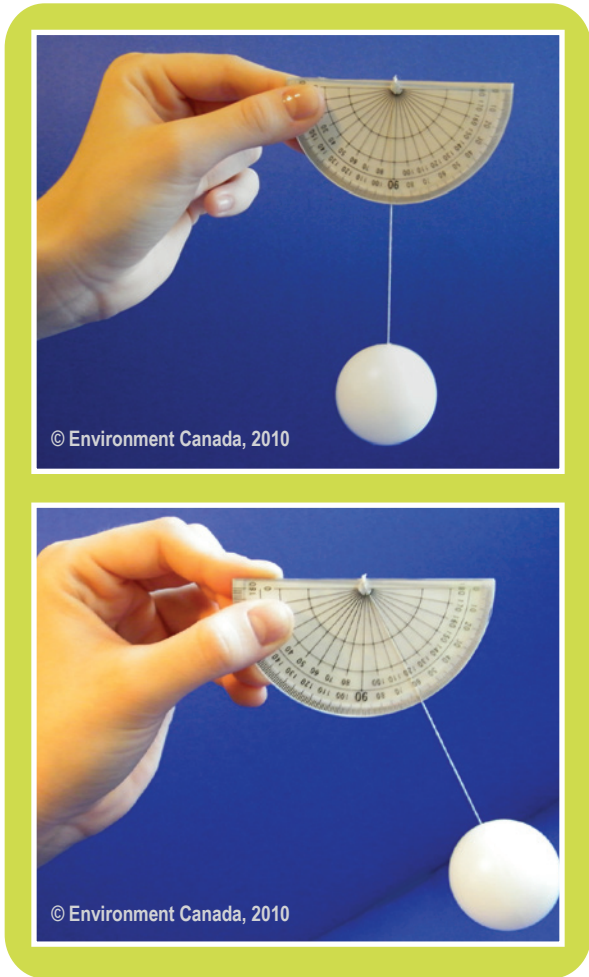
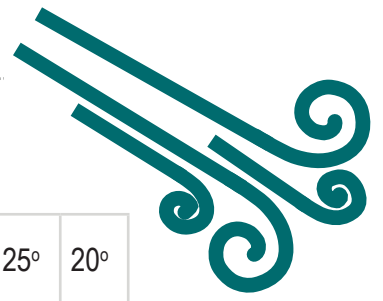


TABLE OF WIND SPEEDS (kilometres per hour)

Acute Angle	90°	85°	80°	75°	70°	65°	60°	55°	50°	45°	40°	35°	30°	25°	20°
Speed (km/h)	0	9	13	16	19	22	24	26	29	32	34	38	42	46	52



Station 1: Wind Inspectors – Student Handout



Name: _____ Date: _____

Consider your indoor and/or outdoor wind speed results.

- 1 Pick one of your results and draw the angle you used to calculate the wind speed.

- 2 Did you measure any wind indoors in unexpected places? If so, where? _____

- 3 What was the outdoor wind speed? _____

- 4 Look at your natural surroundings (trees blowing, grass moving). Does the wind speed appear to match current weather conditions, or is it unexplained? _____

- 5 Write an announcement that you could read to the school tomorrow morning to explain the unusual events. _____





Station 2: What a Wacky Winter!

Summary

Students design an experiment to determine how the energy from the sun heats water and land differently.

Real-world connection

- Different climates along Canadian coastal communities compared to inland communities.
- Scientific process as experienced by working scientists.

Preparation

- Student Instruction Sheet, one per station
- Student Handout, one per student

Curriculum outcomes

Theme: Sun's Energy Reaching the Earth: Warming. For a complete list of curriculum outcomes, please go to the appropriate table at the end of this document.

References

Clark, R.L., M.P Clough, and C.A. Berg. Oct 2000, 40-43. Modifying Cookbook Labs. The Science Teacher v67 n7

Reiff, R., W.S. Harwood, and T. Phillipson. 2002. A Scientific Method Based upon Research Scientists' Conceptions of Scientific Inquiry. Proceedings of the Annual International Conference of the Association for the Education of Teachers in Science. ED 465 618

Weekes, H. Jan 2005, 34-37. Drawing Students Out: Using sketching exercises to hone observation skills. The Science Teacher.



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Materials (Optional)

Some students may benefit from having concrete materials to help trigger their imagination. Possibilities include:

- Soil
- Sand
- Gravel
- Water
- Lamp(s)
- Lightbulbs (different kinds)
- A variety of containers
- A plant or grass
- A piece of asphalt / brick
- Thermometer





Station 2: What a Wacky Winter! – Student Instructions

Did you know that coastal provinces have milder winters than those that are inland? For example, for the last 29 years, the average winter temperature (December to March) was -4.6°C in Collegetown, Nova Scotia, but in Ottawa, Ontario, it was -7.0°C , even though they are the same distance north (Latitude 45°N) and have a similar elevation (about 78 m above mean sea level). There are lots of factors that affect local climate, but I wonder how much it matters that one is out in the ocean and the other is landlocked. After all, the sun is in both places! Let's see by planning an investigation...

How to Plan

- 1 Form a question
- 2 Investigate what's known
- 3 Fine-tune your question
- 4 Suggest a set-up
- 5 Decide on controls
- 6 Plan for observations
- 7 Sketch final set-up
- 8 Set expectations
- 9 Carry out the study

1 FORM A QUESTION

Let's set some goals to find out how much it matters that Nova Scotia is along the ocean and Ottawa is landlocked. Write all your answers on your handout.

Pick one or two of the following questions, or try making one of your own.

- Does water heat up faster than land?
- Does it matter what is on the land (cityscape vs. vegetation or agricultural crops)?
- Does the type of land matter (soil vs. sand)?

2 INVESTIGATE WHAT'S KNOWN

What is known about these topics? Brainstorm on your handout. A scientist would do a huge search on everything there is to know about these topics before deciding what to study. She or he would want to find out what is in the literature about different climates and how the sun heats our planet. This might take weeks of going to conferences, the library and talking with other scientists. Since we don't have all that time we are going to go ahead now and pretend that not much is known about our topics.

3 FINE-TUNE YOUR QUESTION

(And, if you like, one sub-question).

4 SUGGEST A SET-UP

With your team, invent laboratory procedures that will help you answer your

question. Brainstorm them and try sketching out some options. Bounce ideas off each other. There is no right or wrong answer when you are brainstorming. You will do a sketch of your final set-up later.

The following questions may guide you.

- What will you use for the sun?
- How will you measure the temperature?
- What will you use for the ocean?
- What other materials do you need?

5 DECIDE ON CONTROLS

In studies, you need to make sure that you're testing only one thing at a time and controlling the other things. Sometimes you need to repeat parts of your setup in order to do this.

- Where would you set up the experiment?
- Is there anything around the setup that could influence your results and "mess it up"?
- What do you need to control in your study?
- How will you do this?





6 PLAN FOR OBSERVATIONS

Now think about how you're going to record what you observe. A geologist once said, "Many people look but they do not see." As a scientist, you want to be able to *look* and to *see*.

Make a table that you could use later to record your observations, measurements and/or calculations in your experiment. Fill in the title of each column.

7 SKETCH FINAL SET-UP

Now, make a final decision about how you should set up your experiment. **SKETCH** your final set-up on your handout. Label it neatly.

8 SET EXPECTATIONS

On your handout, fill in the blanks:

When I start my experiment, I expect to see... and I expect to hear... and I expect to feel...

When the experiment is finished, I expect to see... and I expect to hear... and I expect to feel...

9 CARRY OUT THE STUDY

You are now ready to carry out the study as you planned. You can see that a lot of planning can go into an experiment before the experiment actually happens. Another day you might be able to carry out your plan, see the results, and then think and talk about what you find with others. All of this leads to even more interesting questions. There you have it—that's the scientific method!





Station 2: What a Wacky Winter! – Student Handout

1 QUESTION(S): _____

2 WHAT'S KNOWN:
What do we know about how the sun heats the Earth?

List	Draw





3 SET-UP

How will you measure the temperature?

What will you use for the sun?

The ocean?

What other materials do you need?

4 CONTROLS

Where would you set up the experiment?

Is there anything around the set-up that could influence your results and “mess it up”? Explain.

What factors do you need to control?

How will you do this?





5 DATA TABLE:

6 FINAL SKETCH (Label it neatly):

7 EXPECTATIONS:

When I start the experiment, I expect to see _____

and I expect to hear _____

and I expect to feel _____.

