Contextualized Learning Activity: ENVIRONMENT
MBF3C/- Environmental Assessment Study

Purpose: Investigate and analyze an environmental topic of interest to you, and research or design ways to help improve your chosen environmental concern.

Module 1: Collection and displaying of data.

- Using data provided on chosen topic, display results in the most appropriate graphical and statistical measures.
    - Pie chart
    - Bar graph
    - Histogram
    - Mean, Median, Mode (measures of central tendency)
    - Range in standard deviation (measures of spread)

Module 2: Using various mathematical models to interpret and analyze the data.

- Using graphs and measures from Module 1, identify the most appropriate model (linear, quadratic or exponential) and distribution (normal, bimodal or skewed).
- Based on your models, determine the most appropriate algebraic representation of your data.

Module 3: Interpretation of data and designing ways to decrease impact on environment locally, provincially or nationally.

- Design a survey to assess impact within the local community. Written to get local community feedback on impact of chosen topic in our geographical area.
- Using potential outcomes from survey, recommend ways of reducing impact on the environment.
- Personal reflection (optional).

CHECKPOINT LIST:

Module 1	
Checkpoint	*Completed (✓)*
Step 2: Do you have sufficient data to continue onto the graphing part?	
Step 3: Have you graphed your data correctly? Are you using proper mathematical format for your graphs? Are your graphs neat with axis labeled? If you used statistical methods, have you used proper format?	
Module 2	
Checkpoint	*Completed (✓)*
Ensure that the teacher has reviewed your progress a few times during this module to ensure you are on the right track.	
Module 3	
Checkpoint	*Completed (✓)*
Step 2: Ensure you have followed all of the criteria given for your survey (see table in step 2)	
After Step 2: Switch surveys with a peer and suggest ways to improve.	
Step 5: Ensure you receive feedback from your teacher before finalizing your presentation. Have you included graph or graphs included & displayed them appropriately? Have you discussed the analysis of your graphs? Have you included impacts and solutions to these impacts in your presentation?	
Step 6: Ensure you have answered all of the guiding questions for your reflection.	

CHECKPOINT symbol: *Each time you see this symbol, check off that you have completed all of the necessary components on the Checklist (see front page) and submit your material to the teacher for assessment.*

Module 1: Collection and displaying of data.

Length of time to complete: 0.5 - 1 class periods (76min maximum)

Optional materials and resources:

- Microsoft Excel
- Microsoft Word
- Fathom
- CAS calculator
- Graph paper
- Protractor
- Ruler
- Pens/pencils/pencil crayons
- Compass

Procedure:

1. In small groups brainstorm current environmental concerns. Make a list of the top three concerns of importance to you. Write down your top three choices below.

2. Obtain data charts from STAT-CAN or from your teacher.

3. Organize your data by using the most appropriate graphical and statistical measures. You must choose a MINIMUM of two different ways to display your results.
    a. Bar Graphs
    b. Pictograms
    c. Pie Charts
    d. Histograms
    e. Measures of central tendency
    f. Measures of spread

Module 2: Using various mathematical models to interpret and analyze the data.

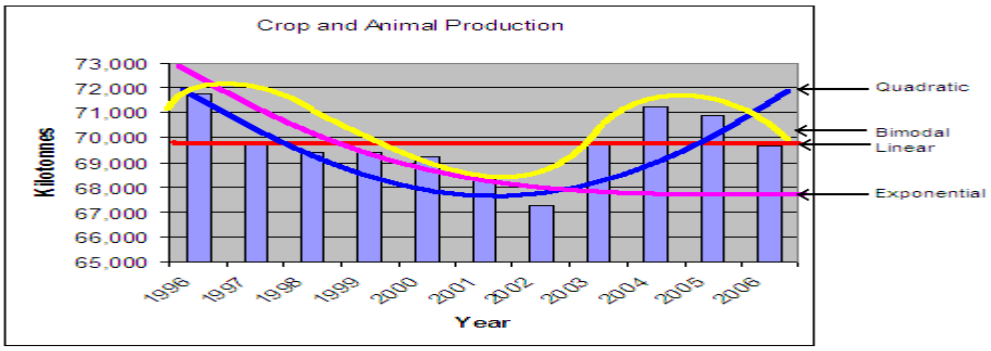
Length of time to complete: 0.5 - 1 class periods (76min maximum)

Procedure:

1. Think-Pair-Share with partner. Focus on discussing what your results tell you, as well as the environmental impact and whether or not the data was displayed in the most appropriate format.

Complete the following work independently.

2. Approximate the linear, quadratic, exponential and distribution models on your graphs. Example is shown below.



Linear: Draw a line of best fit for the data.

