**ACTIVITY 2: Exploring the weather wall**

**Overview**

[Ecolinc](http://www.ecolinc.vic.edu.au/) is a Department of Education and Early Childhood Development, environmental science centre situation in [Bacchus Marsh, Victoria](http://maps.google.com.au/maps?q=Bacchus+Marsh,+Victoria&hl=en&ll=-37.677299,144.440002&spn=1.604262,2.559814&sll=-25.335448,135.745076&sspn=56.685438,81.914063&z=9).

The [Ecolinc Weather Wall](http://202.76.157.2/weatherwallBMDB/wwallBMDM.html) has been designed and installed by CSIRO Atmospheric Research. The Weather Wall has the ability to display weather data from 22 December 2004 to today. Please note that this data is not official but is meant as a guide only to indicate what the weather at Ecolinc, Bacchus Marsh was at the requested date.

**Aim**

To read weather data collect by the Ecolinc Weather Wall and make observations.

**Objectives**

* To determine current weather conditions at Ecolinc
* To use the Ecolinc Weather Wall
* To recognise relationships between weather parameters
* To determine the annual rainfall and average monthly temperature at Ecolinc and how this compares to Melbourne’s data

**Tasks**

1. Ecolinc overview

Open the [Ecolinc](http://www.ecolinc.vic.edu.au/) website and explain that Ecolinc has a weather station designed by the CSIRO. The Ecolinc weather station records data on various weather parameters and this data is stored and displayed on the Ecolinc Weather Wall. Students explore the Ecolinc and [CSIRO](http://www.csiro.au/) website and in their journal explain what the CSIRO does. A: CSIRO, the Commonwealth Scientific and Industrial Research Organisation, is Australia's national science agency. CSIRO conducts research activities in Australia and internationally, in various Science fields such as climate, minerals, agriculture, oceans, energy and many more.

1. Ecolinc weather station

Show PowerPoint 1 and 2. Students examine the photo provided and answer questions in their journal. The Ecolinc weather station is located in an open position in the middle of the Ecolinc wetland and grassland ecosystem. The monitoring instrumentation is not influenced by local disturbance such as trees or buildings. Why might this be a problem? A: Trees, buildings or other obstructions would influence the weather instruments not enabling them to make accurate readings.

1. This link provides individual photos of the weather instruments at Ecolinc. Identify and in a few words describe features of the instrumentation. NOTE: Additional information has been provided for teachers. Students are not expected to know all the details herein.

A: Wind speed and direction: Wind direction is measured using an axial symmetric rotating potentiometer with two slides, which provides a full range from 0° to 360°. The materials of manufacture include polyamide plastic reinforced with carbon fibre and guarantee a rigid structure to provide optimal performance under both light winds and severe weather conditions.

Barometric pressure: Sensor Technics pressure sensor is used to monitor barometric pressure. The pressure sensing ranges for the sensor is 800 to 1100mbar. The barometric pressure sensor is calibrated against local atmospheric pressure for the region after correction for altitude.

Rain gauge: The Tipping Bucket rain gauge operates by filling and dumping two buckets, one mounted on either end of a beam that pivots around a central axle. Rainwater gathered in the lid portion of the gauge trickles down into the upper bucket through a small-diameter hole in the lid’s funnel-shaped bottom. When the bucket has received the proper amount of water, it empties itself by pivoting around the axle and pouring the water into the base. This action empties its contents; it moves a magnet past a reed switch and causes it to close. With each closure typically representing 0.2mm of rainfall.

Air temperature and humidity: Humidity is measured with a capacitive thin film polymer sensor. Temperature is measured with a resistive platinum sensor. Both the humidity and temperature sensors are located at the tip of the probe and protected by a membrane filter. The probe is housed within a radiation shield.