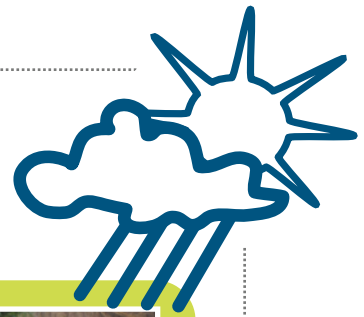
When the experiment is finished, I expect to see _____

and I expect to hear _____

and I expect to feel _____.



Station 3: Click!



Summary

Students analyze different sources for weather information (past, present and future) and make decisions based on what they find. On a brief jaunt into history, students consider how the weather may have shaped key events of our times.

Real-world connection

- How to find and interpret weather reports (current conditions, forecasts).
- How weather affects our lives.
- How to appropriately prepare/dress for weather conditions (i.e. UV index or wind chill).
- Using technology to share information with others.

Materials

- Computer with Internet access
- Local newspaper

Preparation

- Order Sky Watchers Weather Observation Wall Chart from Environment Canada's Inquiry Centre: enviroinfo@ec.gc.ca
- Student Handout, one per student
- Bookmark the following websites on the in-class browser:

Sky Watchers:

www.ec.gc.ca/meteoaloeil-skywatchers/

Environment Canada's Weatheroffice:

www.weatheroffice.gc.ca

The Weather Network:

www.theweathernetwork.com

Curriculum outcomes

Theme: Measuring and Describing Weather (Weather Reports). For a complete list of curriculum outcomes, please go to the appropriate table at the end of this document.



Student measuring wind speed

References

Canadian Daily UV Index Forecast.
www.weatheroffice.gc.ca/forecast/textforecast_e.html?bulletin=fpcn48.cwao.
Retrieved December 19, 2008.

CBC News. More hay headed West.
www.cbc.ca/canada/story/2002/08/10/hay020810.html
Updated August 11, 2002.

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www.ec.gc.ca/meteoaloeil-skywatchers/. Updated June 2010.

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<http://archive.gg.ca/media/doc.asp?lang=e&DocID=4388>.
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Michaëlle Jean. (2008, December 19). In Wikipedia, The Free Encyclopedia. Retrieved 17:34, December 19, 2008, from http://en.wikipedia.org/w/index.php?title=micha%C3%ablle_jean&oldid=258886529

The Weather Network.
www.theweathernetwork.com.
Updated December 19, 2008.

Timeline of Canadian history. (2008, December 10). In Wikipedia, The Free Encyclopedia. Retrieved 18:03, December 19, 2008, from http://en.wikipedia.org/w/index.php?title=Timeline_of_Canadian_history&oldid=257123759

Yukon Arts Center. www.storytelling.yk.net



Station 3: Click! – Student Instructions



Retrieved December 19, 2008.

1 In separate browser windows, load:

Environment Canada's Weatheroffice:
www.weatheroffice.gc.ca

The Weather Network:
www.theweathernetwork.com

2 Click on your province or territory or click your closest location on the weather map.

3 Complete Student Handout. Then, if your class has a weather observation to enter, proceed to step 4.

4 *If you and your class take weather observations using instruments* (such as a thermometer, barometer, wind vane, etc.), your class can record the weather data on the Sky Watchers Weather Observation Wall Chart.

Historical Data

Historical data can be found under the **More Info** link under the forecast for different cities in Canada.

1 Click on the appropriate **province and location** on the Environment Canada Weatheroffice.

www.weatheroffice.gc.ca

2 Scroll down to **Historical Data**.

3 Click "**More Info**."

4 Click "**Historical Weather**."

Alternatively, go to:

www.climate.weatheroffice.ec.gc.ca/climatedata/canada_e.html



Station 3: Click! – Student Handout



Current Weather

1 If you were babysitting right now and decided to take the child outside for the next hour, what clothing should you put on them or what weather-related items would you take with you? Draw a sketch and/or make a list. Then, justify your choices.

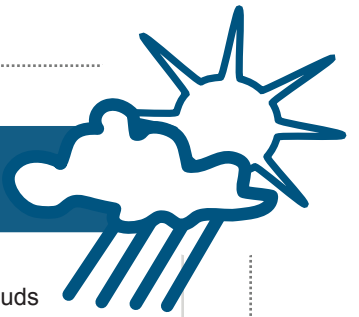
Drawing or list	Reasoning

Forecast

2 Complete the following table for the weather forecast (tomorrow) in your location using the descriptions, images and weather maps.

Item	Environment Canada Online Weatheroffice	The Weather Network	Newspaper
Date			
Time			





Item	Environment Canada Online Weatheroffice	The Weather Network	Newspaper
Cloud cover (check one)	<input type="checkbox"/> Clear <input type="checkbox"/> A few clouds <input type="checkbox"/> Cloudy <input type="checkbox"/> Overcast	<input type="checkbox"/> Clear <input type="checkbox"/> A few clouds <input type="checkbox"/> Cloudy <input type="checkbox"/> Overcast	<input type="checkbox"/> Clear <input type="checkbox"/> A few clouds <input type="checkbox"/> Cloudy <input type="checkbox"/> Overcast
Pressure (kPa)			
Tendency	<input type="checkbox"/> rising <input type="checkbox"/> falling	<input type="checkbox"/> rising <input type="checkbox"/> falling	<input type="checkbox"/> rising <input type="checkbox"/> falling
Weather phenomena (check all that apply)	<input type="checkbox"/> haze <input type="checkbox"/> fog or mist <input type="checkbox"/> thunder and/or lightning <input type="checkbox"/> drizzle <input type="checkbox"/> rain <input type="checkbox"/> hail <input type="checkbox"/> snow <input type="checkbox"/> blowing snow <input type="checkbox"/> freezing precipitation	<input type="checkbox"/> haze <input type="checkbox"/> fog or mist <input type="checkbox"/> thunder and/or lightning <input type="checkbox"/> drizzle <input type="checkbox"/> rain <input type="checkbox"/> hail <input type="checkbox"/> snow <input type="checkbox"/> blowing snow <input type="checkbox"/> freezing precipitation	<input type="checkbox"/> haze <input type="checkbox"/> fog or mist <input type="checkbox"/> thunder and/or lightning <input type="checkbox"/> drizzle <input type="checkbox"/> rain <input type="checkbox"/> hail <input type="checkbox"/> snow <input type="checkbox"/> blowing snow <input type="checkbox"/> freezing precipitation
High temperature (°C)			
Low temperature (°C)			
Wind direction			
Wind speed (km/h)			
Wind chill			
Humidity			
Humidex			
UV			
Warm or cold front?	<input type="checkbox"/> Warm front <input type="checkbox"/> Cold front	<input type="checkbox"/> Warm front <input type="checkbox"/> Cold front	<input type="checkbox"/> Warm front <input type="checkbox"/> Cold front
Probability of precipitation			





3 Of these three sources, which one gave the most information?

- Environment Canada’s Weatheroffice
- The Weather Network
- Newspaper

4 Of these three sources, which one was easiest to use?

- Environment Canada’s Weatheroffice
- The Weather Network
- Newspaper

5 Of these three sources, which is your preferred source? Explain your answer.

- Environment Canada’s Weatheroffice
- The Weather Network
- Newspaper

6 If you wanted to hear a weather report on the radio, when would you tune in? Support your choice.

7 The UV Index, according to the Environment Canada Weatheroffice, is listed in the following table. Finish the table by checking off the UV categories that require sun protection (Hint: click on “More Info” on the forecast and scroll down):

UV Categories	UV Index Range	Requires Sun Protection?
Extreme	11 or higher	<input type="checkbox"/> Yes <input type="checkbox"/> No
Very high	8 to 10	<input type="checkbox"/> Yes <input type="checkbox"/> No
High	6 to 7	<input type="checkbox"/> Yes <input type="checkbox"/> No
Moderate	3 to 5	<input type="checkbox"/> Yes <input type="checkbox"/> No
Low	Less than 2	<input type="checkbox"/> Yes <input type="checkbox"/> No





Historical weather

Weather shapes our lives each day. It affects our choices, moods, health, and our interactions with others.

Consider the following events and how the weather may have shaped the event or our reaction to it.

For these questions, use the Historical Data provided by Environment Canada (See Student Instruction Sheet).

