Math 6
Statistics and Probability: Air Quality

Abstract

Through activities, students learn about air pollution and how information can be recorded and presented.

Logistics

Time Required
- **Class Time:** One to two 50 - 60 minute classes. Extensions will take additional time.
- **Prep Time:** 20 minutes

Materials
- Student Worksheet – Air Quality
- Separate graph paper
- Air Quality Health Index Card

Classroom Requirements
- Computer(s) with Internet access

Learning Objectives:

Using an interdisciplinary approach students will:
- Increase mathematical skills in interpreting line graphs, data collection and problem solving from graphed data
- Gain an understanding of local issues and increased awareness of air quality

Prescribed Learning Outcomes, B.C. Curriculum

- D1 create, label, and interpret line graphs to draw conclusions
- D2 select, justify, and use appropriate methods of collecting data, including: questionnaires, experiments, databases, electronic media
- D3 graph collected data and analyze the graph to solve problems
- A6 demonstrate an understanding of percent (limited to whole numbers) concretely, pictorially, and symbolically

Preparation

One week prior to activity:

1. Have a brief discussion about air quality in the region. Help students identify that local issues can be relevant to and incorporated into our learning, even mathematics.

2. Have students record the current ratings of the Air Quality Health Index (AQHI), wind speed and temperature for a minimum of 5 days. Indicate that these values should be recorded at approximately the same time each day. Students can all be assigned one community or data can be collected for various communities that have daily AQHI ratings. Students may need to be directed on how to collect data. AQHI ratings are available at http://www.bcairquality.ca/readings/index.html and Environment Canada will have forecast with temperature at http://www.weather.gc.ca/canada_e.html.

3. Students should organize the gathered data into a chart that clearly organizes the information to be used for graphing in the review activity.

Review Activity

1. Share with your students the general overview of the activity they will be participating and the air quality issues that will be explored as they review concepts. Hand out the worksheet.

2. Explain worksheet.

3. Provide assistance as required.

4. End the session with a discussion on air quality and how it can be explored in math class. Allow time for question and answer period with the whole class. Remind students that there are ways in which they can reduce their exposure to poor air quality. Get students to consider behaviors they can practice to help reduce pollutants in the air.

Student Worksheet – Air Quality   Name: _____

LINE PLOTS

The Air Quality and Health Index is a scale from 1 to 10 designed to help people understand what the condition of the air around them means to their health. The higher the number the greater the health risk associated with the air quality.

The following AQHI ratings are hypothetical. Current ratings are available online or via the AQHI website : http://www.bcairquality.ca/readings/index.html.

1. During a two-week period in April the Air Quality Health Index (AQHI) had the following daily ratings:

| 1 | 3 | 2 | 4 | 3 | 4 | 4 | 5 | 3 | 2 | 1 | 1 | 1 | 2 |

a. Use the data to complete the line plot below (the first one is done).

AQHI ratings from April 1 –14
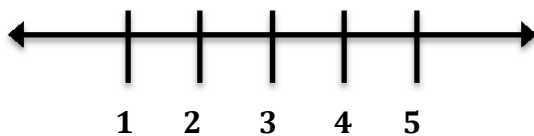
On the AQHI Scale:

- 1-3 ratings are considered low health risk

- 4-6 ratings are considered moderate health risk

- 7-10 ratings are considered high health risk

- 10+ ratings are considered very high health risk

b. How many days of low health risk rating were there in the two-week period?

c. What percent of days in the two-week period was a moderate health risk rating? Write percentage to the nearest whole number:

LINE GRAPHS – PART A

BACKGROUND: Hydrogen sulphide is a colourless gas with a rotten egg odour. Total reduced sulphur (TRS) includes hydrogen sulphide. Industrial sources of H_2S and TRS include emissions from petroleum refineries, tank farms for unrefined petroleum products, natural gas plants, petrochemical plants, oil sands plants, sewage treatment facilities, pulp and paper plants that use the Kraft pulping process, and animal feedlots. Natural sources of H_2S include sulphur hot springs, sloughs, swamps and lakes.

In Prince George, British Columbia Total Reduced Sulphur (TRS) is measured hourly and recorded. The Ministry of Environment writes the Annual Air Quality Report for the Prince George Airshed. The following chart comes from the 2010 report.
www.env.gov.bc.ca/epd/regions/omineca/air/pdf/2010-AQ-report.pdf

Annual trend summary of TRS from the Plaza site in Prince George	
Year	Maximum Daily Average ($\mu g/m^3$)
1980	62.4
1985	81.6
1990	47
1995	20.5
2000	21.8
2005	12
2010	15.5

a. Draw and label a line graph on a separate paper using the information in the chart above, **Annual trend summary of TRS from the Plaza site in Prince George.**

Looking at the graph you just drew, answer the following questions:

b. In which year on the graph was the Maximum Daily Average ($\mu g/m^3$) the lowest?

c. What is the overall trend or pattern for Total Reduced Sulphur (TRS) levels at the Plaza site during this 30-year period?

d. What conclusion(s) can you make about air quality over the 30 years from the Total Reduced Sulphur (TRS) data that you graphed?

LINE GRAPHS – PART B

a. Use the AQHI ratings and temperatures you have collected and recorded over the last several days to create and label **three** separate line graphs (AQHI, wind speed, and temperature) on a separate piece of paper.

Answer the following questions from the data you have graphed.

b. Which day(s) had the highest AQHI rating?

c. Were there any days that had an AQHI rating that would be considered high health risk?

d. Which day had the least amount of wind or lowest wind speed and what was the corresponding AQHI rating for that day?

e. What was the highest temperature reached in the observation period?

f. What is the difference in temperature from the warmest day to the coldest day during the observation period?

g. In your opinion, was the air quality poor, moderate or good during the observation period? Explain.

Wind speed contributes to how quickly pollutants are carried away from their original source and out of the airshed.

Air Quality Health Index

Helping you understand what air quality means to your health

Find out what the **AQHI** value is in Fraser Valley right now at **www.airhealth.ca**

Risk: Low (1–3)

General population: Ideal air quality for outdoor activities.

At-risk population: Enjoy your usual outdoor activities.

Moderate (4–6)

General population: No need to modify your usual outdoor activities unless you experience symptoms such as coughing and throat irritation.

At-risk population: Consider reducing or rescheduling strenuous activities outdoors if you are experiencing symptoms.

High (7–10)

General population: Consider reducing or rescheduling strenuous activities outdoors if you experience symptoms such as coughing and throat irritation.

At-risk population: Reduce or reschedule strenuous activities outdoors. Children and the elderly should also take it easy.

Very High (10+)

General population: Reduce or reschedule strenuous activities outdoors, especially if you experience symptoms such as coughing or throat irritation.

At-risk population: Avoid strenuous activities outdoors. Children and the elderly should also avoid outdoor physical activity.

1 2 3 4 5 6 7 8 9 10 +

Fraser Basin Council

Fraser Valley Regional District

Canada

For additional lessons and to complete an evaluation survey, visit: www.fvrd.ca/airquality