Quadratic: Draw a parabola of best fit for the data.

Exponential: Draw an exponential of best fit for the data.

Distributions: Draw a normal curve, bimodal curve and/or skewed curve for the data.

3. Which model best represents your data and why?

- *If your best model is Linear, Quadratic or Exponential, create an equation for the line/curve you drew (algebraic representation)*
- *If you are using a histogram, calculate the measures of central tendency(mean, median, mode) and measures of spread (range and standard deviation) for your data and then identify the best representation and why. *the graph above is not a histogram however the recognition of the cyclic pattern may assist students in the prediction of future trends.*

4. Predict what will happen 10 years from now based on the model(s) chosen. *You can use the graphical or algebraic representation to complete this section.

- *Example from above graph: If the 8 year cyclic nature of the graph continues, in 2020, the Crop and Animal Production Carbon Emissions should be at another peak. Since the agriculture industry in Canada is shrinking due to the requirement of the urban areas, I would expect the peaks be decreasing in value and hence the level would be approximately 71 000 kilotonnes.*

5. How do your predictions impact our environment (locally, provincially, nationally)?

- *Example from above graph: Since much of our agricultural land is being redeveloped into urban areas, we are losing our ability to produce food locally. Consider that this is also occurring both provincially and nationally this would reduce the greenspace of our nation (and hence reduce our ability to counteract the effects of carbon emissions) and likely result in more imports of food and agricultural products.*

Module 3: Interpretation of data and designing ways to decrease impact on environment locally, provincially or nationally.

Length of time to complete: 3-5 class periods (76min each period)

Procedure:

1. Using the prediction and impact statements from Module 2, create a 7 to 15 question survey to assess the direct impact of "one" of the conclusions that has an effect on our local community. Identify a specific population and sampling technique, and then create the questionnaire.

   Answer the following questions below and then design your survey. Use another piece of paper if you require more room.

   - *What is the local issue you will be addressing? (i.e. identify the goals or questions you would like to address through the completion of the survey)*
   - *From what population will you be collecting your sample?*
   - *What sampling method and technique will you use to distribute and collect the information? Write a brief explanation of your strategy.*

2. Your survey needs to meet the following requirements:
   - ☐ There must be between 7 and 15 questions (or data collection components)
   - ☐ Incorporate both open and closed response questions
   - ☐ The questionnaire must collect more than one type of data (continuous, discrete, categorical)
   - ☐ Avoid leading, biased, and personal questions. Questions that provoke an emotional response may cause people to refuse to participate and may bias your results.
   - ☐ Include a few questions that collect demographic data (i.e. gender, age etc.)

3. Write a paragraph summary that indicates how you hypothetically plan to analyze the data you collect.

4. Design a list that summarizes at least three recommendations and/or actions based on the hypothesized results of your survey. Use the questions below to help guide your answers.
    - *What are three ways that we can reduce the impact on the environment locally right now?*
    - *What steps must be taken in order to achieve such goals?*
    - *If your recommendations are implemented within a reasonably short timeline, what impact would you expect to see in the results (how would it change the graph(s) you created earlier?*

5. Using what ever methods you wish (and that are available), present your findings from your data collection analysis and recommendations to the class. (This could be in video, poster board, Power Point etc. format and should be no more than 5 minutes in length).

    Examples:

    - Power Point presentation about how not recycling impacts our landfills with a video of how to appropriately recycle within the school.
    - Poster board display of the impact our urban expansion has on our agricultural industry and a commercial for the support of buying local food and products.

6. Individual Reflection (**optional**). After listening to other presentations (and asking questions where appropriate), write a 1-2 page reflection on what you have learned from other students in the course. Be sure to include:
    - What have you learned?
    - What results/recommendations affected/moved you the most?
    - What do you plan on doing right now as a result of what you have learned?

Submission Checklist

At the end of the activity, use this checklist to make sure you have completed and submitted ALL of the required components:

TASK	*Submitted (✓)*
• Entire student handout booklet	
• Charts and graphs from Module 1 (printed from Excel, hand drawn, etc.)	
• Data analysis from Module 2 (printed from computer, hand drawn, etc.)	
• Predictions for the future based on data (Q#4 and 5) complete from Module 2	
• Survey (printed from computer, hand drawn, etc.) complete from Module 3	
• Summary and recommendations (Q#3 and 4) based on hypothesized results from survey in Module 3	
• Presentation submitted (Powerpoint, DVD, brochure, poster board, etc.) in its entirety from Module 3	
• Reflection complete and submitted from Module 3	