8 Fill in the following chart.

Event	Date	Location	Weather Phenomena	High Temp.	Low Temp.
Your birth					
Canada Day last year (were there fireworks?)		Your town:			
Ice storm	Jan. 1, 1998	Ontario/Quebec			
Last hockey game at Maple Leaf Gardens	Feb. 13, 1999	Toronto			
Nunavut formed	Apr. 1, 1999	Nunavut			
Severe drought in Western Canada: Livestock food sent from East	Aug. 11, 2002	Prairies			
Massive blackout	Aug. 14, 2003	Ontario/Quebec			
Hurricane Juan hits Nova Scotia	Sep. 29, 2003	Halifax			
Canadian National Women's Ice Hockey Team wins world championships	Apr. 6, 2004	Halifax			



Event	Date	Location	Weather Phenomena	High Temp	Low Temp
Opening of the 2005 Canada Summer Games	Aug. 6, 2005	Saskatoon			
First black Governor General of Canada was appointed	Sep. 27, 2005	Ottawa			
Sam Sullivan awarded the Order of Canada for his work on behalf of the physically disabled	Mar. 3, 2005	Ottawa			
Opening of the 2007 Canada Winter Games	Feb. 23, 2007	Whitehorse			
Yukon International Storytelling Festival	Nov. 28, 2008	Whitehorse			



Station 4: Lights, Camera, Weather, Action!



Summary

Students transcribe local weather data, including cold and warm fronts, onto the Sky Watchers Weather Map and identify three areas of changing weather conditions.

Real-world connection

- Weather maps and frontal systems.

Materials

- Sky Watchers Weather Map
- Washable markers to use on the map
- Pencils and paper
- A copy of today's weather page from *The Globe and Mail*, another national paper or Environment Canada and Nav Canada's daily surface analysis weather map (for Canada) that can be found on-line at: www.flightplanning.navcanada.ca/Latest/anglais/Latest-analsfc-e.html

Preparation

- Order Sky Watchers Weather Map from Environment Canada's Inquiry Centre: enviroinfo@ec.gc.ca
- Student Instruction Sheet, one per station
- Student Handout, one per student

Teacher background information

Additional information about fronts can be found on the Sky Watchers' frontal poster, which can be downloaded at:

www.ec.gc.ca/meteoaloeil-skywatchers/default.asp?lang=En&n=149C159E-1

and in the Sky Watchers' Teachers Guide, Chapter 2, pages 2-7 to 2-10.

Curriculum outcomes

Theme: Properties of Air: Warm and Cold Fronts. For a complete list of curriculum outcomes, please go to the appropriate table at the end of this document.

References

Environment Canada, (2006). Sky Watchers Guide to Weather. Downsview, ON: Environment Canada, Ontario Region.



Station 4: Student Instructions



Welcome to the world of movies! You are now part of a movie making team, working for a director who is producing a movie that needs to be filmed in a few areas of rainy or stormy weather. You (and the team) are responsible for inspecting the weather pages of the paper and finding a map of Canada with weather information on it. Then you need to select three places in Canada where you think the weather is going to change to rain or storms. Let's see what you can find!

- 1 Start by opening up the weather section of the newspaper. Find the small map of Canada which has certain weather information on it. The first task of the team is to copy all that information down on the Sky Watchers Weather Map. Use the same labels so that you indicate both warm and cold fronts, temperatures, areas of thunderstorms or rain, snow, freezing rain, and anything else you see in the newspaper's map. Make sure you include the Map Key so you can remember what you have marked down!
- 2 Now, have a close look at your new Sky Watchers map. Find the **cold fronts** and **warm fronts**. Do you know what they are? Read below to find out!
- 3 In your small group, review your map. Then turn to the Student Handout and answer the questions.

Cold Fronts and Warm Fronts: How Are They the Same?

- Both are **fronts**, which is the edge where two air masses meet.
- Both involve cold air and warm air masses.
- Both can result in rain or stormy weather.
- Warm air rises in both of them.

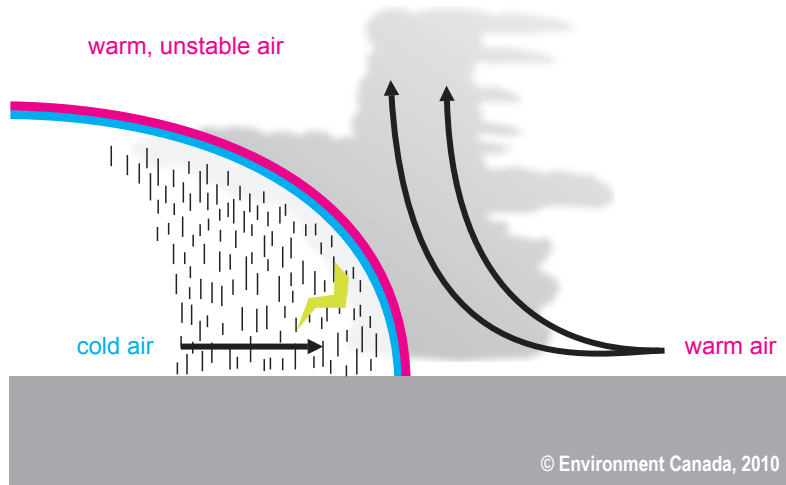




Cold Fronts and Warm Fronts: How Are They Different?

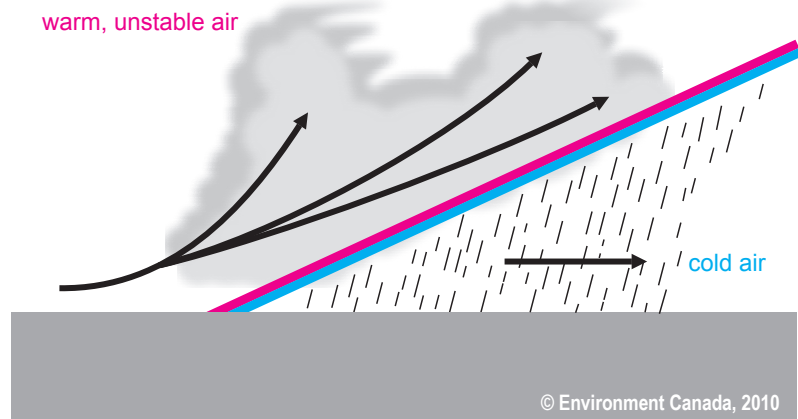
Cold Front

- Heavy cold air pushes into an area.
- This cold, dense air mass pushes the lighter, warmer air up very quickly.
- The front is steeper.
- It creates more extreme weather events like high winds, heavy rains and thunderstorms.



Warm Front

- A cold air mass moves out of an area (retreats).
- Warmer air moves in gradually to replace it.
- The front is not as steep.
- It can create rain or other forms of precipitation.



Station 4: Student Handout



Greetings! As you know, you are charged by the director of a new movie to find three locations in Canada where you expect to see some changes in the weather over the next few days. Please fill out this form so that the movie director can decide where to film.

1 Mark your community on the Sky Watchers Weather Map with a star. 

2

<input type="checkbox"/>	Did you draw any warm fronts on your map?	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> No	<input type="checkbox"/>
<input type="checkbox"/>	If yes, what kind of weather is happening near that front?	<input type="checkbox"/>
<input type="checkbox"/>		<input type="checkbox"/>
<input type="checkbox"/>	Did you draw any cold fronts on your map?	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> No	<input type="checkbox"/>
<input type="checkbox"/>	If yes, what kind of weather is happening near that front?	<input type="checkbox"/>
<input type="checkbox"/>		<input type="checkbox"/>
<input type="checkbox"/>		<input type="checkbox"/>

3 To help out the director, select three locations in Canada where you expect significant changes in the weather over the next few days. Mark these on your map with a letter **A**, **B** and **C**.

4 Explain why you have chosen each location:

A:

B:

C:



Station 5: Is Air Really There?

Summary

Students are presented with the problem of proving that air has mass. To solve this, they must consider what they already know about air, and try to design an activity that will prove that air is really there!

Real-world connection

- How to understand a property of air—that air takes up space and has mass.

Preparation



Materials

- Metre stick (or dowling or similar long piece of wood)
 - Scissors
 - Masking tape
 - Tack or pin
 - Balloons
 - String
- Student Instruction Sheet, one per station
 - Student Handout, one per student

Curriculum outcomes

Theme: Properties of Air: Takes Up Space, Has Mass, Expands. For a complete list of curriculum

outcomes, please go to the appropriate table at the end of this document.

Background information

This activity is intended to be full inquiry, a student-centred approach that allows students to freely explore a phenomenon themselves.



Full or guided inquiry?

You may consider a more guided approach for some groups (e.g. you might tell them to think of a way they could make a balance with a piece of string and a metre stick).

The idea is for the students to investigate through inquiry the best way to demonstrate that a balloon that is inflated (with air) has greater mass than one which is not inflated.

References

Jefferson Lab Science Education,
http://education.jlab.org/qa/matter_03.html.
 Retrieved December 21, 2008.

Marin-Hansen, L. 2002. Defining Inquiry: Exploring the many types of inquiry in the science classroom. *The Science Teacher*. 69(2): 34-37.