1. Students explore the current weather conditions via the [Ecolinc Weather Wall](http://202.76.157.2/weatherwallBMDB/wwallBMDB.html). The following link provides instructions for how to use the Ecolinc Weather Wall. It might be useful to have the Ecolinc Weather Wall on a data projector for all students to see in case questions arise.
2. Students describe the current weather (ensure they include the date and time of their observation).
3. Students examine past data and make observations. They identify the weather conditions on two past dates. Birth dates are suggested, and you might like to suggest Christmas Day, New Years Day or a parents birthday (ensure they include the date and time of their observation).
4. Students explore the ‘Interactive History’ feature and examine data collected throughout the day. Students notice how wind direction, air pressure, humidity, temperature and rainfall can vary and make an observation.
5. Students explore relationships between weather parameters. Students use Weather Wall data to support the theory explanations.
6. Air pressure and rainfall - In general, low air pressure = precipitation, and high pressure = clear skies. Air pressure becomes lower because the air rises. In the process, the air cools down and produces condensation that will ultimately lead to rainfall. A: Ecolinc Weather Wall data: 2 February 2005, 19:25, air pressure 990mb, rainfall 31.00mm
7. Wind direction/speed and temperature. Consider the location of Bacchus Marsh in relation to the ocean. In general, air coming off the ocean is cool whereas air coming off the land is warm. In Bacchus Marsh’s case a north wind is warm and a southerly is cool. A: Ecolinc Weather Wall data: 1 January 2008, 14:55, temperature 41.8°, wind direction northwest, wind speed 20.1km/h
8. Wind speed/direction and temperature. Wind chill is the felt air temperature on exposed skin due to wind. It measures the effect of wind on air temperature. When it is very cold the wind chill temperature is usually lower than the air temperature. When it is mild the wind chill temperature will be very close to the air temperature, if not the same. A: Ecolinc Weather Wall data: 8 June 2011, 13:25, temperature 10.1°, chill temperature (wind chill) 3.1°, wind direction southwest, wind speed 22.3km/h

Ecolinc Weather Wall data: 2 February 2010, 13:25, temperature 35.0°, chill temperature 35.0°, wind direction northeast, wind speed 8.6km/h

1. Humidity and rainfall. Humidity is also known as relative humidity. The relative humidity maximum is 100%, which is means the air becomes saturated. If the air becomes saturated, condensation of the water occurs leading to a formation of tiny water droplets. Millions of such water droplets come together to form clouds. Under certain conditions such water droplets combine to form big rain drops which fall as precipitation due to gravity. Therefore, if the humidity is high, it leads to the formation of clouds and subsequent precipitation. A: Ecolinc Weather Wall data: 3 February 2005, 15:25, temperature 14.2°, humidity = 79%, rainfall = 1.8mm
2. Students observe ‘Mean Monthly Rainfall’ data and provide explanations for the following:
3. In which month and year did Ecolinc experience the most amount of rain? A: February 2005
4. What time of year has the most rain? Is this what you would expect? A: November tends to have the most amount of rain. Students may assume winter (June and July) will have the most rain.
5. Open the following web page: [Monthly climate statistics - BOM - Melbourne](http://www.bom.gov.au/climate/averages/tables/cw_086071.shtml)

Ecolinc annual rainfall in 2009 = 352.6mm and in 2010 = 607.6mm. How does the annual rainfall at Ecolinc compare to Melbourne mean annual rainfall? A: Melbourne mean annual rainfall = 649.8mm. Ecolinc has a lower rainfall than Melbourne.

1. Bacchus Marsh is in a rain shadow, with warmer temperatures and a lower rainfall than Melbourne, Geelong and Ballarat. Bacchus Marsh mean annual rainfall is 505mm.

*In Victoria, the area around Port Phillip Bay is in the rain shadow of the Otway Ranges. The area between Geelong and Werribee is the driest part of southern Victoria; whereas the crest of Otway Ranges receives 2000mm of rain annually.*

Draw a picture to explain that is a rain shadow. [What is a rain shadow?](http://en.wikipedia.org/wiki/Rain_shadow)

1. This table shows the annual rainfall at Ecolinc.

|  |  |
| --- | --- |
| **Year** | **Ecolinc annual rainfall (mm)** |
| 2005 | 390 |
| 2006 | 354.8 |
| 2007 | 415 |
| 2008 | 303.8 |
| 2009 | 352.6 |
| 2010 | 607.6 |

Students draw a line graph showing the annual Ecolinc rainfall using Excel or similar program.

1. ‘In 2010 Victoria recorded its wettest year since 1974 and the fifth wettest year on record, whilst Melbourne experienced its first year of above average rainfall since 1996’ (BOM Special Climate Statement Feb. 2011).

Does the data collected at Ecolinc and by the BOM support this observation? A: Yes, the Ecolinc data supports the observation made by BOM Scientists.

1. Students observe ‘Mean Temperature’ data and provide explanations for the following:
2. Which months tend to be the warmest? Which months tend to be the coolest? A: Warmest months = January and February; and coolest months = June and July.
3. Is there a trend from year to year? A: Yes, there is a trend from year to year.

