

## **Environment > Solar Water Heater Experiment**

Recommended year level: 9 – 10 (7 – 12 including options)

Time taken: 90 minutes

Subject: Physics, Environment

### **Intro:**

- This section uses hundreds of weather stations spread all over Australia to provide temperature, humidity, rainfall, pressure, wind speed and wind direction data which is used to produce weather forecasts.

### **Learning Outcomes:**

- Students learn about temperature and humidity and how they are related to one another.
- Introduce students to an alternate way of determining seasons, namely the traditional owners of North West Arnhem land and Kakadu National Park and their six distinct seasons: Gudjewg, Banggerreng, Yegge, Wurrngeng, Gurrung, and Gunumeleng. Using weather station data, students will explore the differences between these seasons.

### **Experiment Summary:**

- Part 1 will focus on temperature and students will remotely access weather stations from around Australia to gather data.
- Students then use an online plotting tool to visualise the temperature recorded over a 3-day period for several cities to determine minimum and maximum temperatures. This temperature data will be used to determine temperature drops and for which areas of Australia these are the greatest.
- Part 2 explores humidity and its variance depending on where you are in Australia.
- Students make a 7-day plot for the humidity of Bundaberg and Alice Springs to determine which has the greatest temperature drop overnight and why. Then students look at Darwin, Perth and Brisbane and compare average humidity and order them from lowest to highest while giving possible reasons for this order.
- Part 3 compares temperature and humidity and how one affects the other based on data taken from Alice Springs.
- Part 4 engages students with some indigenous culture by exploring the six seasons identified by the people of North West Arnhem Land and Kakadu National Park. They look at 4 plots of weather data measured at Jabiru and answer several questions based on what they infer from each plot.
- Part 5 explores weather fronts and how weather patterns can be observed from the pressure they create. Students make a 7-day plot of the pressure in Perth, Adelaide and Melbourne and

find when and for how long the pressure is lowest. Using this information they can determine which direction a weather front is moving.

### Answers to Evaluate Questions:

1. Any three of pressure, temperature, humidity, wind speed, dew point and daily rainfall.
2. The coldest time of day in South Australia is just before the dawn.
3. The word for water vapour in the air is humidity.
4. It is more humid closer to the coast as water vapour in the air is created by evaporation from the oceans. Being closer to the ocean increases the amount of water vapour in the air and therefore the humidity.
5. The Aboriginal word for the wettest season in Kakadu National Park is "Gudjeuk".
6. Wurrng is the most pleasant time of year (June to August). There are blue skies and dry weather during the day and clear starry skies at night. Mornings are cool and the humidity is low.
7. The weather move from west to east. These are known as trade winds.
8. The name for the beautiful lights created by space weather in Antarctica and Tasmania is Aurora Australis.
9. The name for the "blanketing" of the earth by the atmosphere which keeps the earth warm is called the greenhouse effect.
10. The difference between the day-time and night-time temperature on the planet mercury is about 570°C. This is because Mercury has almost no atmosphere.

### Expected Results:

- Part 1 The temperature vs time graphs will have rising and falling temperatures due to the rising and setting of the sun.
- Part 1.2 The temperature drop overnight is larger in the South
- Part 2 The overnight temperature drop is bigger in Alice Springs.
- Part 3 The plot you create will show the humidity peaks when the temperature is lowest and vice versa. High temperatures "burn off" the water vapour in the air.
- Part 5 The low pressure and hence the weather front appears to move from west to east (i.e. From Perth to Adelaide to Melbourne).