Station 5: Is Air Really There? – Student Instructions

Where is air? Is it really there? And if it is, does it take up space? If you can't see it, how can you know the answers to these questions for sure? If you sit down and think hard about what you already know about air and how it reacts, you will surely be able to figure out how to prove that it is really there... wherever that is!

- 1 **QUESTION:** Does air have mass?
- 2 To start, you need to first look at what is at the station.
- 3 Devise a plan using the materials provided and your Student Handout. If you are stuck, ask your teacher for a hint.
- 4 Carry out your investigation and record your data.



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Materials

- Metre stick
- Scissors
- Masking tape
- Tack or pin
- Balloons
- String





Station 5: Is Air Really There? – Student Handout

Devise your plan!

1 Look at the material you have to work with. Think of a way you can use all this to decide if air has mass. Now state your ideas by making a hypothesis. A hypothesis is just an “If..., then ...” statement. So for example, “If I do this, then this will happen.” Please write your hypothesis below:

If _____

2 Now that you have your hypothesis, draw a picture showing how you are going to use the materials to answer the question: Does air have mass? Show in the drawing what you expect will happen.

Try out your plan!

3 Write down the steps to your plan, including how you will record your results.

First, I will...

➔

Then, I will...

➔

Finally, I will...





4 Execute your plan and record your results.

Analyze and conclude

5 Explain what happened when you tested your hypothesis. _____

6 Does this prove that air has mass? Why or why not? _____



Station 6: Under Pressure



Summary

Students use storytelling and exploration with suction cups to learn about relative air pressure.

Real-world connection

- Vacuums as lower pressure.
- Sea breezes and land breezes.
- Low pressure associated with inclement weather.
- The history of science.
- Communication through storytelling and relating history through oral tradition.

Materials

- Suction cups (at least two)
- **Optional:** CD/tape player for students to listen to recording of story

Preparation

- “Under Pressure” story, one per station
- Student Handout, one per student
- **Optional:** Read aloud and record the “Under Pressure” story for students to listen to at the station.

Curriculum outcomes

Theme: Movement of Air: Low and High Pressure. For a complete list of curriculum outcomes, please go to the appropriate table at the end of this document.

References

Basca, Belinda and T. Grotzer. 2001. Focusing on the Nature of Causality in a Unit on Pressure: How Does it Affect Student Understanding? National Science Foundation. ED 456 029.

Hakim, J. 2005. The story of science: Newton at the center. New York: Smithsonian Books.

Isabelle, Aaron D. 2007. Teaching Science Using Stories: The Storyline Approach. ScienceScope. 31(2):16-25.

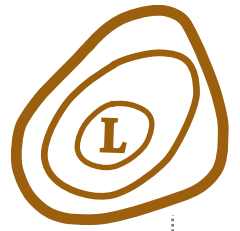
Khan, Ian. (Personal communication with Environment Canada meteorologist. December 1, 2008.)

Sample, Sharon. It's a Breeze: How Pressure Affects You. http://kids.earth.nasa.gov/archive/air_pressure/index.html. Updated 22 January 2003.

Sea breeze. http://en.wikipedia.org/w/index.php?title=Sea_breeze&oldid=254561685. Edited 28 November 2008.



Station 6: Under Pressure – Student Instructions

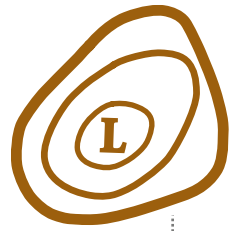


The story *Under Pressure* and its associated suction cup questions are used with permission of Aaron D. Isabelle.

- 1 **BEFORE YOU START:** Push the suction cups tightly together.
- 2 In your cooperative group, discuss what is happening. On your handout, write two or three sentences to explain how the suction cups stay together and draw a picture to convey your ideas.
- 3 Read or listen to the story *Under Pressure* by Aaron D. Isabelle.
- 4 **AFTER:** Now that you have heard the story, discuss what you have learned about how the suction cups are staying together. Write a new sentence to explain and draw a new picture to help convey your ideas.
- 5 Finish the Student Handout to apply these new ideas to weather.



Station 6: Under Pressure – Student Handout A



1 BEFORE YOU READ THE STORY: Explain what is happening to the suction cups.

SENTENCE(S):	PICTURE:

2 AFTER YOU READ THE STORY: Explain what is happening to the suction cups. Indicate where there is “higher air pressure” and “lower air pressure.”

SENTENCE(S):	PICTURE:





3 When Otto let the air back into the globe it fell apart onto the ground. The air moved from higher pressure (outside) to lower pressure (inside). Then, the air pressure inside and outside the globe became equal.

Air pressure “wants” to be in balance but sometimes the air around us does not have equal pressures everywhere.

If there is a difference in air pressure in the atmosphere, the air will move. Which way will the air move? From higher pressure to lower pressure!

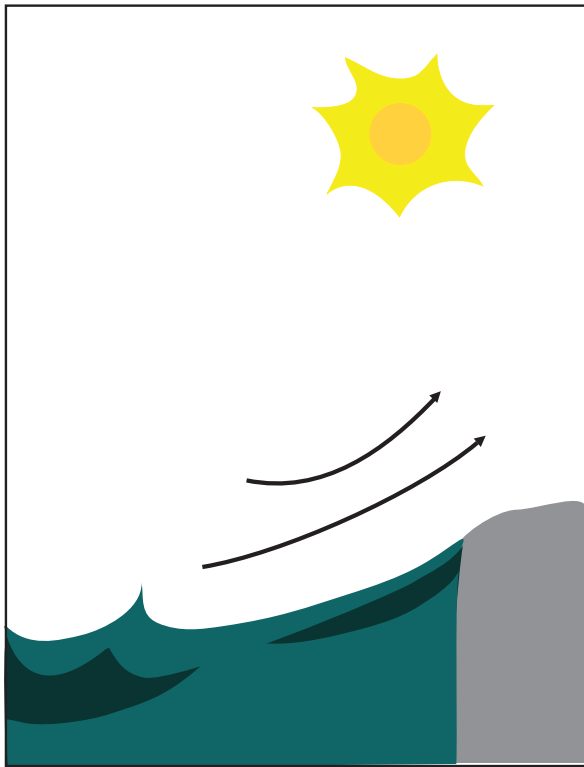
Predict the air pressure in the following situations. Fill in the blanks with the word “lower” or “higher.”

Sea breeze (daytime):

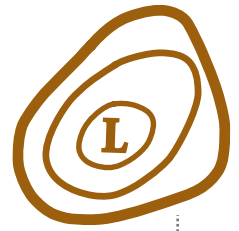
On a hot, sunny day on the coast, air expands. The wind blows from the ocean to the land. Air moves from a _____ pressure zone to a _____ pressure zone. During the day, the air pressure is _____ over the ocean than over the land.

Land breeze (nighttime):

At night the land cools down faster than the ocean, compressing the air. The wind blows from the land back to the ocean. Air moves from _____ pressure to _____ pressure. At night, air pressure is _____ over the land than over the ocean.



Station 6: Under Pressure – Student Handout B – Story



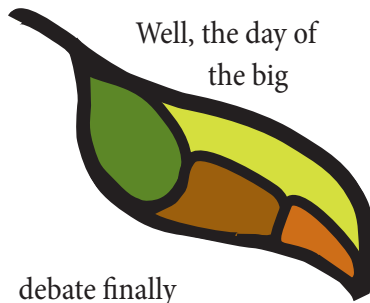
Under Pressure

By Aaron D. Isabelle

It was only a couple days left until Election Day and the two candidates for Mayor were preparing for the last big debate. The people of the town of Magdeburg, a small town in Germany, were all taking this election very seriously. There were a lot of serious issues at hand, like job opportunities and health care. But above all of the problems to be discussed, the people of Magdeburg wanted one problem solved more than any other: they wanted their mayor to put their town on the map; they wanted their town to be heard of and admired across the country! Berlin and Munich were cities in Germany that people spoke about all the time. But, no one knew anything about Magdeburg; most people never heard of such a town, never mind where it was in Germany.

“But, what could the town of Magdeburg ever be famous for?” the people asked. It was not as large as Berlin or Munich. No one famous had ever been born there.

Magdeburg didn’t manufacture or produce anything important. Basically, Magdeburg was an average size town, with an average population; it had an average location; the lives of its citizens could even be considered to be quite average. Everything about the town of Magdeburg was average and the people were sick and tired of being just average. They wanted to be known as “The Great Town of Magdeburg” or “The Incredible Town of Magdeburg,” or at the very least, “The Above Average Town of Magdeburg.” The only problem was that they didn’t know how to achieve this. That was why this election was so important to them. They wanted their new Mayor to have an answer to their problem.