**Materials**

* Journal – paper and pen style or digital journal
* Computer, netbook or laptop with internet access
* Data projector, computer and internet access for teacher presentation
* PowerPoint – a suggested PowerPoint has been provided to supplement the session. A suggested order for the presentation is included
* Calculator

**Resources**

[www.bom.gov.au/climate/data/index.shtml](http://www.bom.gov.au/climate/data/index.shtml)

AustralianGovernmentBureau of Meteorology

Climate Data Online – daily and monthly observations for weather and climate, rainfall, temperature and solar exposure, for many locations throughout Australia.

[www.bom.gov.au/jsp/awap/rain/index.jsp](http://www.bom.gov.au/jsp/awap/rain/index.jsp)

AustralianGovernmentBureau of Meteorology

Daily rainfall totals for Australia – recent conditions.

[www.bom.gov.au/climate/averages/maps.shtml](http://www.bom.gov.au/climate/averages/maps.shtml)

AustralianGovernmentBureau of Meteorology

Climate Maps – various maps are included (mean rainfall, decadal rainfall, days of rain, average temperature, average humidity, etc.) which explores the variability of the Australian climates.

**Duration**

2 hours

**Suggested post activities**

Weather investigation at Aspendale

The CSIRO have designed and installed another Weather Wall at [Aspendale, Victoria](http://maps.google.com.au/maps?q=Aspendale,+Victoria&hl=en&ll=-37.957192,144.883575&spn=0.799103,1.279907&sll=-37.677299,144.440002&sspn=1.604262,2.559814&z=10). The [Aspendale Weather Wall](http://www.dar.csiro.au/weatherwallDB/wwallDB.html) is the same design as the Ecolinc Weather Wall.

Students could undertake the previous activity with the Aspendale data to determine if there are any similarities between the sites and if relationships exist?

Write a profile of the two sites. Include the following:

* Location and distance from Melbourne
* Topography
* Landscape
* Expected weather throughout the year.

Collect weather data from school

Students collect data from school using weather measuring instruments. Teachers can borrow a weather kit provided by the Bureau of Meteorology. This kit was produced as part of the Department of Education’s Science in Schools program. The [BOM weather kit](http://www.bom.gov.au/info/weatherkit/contents.shtml) contains suggested activities, instructions on to use the instruments, contacts and further information. The following is included in the kit:

* Wind speed 4 [anemometers](http://www.bom.gov.au/info/weatherkit/section2/ane.shtml), 2 [venturi meters](http://www.bom.gov.au/info/weatherkit/section2/vent.shtml)
* Air pressure 2 [barometers](http://www.bom.gov.au/info/weatherkit/section2/barom.shtml)
* Wind direction 4 [compasses](http://www.bom.gov.au/info/weatherkit/section2/comp.shtml)
* Humidity 2 [whirling psychrometers](http://www.bom.gov.au/info/weatherkit/section2/psy.shtml), 1 [hygrometer](http://www.bom.gov.au/info/weatherkit/section2/hygro.shtml)
* Rainfall 1 [rain gauge](http://www.bom.gov.au/info/weatherkit/section2/rain.shtml)
* Temperature 10 [thermometers](http://www.bom.gov.au/info/weatherkit/section2/thermo.shtml)
* UV index 4 [UV meters](http://www.bom.gov.au/info/weatherkit/section2/uv.shtml)
* Clouds 2 [cloud charts](http://www.bom.gov.au/info/weatherkit/section2/cloud.shtml)

If you are interested in borrowing the kit, the [BOM: Student and teachers](http://www.bom.gov.au/lam/Students_Teachers/learnact.htm) page lists the contact people in your state.

The UK Weather and Climate Resources for Teachers, Schools and Students provides a comprehensive resource for teachers about weather instrumentation - [Simple Weather Measurements at School or Home](http://www.rmets.org/pdf/simweameasurements.pdf)

Class data

This activity has been designed for temperature, however it could be adjusted to suit any weather element.

Once temperature data has been collected for seven days, analyze changes in results.

1. Draw a graph containing one line graph. Label the x-axis using each of the different dates starting with seven days ago to the left and ending with today’s date to the right (also include the time). On the y-axis label °C from 0 to 50 (mark the intervals in between). Plot the results.
2. Did the temperature go up, down or stay the same over the past week?

Class data vs. the BOM

Compare and contrast the weather you collected at school with data from the [Bureau of Meteorology](http://www.bom.gov.au/). The following is a list of ideas students could undertake:

1. Create a line graph comparing the temperature you collected with the class instrument with the data from the BOM site.
2. Is your temperature the same as reported on the website? If not, can you think of any reasons why they are not the same?
3. Does your wind data (direction and speed) match the data from the BOM site? If not, can you think of any reasons why they are not the same?
4. Does your rainfall data match the data from the BOM site? If not, can you think of any reasons why they are not the same?