Four Seasons

Key Stage: 2

Strand:
  Mathematics: Data Handling (Learning Unit: Broken line graphs)
  General Studies: People and Environment (Learning Objective: to identify and describe climate and seasonal changes and their effects)

Objectives: (i)   To read and discuss broken line graphs
        (ii)   To construct broken line graphs
        (iii)   To recognise the temperature change in the four seasons
        (may collaborate with General Studies)

Prerequisite Knowledge: (i)   Finding the average of a group of data
                          (ii)   Reading and constructing bar charts of large frequency counts

Resources Required: World maps, globes and computers

Related Links: Hong Kong Observatory: *www.hko.gov.hk*
                     Bureau of Meteorology, Australia: *www.bom.gov.au*

Description of the Activity:
Activity 1
The teacher asks students to record the daily temperature of 7 days in a week. It is not necessary to guide the students to record the data in any means or in any forms. Students may collect the data from various sources, e.g. thermometer, weather report. One week later, the teacher discuss with students the data collected.

Questions for discussion:
1.　Why are the data collected by everyone on each day different?
2.　If the temperature of one day is selected to represent that of the week, which day should be selected?

Notes for Teachers:

1. The teacher may guide students to account for the difference. For example, the temperature varies within a day and the readings are not the same when they are measured at different time of a day. Measuring at different places or by different instruments may also lead to inconsistent results. Students are guided to conclude that some conditions or criteria are necessary in the setting of data collection.

2. By using the result in the discussion, the teacher may introduce that different regions use maximum temperature, minimum temperature or average temperature for describing the temperature of a particular period of time. The following links can be referred to:
   - Climatological Information Services (Hong Kong Observatory):
     www.weather.gov.hk/cis/climat_e.htm
   - Climate statistics for Australian location (Bureau of Meteorology, Australia):
     www.bom.gov.au (follow the path Bureau Home > Climate > Climate Data Online)

3. Through discussion, the teacher can introduce the use of the average of a group of data to represent the group in daily life situations.

Activity 2

According to the result of Activity 1, the teacher guides the students to agree with a scheme for measuring temperature. Students will measure the temperature of 7 days in another week in accordance with the scheme.

Questions for discussion:

1. Are the temperatures measured at one or some particular times on each day? If so, which moments are the most appropriate?

2. If the temperatures are measured at different time of a day, is the maximum temperature or minimum temperature selected to be the target data for recording? How can you collect the data for the maximum temperature or minimum temperature?

Notes for Teachers:

To arouse students' interest, the teacher can introduce some instruments that are commonly used by the Hong Kong Observatory for measuring temperature. The following links can be referred to:

- Conventional Instruments installed at an Automatic Weather Station in Hong Kong (Hong Kong Observatory)
  http://www.hko.gov.hk/education/article_e.htm?title=ele_00454

Activity 3

1. The teacher introduces and discusses with students the temperature information available in the Internet, e.g. the monthly mean of maximum daily temperature of Hong Kong available in the webpage of the Hong Kong Observatory.
2. The students collect temperature information from the webpage of Hong Kong Observatory and Australia's Bureau of Meteorology.
3. The students construct broken line graphs by Excel under the guidance from the teacher.
4. There can be discussion on the points to note in the construction of broken line graphs by Excel.
5. The students read and discuss the characteristics of the broken line graphs.
6. The teacher shows the broken line graphs constructed by using the temperature information of the two places and guides the students to compare and find their differences. Students can explore the reason to account for the phenomenon.

Questions for discussion:
1. When is summer in Hong Kong? When is winter in Hong Kong?
2. When is summer in Australia? When is winter in Australia?
3. Ying Ying's grandma lives in Australia. If Ying Ying is going to visit her during Christmas holiday, should Ying Ying wear winter clothes or summer clothes?
4. Describe the changes of temperature of the two places. Why is there such a difference?

Notes for Teachers:
1. When the students are guided to construct broken line graphs by Excel, the teacher should guide the students to use an appropriate graph.
2. When the students have finished their construction, they should be reminded to check if the graph has provided adequate information, such as title and labels for the two axes, etc.
3. For the ease of teacher's preparation, two sets of tempeturn data of Hong Kong and Australia are included in the Information Sheet.
4. The teacher may use the monthly mean of daily maximum/minimum temperature of two places for comparison.
5. If necessary, data from places other than Hong Kong and Australia can be used to construct broken line graphs. They can be used as reference and to support students' conclusion.

Integration and Application:

Science Education: Revolution of the Earth around the Sun

Technology Education: Construction of graphs by IT

Mathematics Education: Data collection and handling

This example mainly involves the following generic skills:

1. Creativity
    - Design own scheme in recording the daily temperature.

2. Critical Thinking Skills
    - Explore reasons to account for the differences in daily temperatures recorded by classmates and the difference in seasonal temperature variations between Hong Kong and Australia, and justify the reasons.

3. Information Technology Skills
    - Use a spreadsheet program to construct statistical charts.

Monthly Means of daily maximum, mean and minimum temperature recorded at the Hong Kong Observatory and Bureau of Meteorology, Australia between 1981-2010[*]

Hong Kong	Mean Daily Maximum (℃)	Mean Daily Minimum (℃)	Perth, Australia[#]	Mean Daily Maximum (℃)	Mean Daily Minimum (℃)
January	18.6	14.5	January	31.9	17.3
February	18.9	15.0	February	32.1	17.6
March	21.4	17.2	March	29.9	16.2
April	25.0	20.8	April	26.1	13.4
May	28.4	24.1	May	22.2	10.9
June	30.2	26.2	June	19.2	9.0
July	31.4	26.8	July	18.1	8.1
August	31.1	26.6	August	18.7	8.2
September	30.1	25.8	September	20.4	9.3
October	27.8	23.7	October	22.9	10.5
November	24.1	19.8	November	26.5	13.3
December	20.2	15.9	December	29.2	15.2

Note:

The sources of two sets of data are the Hong Kong Observatory (*www.weather.gov.hk*) and the Bureau of Meteorology, Australia (*www.bom.gov.au*)

[*]   To make the data comparable and more reliable, data of thirty years (1981 – 2010) of two places are extracted.

[#]   Perth is chosen from Australia as it lies in the same time zone as Hong Kong.