Well, the day of
the big

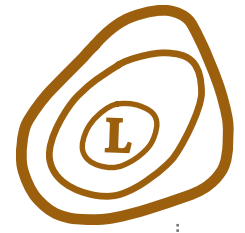
debate finally arrived. Excitement was in the air and the people were hopeful that their city would soon make a name for itself. All were attentive as the first of the two candidates stepped

onto the stage. The first candidate for Mayor, by the name of Hans, was the more experienced of the two. Hans had invested a lot of time and money into the town of Magdeburg and he was pretty confident that he would be the next mayor of Magdeburg. And, if this had been a normal election, Hans’s probably would’ve won. But, this was by no means a normal election. As experienced in politics as he was, he was also a very quiet, soft-spoken person. The crowd was so excited that Hans’s soft-spoken nature was, unfortunately, not a good thing at that moment. The people wanted someone on the platform as fired up and loud as they were.

Hans quietly and calmly said, “I want to give this town a good name as much as you do. So, I have a plan to clean up this town. Magdeburg will be known as “The Cleanest Town in Germany...”

Someone at the back of the crowd interrupted Hans and shouted, “Speak up, Hans! We can’t hear a word you’re saying!”





Hans started to repeat his idea when another person yelled back, “He’s talking about cleaning up the town or something like that...” Once the people heard what Hans had been saying, the whole crowd began to “Boo” him and his idea. Granted, it was a good idea to clean up the town, but the people of Magdeburg were aiming a little higher than: “Welcome to Magdeburg: The Cleanest Town in Germany.”

As Hans walked off the stage, the crowd continued to grumble. In the midst of all the emotion, no one had even noticed that the next candidate for mayor, a person by the name of Otto, had walked onto the stage and was standing in front of them. Although Otto did not have the same political experience that Hans did, he not only had a bellowing voice, but he also had a way with crowds; he was quite an entertainer and a showman.

Otto suddenly spoke clearly and loudly: “My good people of Magdeburg. There is no reason for such anger. If you will all just calm down and gather around me, you will be able to witness my plan for making this town known to all of Germany.”

Otto’s calming, commanding presence affected the crowd and they began to settle down and walk closer to him to see what he had to say.

“My name is Otto-Otto Guericke (GAY-rik-uh) (Hakim, 2005, p. 218). Most of you do not know me, but if you will lend me your eyes and your ears, I believe I will be able to help you. Now, what I have next to me might look strange to you, but it is simply a hollow bronze globe that I made with my own hands.”

The crowd stared in surprise at the shiny metal globe that was about two feet wide (about 60 cm). They did not know what to make of this spectacle.

Otto continued speaking in the face of their amazement, “As you can see, the bronze globe is cut in half so that the two halves of the globe can easily come apart.”

He showed the crowd that the bronze globe could easily be separated in two and that the inside was completely hollow. When separated, it was like the two halves of an orange with the inside taken out. He then put the globe back together and showed the people that both halves fit tightly together.

Otto went on to say, “When I put the two halves of the globe together, the globe is air tight! That means that when the globe is together, nothing, not even air or water, can pass in or out.”

To show them this, Otto forced the globe underwater for a few minutes. After he took the globe out of the water, he separated the two halves, showing that the inside of the globe was completely dry. Clearly, the two halves of the globe fit very tightly together.

Someone in the crowd then yelled out, “So what’s the point, Otto? How is this globe going to make us famous?”

“Well,” said Otto, “I want to make you all a proposition. I bet that once I put the two halves of this globe together that two teams of eight horses pulling on both sides of the globe will not be able to pull the globe apart.”

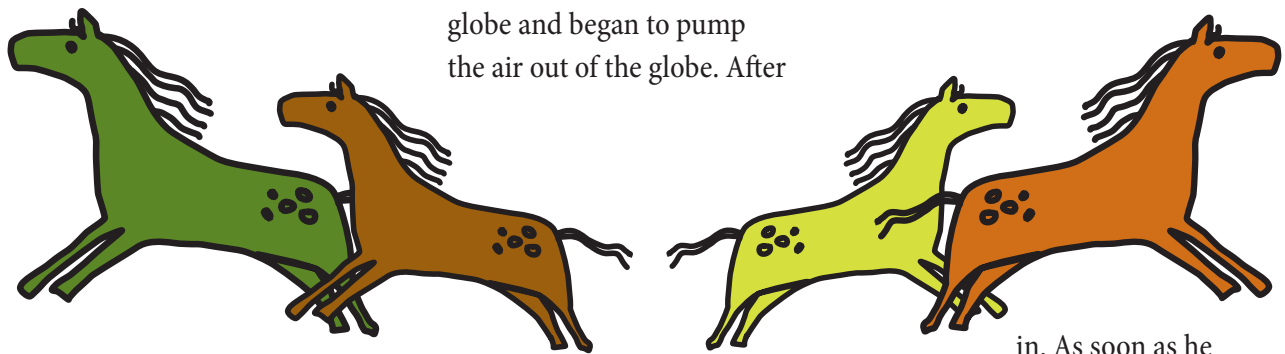
“Another person in the crowd shouted, “This must be a joke... You just showed us how easily the globe can be pulled apart!”

“This is no joke!” said Otto authoritatively. “I’m very serious. So serious that if I’m



right, word will spread all around Germany about this fantastic event in Magdeburg. You will be known as “The Great City of Magdeburg Where Anything is Possible,” and I, Otto Guericke, will be your Mayor.

At this point, as ridiculous as the idea sounded, the citizens of Magdeburg were willing to try anything. So, without hesitation, they cleared an area in the center of town and prepared two teams of eight



horses to pull apart the bronze globe. On each side of the globe, Otto had attached solid brass rings. The horses were tied with ropes onto these rings so that there were eight horses on each side of the globe, ready to pull in opposite directions. Everything was ready to go.

Otto walked to the center of the crowd where the bronze globe and the horses were and said to the people, “What you

are about to see is real. This is not some sort of magic show intended to fool you. Rather, what is going to happen here can be explained by science.”

Otto then placed before the people an interesting looking device. “What I have in my hands is a tool I constructed a few years ago. It is a type of air pump, but instead of pumping air into something (like a bicycle pump), this device pumps air out.”

Otto attached the air pump to a small valve on the bronze globe and began to pump the air out of the globe. After

a couple of minutes, he was finished and he said to the people, “All I did was take out most of the air that was inside the globe. Let the horses try to pull the globe apart now!”

At Otto’s command, the horses were released. Most of the people in the crowd thought that the globe would have immediately come apart, but it did not. One person in the

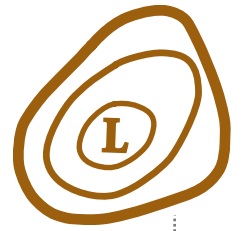
crowd said, “This won’t last. I’ll give it a minute at the most.” Surprisingly, more than a minute went by. At least five minutes went by and the horses were still pulling at hard as they could. Their hooves were even digging far into the dirt. They eventually had to stop the horses because they were tiring.

Otto then went over and opened the air valve in the globe, letting all of the air back

in. As soon as he did this, the two halves of the globe fell right apart onto the ground.

Everyone in the crowd was in awe. One person remarked, “How is this possible? Anything else would’ve been torn apart in seconds by the power of those horses.”

“Two words,” said Otto, “Air Pressure! You see the air around us actually pushes upon us in all directions with great force.



If you were underwater, the pressure of the water would be pushing inward on every part of your body. Well, the same thing is happening right now with the air around us. Basically, we all live at the bottom of an ocean of air. In fact, the force of the air on our bodies is extremely large. There is close to 30,000 pounds of force (133,440 Newtons) pushing upon our bodies, from all directions, right now!”

A person nearby said, “30,000 pounds? If someone placed 30,000 pounds on one of us right now, that person would be crushed in a second. If what you say is true, why isn’t the air pressure crushing us right now?”

Otto said, “That’s a very good point. But remember as we breathe, air enters our bodies, our bloodstream, and our cells. Air exists in all of our tissues and body cavities. So, even though the air is pushing upon us with about 30,000 pounds, the air in our bodies is pushing out with the same force. So, we’re okay because the forces are balanced. If you could somehow take the air out of our bodies, then the

air pressure around us would certainly crush us because there would be no air to exert an outward force from inside our bodies. The force of air pressure inside our bodies and outside our bodies would no longer be balanced.”

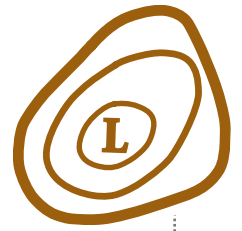
Otto went on to say, “That is exactly what I did in this demonstration. As long as there was air inside the globe, the two halves came apart quite easily. But, when I took most of the air out of the globe, there was hardly any air pressure left inside. I made a partial vacuum, or a space with hardly any air inside. When I did this, the air outside the globe was still pushing with 30,000 pounds, but there was very little air inside the globe to push back. In essence, the forces of air pressure were unbalanced. So, you have all that air on the outside pressing upon the globe from all directions, keeping it together. The only reason the globe wasn’t crushed by all that force was because it is made out of a strong metal. We saw the horses working against air pressure. Believe it or not, those horses were no match for

30,000 pounds of force exerted by the air on the globe.”

One of the leaders of the town spoke up and said, “This is truly amazing. But I wouldn’t have believed it if I hadn’t seen it with my own eyes. I don’t think other people will believe us when we tell them. They’ll just say, ‘It’s just those average people from Magdeburg desperately trying to be famous again.’”

“Well,” said Otto, “If you elect me to be the new mayor of Magdeburg, I will call the bronze globe ‘The Magdeburg Hemispheres’ and I will tour the countryside to carry out this experiment. Everyone in Germany will be shocked and delighted. People will come from miles away to see the indestructible Magdeburg Hemispheres and every one will say, ‘Magdeburg is truly an amazing town where anything is possible!’”

All the townspeople cheered with happiness for they knew their town would finally go down into history as great. They all carried Otto Guericke to the town hall and swore him in as their mayor. From that moment on, he became Otto “Von”



Guericke in respect for his new position.

It was quite a day in Magdeburg's history. It was also quite a day for Otto von Guericke. Just like his globe, he was under a lot of pressure in front of all those angry people. He knew that if his experiment hadn't worked, that he would've had to face a rioting crowd. But, Otto seemed so confident about the demonstration that there didn't appear to be a doubt in his mind. "Never let them see you sweat," so the expression goes. But, if everyone could've only heard what was going on in Otto's mind:

- Is the bronze strong enough to withstand the air pressure?
- Are the halves fitting tightly together so no air will leak in?
- Does the air pump work correctly?

- Did I pump out enough air?
 - Are the horses stronger than what I calculated?
 - Do I really want to be Mayor?
- In any case, putting all doubts aside, the day was a success for all. And even though most people have never heard of the

town Magdeburg, Germany today, I'm sure it was a pretty popular place 350 years ago.

THE END

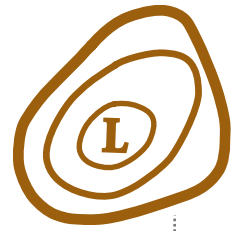
Used with permission of Aaron D. Isabelle.

Fact

- Otto was the Burgomeister or Burgomaster (similar to a Mayor) in Magdeburg, Germany in the 17th century. He lived from 1602–1686.
- Otto was a scientist and inventor, but preferred conducting experiments on a large scale.
- He was a showman; the bigger the spectacle the better!
- His Magdeburg Hemisphere experiment did actually occur in 1654 and did bring fame to Magdeburg.

Fiction

- Otto did not conduct his experiment for the purpose of being mayor.
- Hans is a fictitious character.
- Otto did not actually tour the countryside with his globe; however, word did spread about this amazing display of air pressure and became a popular teaching device.



Adaptations and Extensions

Beyond the stations:

If you want to get your students more involved in weather related activities, have a closer look at the ones that are included in the Sky Watchers manual. There are 23 student activities that include such things as building new weather instruments, making your own rainbow, observing and comparing difference sizes of raindrops, and more! Enjoy!!!

Add eLearning:

Visit the Environment Canada Sky Watchers weather site at www.ec.gc.ca/meteoaloeil-skywatchers/, and take a virtual tour of the weather office! Have a close look at some of the instruments real weather forecasters use in their daily activities.

Set up a weather monitoring station:

If you search the Web, you will find countless information about how to set up your own weather monitoring station at the school or at home. But turn first to Chapter 1 of the Sky Watchers Guide, and you will find detailed instructions for setting up your own school weather station, complete with instructions on how to use instruments such as the sling psychrometer, a rain gauge, UV meter and other weather tools.















Evaluation

Handout Score Sheet	Name:	
Criteria	Score	Comments
1: Wind Inspectors	/10	
2: What a Wacky Winter	/10	
3: Click!	/10	
4: Lights, Camera, Weather, Action!	/10	
5: Is Air Really There?	/10	
6: Under Pressure	/10	
Spelling/Grammar	/5	















Handout Score Sheet	Name:	
Criteria	Score	Comments
1: Wind Inspectors	/10	
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3: Click!	/10	
4: Lights, Camera, Weather, Action!	/10	
5: Is Air Really There?	/10	
6: Under Pressure	/10	
Spelling/Grammar	/5	



Peer Score Sheet	Name:		
Listening to others' ideas			
Doing your part			
Keeping on task			
Being respectful			










































Peer Score Sheet	Name:		
Listening to others' ideas			
Doing your part			
Keeping on task			
Being respectful			



Evaluation for Environment Canada

School / Contact:

Fax to Attn.: Victoria Hudec 416-739-4521

				Comments
Appropriate for target audience				
Matches the curriculum well				
Brings the real world to the classroom				
Easy to follow (for the teacher)				
Easy to follow (for the students)				
Activities stand alone without need for much teacher intervention				
Encourages higher-level thinking				
Sensitive and balanced (race, ethnicity, gender, socio-economic group)				
Assessment is adequate				
Title catches attention				
Quick reference guide is useful				
Handouts are ready to use				
Models environmental responsibility				



Station 1: Wind Inspectors – Curriculum Outcomes

Alberta

*Science (1996) – Topic D:
Weather Watch*

Grade 5

General Learner Expectation: Students will be expected to...

- 5-8 Observe, describe and interpret weather phenomena; and relate weather to the heating and cooling of the Earth's surface.

Specific Learner Expectations: Students will be expected to...

- Describe and demonstrate methods for measuring wind speed and for finding wind direction.
- Measure at least four different kinds of weather phenomena. Either student-constructed or standard instruments may be used.

British Columbia

*Science K-7
Integrated Resource
Package (2005)*

Grade 4

Students will be expected to...

- PLO: Measure weather in terms of temperature, precipitation, cloud cover, wind speed and direction.

Manitoba

Science

*Grade 5, Cluster 4:
Weather*

Students will be expected to...

- 5-4-05 Use the design process to construct a weather instrument.
- GLO: C3, D5

New Brunswick

*Science (2002), Earth and
Space Science*

Grade 5

Students will be expected to...

- Identify and/or construct, and use instruments for measuring weather information (204-8, 205-4, 205-10).
- Use appropriate terminology to name weather instruments when collecting weather data (104-7).

Newfoundland and Labrador

*Science (2002), Earth and
Space Science*

Grade 5

Students will be expected to...

- Identify and/or construct, and use instruments for measuring weather information (204-8, 205-4, 205-10).
- Use appropriate terminology to name weather instruments when collecting weather data (104-7).
- Record observations using measuring instruments in order to describe weather in terms of temperature, wind speed, wind direction, precipitation, and cloud cover (205-7, 300-13).

Northwest Territories

*Science and Technology
(2004), Earth
and Space Systems*

Grade 5

General Learning Outcome: Students will be expected to...

- Investigate the major climatic factors associated with weather, and design, construct and test a variety of instruments for recording various features of the weather.

Specific Learning Outcome: Students will be expected to...

- Design, construct and test a variety of weather instruments (e.g. weather vane, anemometer, rain gauge, wind sock hydrometer).

Nova Scotia

*Learning Outcomes
Framework: Science
(Draft) (2008), Earth
and Space Science*

Grade 5

General Learning Outcome: Students will be expected to...

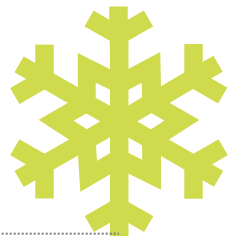
- Using correct names of weather instruments, construct and use instruments to record temperature, wind speed, wind direction and precipitation (104-7, 204-8, 205-4, 205-10, 205-7, 300-13).





<p>Nunavut <i>Elementary Science, Northwest Territories 1986 (Reprinted 1994), Weather</i></p>	<ul style="list-style-type: none"> • Wind speed can be measured by wind gauges.
<p>Students will be expected...</p>	
<ul style="list-style-type: none"> • To observe the effects of the wind. 	
<p>Grade 6</p>	
<p>Ontario</p>	<p>N/A</p>
<p>Grade 5 & 6</p>	
<p>Prince Edward Island</p>	<p>Students will be expected to...</p>
<p>Grade 5 & 6</p>	<ul style="list-style-type: none"> • Identify and/or construct, and use instruments for measuring weather information (204-8, 205-4, 205-10). • Use appropriate terminology to name weather instruments when collecting weather data (104-7). • Record observations using measuring instruments in order to describe weather in terms of temperature, wind speed, wind direction, precipitation, and cloud cover (205-7, 300-13).
<p>Quebec <i>Science and Technology Curriculum</i></p>	<p>Skills:</p>
<p>Cycle 2 and 3 (grades 3-4-5-6)</p>	<ul style="list-style-type: none"> • Propose explanations or solutions to scientific problems. • Build on tools, objects and procedures used in science and technology.
<p>Techniques and Instrumentation</p>	
<ul style="list-style-type: none"> • Use of simple measurement instruments (ex.: rulers, scale, thermometer, weather vane, barometer, wind gauge, hygrometer). • Design/construction of measurement instruments and prototypes. 	
<p>Saskatchewan <i>Science: A Curriculum Guide for the Elementary Level (1990) – Core Unit: Predicting Weather</i></p>	<p>Students will be expected to...</p>
<p>Grade 5</p>	<ul style="list-style-type: none"> • Identify instruments used to measure weather conditions. • Construct instruments to measure wind conditions. • Record measurements made with weather instruments.
<p>Yukon</p>	<p>Students will be expected to...</p>
<p>Grade 5 & 6</p>	<ul style="list-style-type: none"> • PLO: Measure weather in terms of temperature, precipitation, cloud cover, wind speed and direction.





Station 2: What a Wacky Winter! – Curriculum Outcomes

Alberta

*Science (1996) – Topic D:
Weather Watch*

Grade 5

General Learner Expectation

- 5-8 Observe, describe and interpret weather phenomena; and relate weather to the heating and cooling of the Earth's surface.

Specific Learner Expectations

- Describe the effects of the sun's energy on daily and seasonal changes in temperature—24-hour and yearly cycles of change.
- Recognize that weather systems are generated because different surfaces on the face of the Earth retain and release heat at different rates.

British Columbia

*Science K-7
Integrated Resource
Package (2005)*

Grade 4

N/A

Manitoba

Science

*Grade 5, Cluster 4:
Weather*

Students will be expected to...

- 5-4-13 Explain how the transfer of energy from the sun affects weather conditions.
- Include: the sun's energy evaporates water and warms the Earth's land, water, and air on a daily basis.
- GLO: D4, D5, E4

New Brunswick

*Science (2002), Earth and
Space Science*

Grade 5

Students will be expected to...

- Relate the transfer of energy from the sun to weather conditions (303-21).

Newfoundland and Labrador

*Science (2002), Earth and
Space Science*

Grade 5

Students will be expected to...

- Relate the transfer of energy from the sun to weather conditions (303-21).

Northwest Territories

*Science and Technology
(2004), Earth
and Space Systems*

Grade 5

Students will be expected to...

- Describe the ways in which energy from the sun affects weather conditions.

Nova Scotia

*Learning Outcomes
Framework: Science
(Draft) (2008), Earth
and Space Science*

Grade 5

General Learning Outcome: Students will be expected to...

- Relate the transfer of energy from the sun to weather and discuss the sun's impact on soil and water (2065, 30321).





Nunavut N/A
*Elementary Science,
 Northwest Territories
 1986 (Reprinted 1994), Weather*
 Grade 6

Ontario N/A
 Grade 5 & 6

Prince Edward Island **Students will be expected to...**
 • Relate the transfer of energy from the sun to weather conditions (303-21).
 Grade 5 & 6

Quebec
*Science and Technology
 Curriculum*
 Cycle 2 and 3
 (grades 3-4-5-6)

Skills:

- Propose explanations or solutions to scientific problems.
- Build on tools, objects and procedures used in science and technology.

Force and Movement

- The Earth's rotation (ex.: day and night, apparent movement of the sun and stars).

Energy

- Energy transmission (ex.: radiation).

Appropriate terminology

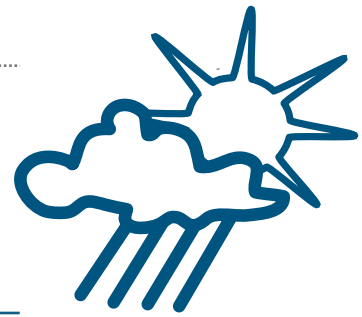
- Drawings and sketches.

Saskatchewan N/A
*Science: A Curriculum
 Guide for the
 Elementary Level
 (1990) – Core Unit:
 Predicting Weather*
 Grade 5

Yukon N/A
 Grade 5 & 6



Station 3: Click! – Curriculum Outcomes



Alberta

*Science (1996) – Topic D:
Weather Watch*

Grade 5

N/A

British Columbia

*Science K–7
Integrated Resource
Package (2005)*

Grade 4

N/A

Manitoba

Science

*Grade 5, Cluster 4:
Weather*

Students will be expected to...

- 5-4-01 Use appropriate vocabulary related to their investigations of weather.
- Include: weather; properties; volume; pressure; air masses; fronts; weather instrument; severe weather; forecast; accuracy; water cycle; climate; terms related to public weather reports, and cloud formations.
- GLO: C6, D5
- 5-4-07 Identify and describe components of public weather reports from a variety of sources.

New Brunswick

*Science (2002), Earth
and Space Science*

Grade 5

Students will be expected to...

- Use a variety of sources to gather information to describe the key features of a variety of weather systems (205-8, 302-11).
- Identify examples of weather phenomena that are currently being studied (105-1).
- Identify the various features of a weather report (ex: temperature, wind speed, precipitation, cloud cover).

Newfoundland and Labrador

*Science (2002), Earth
and Space Science*

Grade 5

Students will be expected to...

- Use a variety of sources to gather information to describe the key features of a variety of weather systems (205-8, 302-11).
- Identify examples of weather phenomena that are currently being studied (105-1).

Northwest Territories

*Science and Technology
(2004), Earth and Space
Systems*

Grade 5

Students will be expected to...

- Use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g. use terms such as temperature, precipitation, relative humidity, wind chill factor, barometric pressure, and cloud cover).

Nova Scotia

*Learning Outcomes
Framework: Science
(Draft) (2008),
Earth and Space Science*

Grade 5

General Learning Outcome: Students will be expected to...

- Using a variety of sources, gather information to describe the key features of weather systems and identify weather related technological innovations and products that have been developed by cultures in response to weather conditions (10714, 2058, 30211).
- Identify examples of weather phenomena that are currently being studied (1051).





Nunavut

*Elementary Science,
Northwest Territories
1986 (Reprinted 1994),
Weather*

- Weather consists of interacting factors such as temperature, pressure, precipitation, humidity and wind.

Grade 6

Ontario

N/A

Grade 5 & 6

Prince Edward Island

Grade 5 & 6

Students will be expected to...

- Use a variety of sources to gather information to describe the key features of a variety of weather systems (205-8, 302-11).
- Identify examples of weather phenomena that are currently being studied (105-1).

Quebec

*Science and Technology
Curriculum*

*Cycle 2 and 3
(grades 3-4-5-6)*

Earth and Space: Systems and Interaction

- Weather systems (ex.: clouds, precipitation, storms and climates).

Appropriate terminology

- Terminology related to understanding the Earth and space.

Saskatchewan

*Science: A Curriculum
Guide for the Elementary
Level (1990) – Core Unit:
Predicting Weather*

Grade 4

Students will be expected to...

- 1.2. Determine what information is recorded on weather maps.
- 2.1. Interpret information on weather maps.

Yukon

N/A

Grade 5 & 6



Station 4: Lights, Camera, Weather, Action! – Curriculum Outcomes



Alberta

*Science (1996) – Topic D:
Weather Watch*

Grade 5

General Learner Expectation

- Observe, describe and interpret weather phenomena; and relate weather to the heating and cooling of the Earth's surface.

Specific Learner Expectations

- Describe patterns of air movement, in indoor and outdoor environments, that result when one area is warm and another area is cool.

British Columbia

*Science K–7
Integrated Resource
Package (2005)*

Grade 4

Students will be expected to...

- PLO: measure weather in terms of temperature, precipitation, cloud cover, wind speed and direction.

Manitoba

Science

*Grade 5, Cluster 4:
Weather*

Students will be expected to...

- 5-4-04 Recognize that warm and cold air masses are important components of weather, and describe what happens when these air masses meet along a front.
- Include: in a cold front the cold air mass slides under a warm air mass, pushing the warm air upwards; in a warm front the warm moist air slides up over a cold air mass.
- GLO: D5, E2

New Brunswick

*Science (2002), Earth
and Space Science*

Grade 5

Students will be expected to...

- Draw a conclusion, based on evidence gathered through research and observation, about the patterns of air and/or water flow that result when two air or water masses of different temperature meet (206-5).
- Identify the various features of a weather report (ex: temperature, wind speed, precipitation, cloud cover).

Newfoundland and Labrador

*Science (2002), Earth
and Space Science*

Grade 5

Students will be expected to...

- Using a variety of sources, gather information to describe the key features of weather systems and identify weather related technological innovations and products that have been developed by cultures in response to weather conditions (107-14, 205-8, 302-11).

Northwest Territories

*Science and Technology
(2004), Earth and Space
Systems*

Grade 5

General Learning Outcome: Students will be expected to...

- Investigate major climatic factors associated with weather, and design, construct and test a variety of instruments for recording various features of the weather.

Specific Learning Outcomes: Students will be expected to...

- Recognize large-scale and local weather systems (e.g. fronts, air masses, storms).

Nova Scotia

*Learning Outcomes
Framework: Science
(Draft) (2008),
Earth and Space Science*

Grade 5

General Learning Outcome: Students will be expected to...

- Using a variety of sources, gather information to describe the key features of weather systems and identify weather related technological innovations and products that have been developed by cultures in response to weather conditions (107-14, 205-8, 302-11).





Nunavut

*Elementary Science,
Northwest Territories
1986 (Reprinted 1994),
Weather*

Grade 6

- Wind is caused by the movement of air masses.
- Students will be expected...**
- 2b. To infer direction of air currents.

Ontario

N/A

Grade 5 & 6

Prince Edward Island

Grade 5 & 6

Students will be expected to...

- Using a variety of sources, gather information to describe the key features of weather systems and identify weather related technological innovations and products that have been developed by cultures in response to weather conditions (107-14, 205-8, 302-11).

Quebec

*Science and Technology
Curriculum*

Cycle 2 and 3
(grades 3-4-5-6)

Skills

- Propose explanations or solutions to scientific problems.
- Build on tools, objects and procedures used in science and technology.

Saskatchewan

*Science: A Curriculum
Guide for the Elementary
Level (1990) – Core Unit:
Predicting Weather*

Grade 4

General Learning Outcome

- To promote both intuitive, imaginative thought and the ability to evaluate ideas, processes, experiences and objects in meaningful contexts.

Science Foundational and Learning Objectives

- Determine what information is recorded on weather maps.
- Interpret information weather maps.

Yukon

Grade 5 & 6

Students will be expected to...

- PLO: measure weather in terms of temperature, precipitation, cloud cover, wind speed and direction.



Station 5: Is Air Really There? – Curriculum Outcomes



Alberta

*Science (1996) – Topic D:
Weather Watch*

Grade 5

N/A

British Columbia

*Science K–7
Integrated Resource
Package (2005)*

Grade 4

N/A

Manitoba

Science

*Grade 5, Cluster 4:
Weather*

Students will be expected to...

- 5-4-03 Describe the properties of air, including: has mass/weight and volume; expands and rises when heated; contracts and sinks when cooled; exerts pressure; moves from areas of high pressure to areas of low pressure.
- GLO: D3

New Brunswick

*Science (2002), Earth
and Space Science*

Grade 5

Students will be expected to...

- Describe situations where air takes up space, has weight, and expands when heated.

Newfoundland and Labrador

*Science (2002), Earth
and Space Science*

Grade 5

Students will be expected to...

- Describe situations where air takes up space, has weight, and expands when heated.

Northwest Territories

*Science and Technology
(2004), Earth and Space
Systems*

Grade 5

N/A

Nova Scotia

*Learning Outcomes
Framework: Science
(Draft) (2008),
Earth and Space Science*

Grade 5

General Learning Outcome: Students will be expected to...

- Describe situations where air takes up space, has weight, and expands when heated.

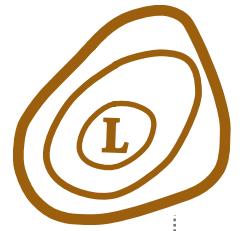




<p>Nunavut <i>Elementary Science, Northwest Territories 1986 (Reprinted 1994), Weather</i></p> <p>Grade 6</p>	<p>N/A</p>
<p>Ontario</p> <p>Grade 5 & 6</p>	<p>N/A</p>
<p>Prince Edward Island</p> <p>Grade 5 & 6</p>	<p>Students will be expected to...</p> <ul style="list-style-type: none"> Describe situations where air takes up space, has weight, and expands when heated.
<p>Quebec <i>Science and Technology Curriculum</i></p> <p>Cycle 2 and 3 (grades 3-4-5-6)</p>	<p>N/A</p>
<p>Saskatchewan <i>Science: A Curriculum Guide for the Elementary Level (1990) – Core Unit: Predicting Weather</i></p> <p>Grade 4</p>	<p>Common Essential Learning</p> <ul style="list-style-type: none"> To promote both intuitive, imaginative thought and the ability to evaluate ideas, processes, experiences and objects in meaningful contexts.
<p>Yukon</p> <p>Grade 5 & 6</p>	<p>N/A</p>



Station 6: Under Pressure – Curriculum Outcomes



Alberta

*Science (1996) – Topic D:
Weather Watch*

Grade 5

Students will be expected to...

- Recognize that weather systems are generated because different surfaces on the face of the Earth retain and release heat at different rates.

British Columbia

*Science K-7
Integrated Resource
Package (2005)*

Grade 4

N/A

Manitoba

Science

*Grade 5, Cluster 4:
Weather*

Students will be expected to...

- 5-4-01 Use appropriate vocabulary related to their investigations of weather.
- Include: weather; properties; volume; pressure; air masses; fronts; weather instrument; severe weather; forecast; accuracy; water cycle; climate; terms related to public weather reports, and cloud formations.
- GLO: C6, D5
- 5-4-03 Describe properties of air.
- Include: has mass/weight and volume; expands to fill a space; expands and rises when heated; contracts and sinks when cooled; exerts pressure; moves from areas of high pressure to areas of low pressure.
- GLO: D3

New Brunswick

*Science (2002), Earth
and Space Science*

Grade 5

Students will be expected to...

- Identify patterns in indoor and outdoor air movement (302-10).

Newfoundland and Labrador

*Science (2002), Earth
and Space Science*

Grade 5

Students will be expected to...

- Identify patterns in indoor and outdoor air movement (302-10).

Northwest Territories

*Science and Technology
(2004), Earth and Space
Systems*

Grade 5

Students will be expected to...

- Identify patterns in air movement (e.g. low pressure and high pressure).
- Identify the effects of air pressure (e.g. low pressure air masses are associated with mild temperature and create conditions that cause thunderstorms or clouds; high pressure air masses are cooler and are often associated with clear weather conditions).





Nova Scotia

*Learning Outcomes
Framework: Science
(Draft) (2008),
Earth and Space Science*

Grade 5

General Learning Outcome: Students will be expected to...

- Identify patterns in indoor and outdoor air movement (302-10).

Nunavut

*Elementary Science,
Northwest Territories
1986 (Reprinted 1994),
Weather*

Grade 6

- 1. Weather consists of interacting factors such as temperature, pressure, precipitation, humidity and wind.
- 2. Wind is caused by the movement of air masses.

Students will be expected...

- 2b) To infer direction of air currents.

Ontario

N/A

Grade 5 & 6

Prince Edward Island

Students will be expected to...

- Identify patterns in indoor and outdoor air movement (302-10).

Grade 5 & 6

Quebec

*Science and Technology
Curriculum*

Cycle 2 and 3
(grades 3-4-5-6)

Appropriate terminology

- Drawings and sketches.

Saskatchewan

*Science: A Curriculum
Guide for the Elementary
Level (1990) – Core Unit:
Predicting Weather*

Grade 4

General Learning Outcome

- To promote both intuitive, imaginative thought and the ability to evaluate ideas, processes, experiences and objects in meaningful contexts.

Science Foundational and Learning Objectives

- Determine what information is recorded on weather maps.
- Interpret information weather maps.

Yukon

N/A

Grade 5 & 6



[WWW.ec.gc.ca](http://www.ec.gc.ca)

Additional information can be obtained at:

Environment Canada

Inquiry Centre

10 Wellington Street, 23rd Floor

Gatineau QC K1A 0H3

Telephone: 1-800-668-6767 (in Canada only) or 819-997-2800

Fax: 819-994-1412

TTY: 819-994-0736

Email: enviroinfo@ec.gc.ca