WE Are Canada

LESSON PACKAGE

GRAPHING ENVIRONMENTAL ISSUES

LESSON PACKAGE FOR GRADES 4 TO 6

THEME: ENVIRONMENT | **SUBJECT:** MATH

WE

CANADA 150

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GRAPHING ENVIRONMENTAL ISSUES

WE LEARNING FRAMEWORK SKILLS LEGEND:

THEME: Environment

SUBJECT: Math

GRADE LEVEL: Grades 4 to 6

LESSON PACKAGE OVERVIEW:

As critical consumers of information, students encounter facts, figures and other data sources on a regular basis. By analyzing data representations, students will begin to understand how the presentation of data plays a strong role in persuading Canadians about environmental issues within Canada.

ESSENTIAL QUESTION:

- How can data from bar graphs about environmental practices be used to create awareness?

STUDENT LEARNING GOALS:

Students will:

- Create and analyze graphs (bar, double bar and stacked).
- Learn about how their actions affect the environment by manipulating data representations to communicate a specific point of view.
- Use data to action plan and take action on a current issue to create awareness within local and national communities and engage with the community to make a change.

WORD BANK

Bar graph—a diagram in which the numerical values of variables are represented by the height or length of lines or rectangles of equal width

Double bar graph—a diagram comparing two sets of data about the same subject. This type of bar graph gives two or more pieces of information for each item on the x-axis instead of just one. This allows for direct comparisons on the same graph by age group, sex, race or other data

Infographic—a visual representation of information or data (e.g., a chart or diagram)

Scale—a set of marks on a line used in measuring, reducing and enlarging; the ratio between units in a numerical system

Stacked bar graph—a diagram breaking down and comparing parts of a whole. Each bar in the chart represents a whole, and segments in the bar represent different categories or parts of that whole. Different colours are used to illustrate the different categories in the bar

MATERIALS AND RESOURCES

- Computer with Internet connection
- Bristol board
- "Communication in the Mathematics Classroom" (Ontario Ministry Monograph)
- Blackline Master 1: Example Bar Graphs
- Blackline Master 2: Graphs About Computer and Television Usage
- Blackline Master 3: "Whose Story Is It?"
- Blackline Master 4: Data for a Grade 4 Student at School

Recommended Assessment for Learning:

You know your students best—their learning styles and preferences, skill levels, and knowledge. You are also best positioned to anticipate the habits of mind that will make this lesson package successful.

In this lesson package, teaching strategies include collaborative group work, interpretation of mathematical data and individual reflection. Suggestions for demonstration of learning include graphing using various perspectives and reflecting on the data collected from the graph. Please make any accommodations or modifications that serve your students

EDUCATOR'S NOTE: Samples of data have been provided in the lessons. Teachers may choose to use data that might be more geographically and/or culturally appropriate by using school, community or provincial data about local environmental issues (e.g., water usage, garbage and recycling).

LESSON 1:

UNDERSTANDING THE DATA FROM A SIMPLE GRAPH

SUGGESTED TIME:
75 minutes

Investigate and Learn

1. Show students **Blackline Master 1: Example Bar Graphs**. Ask students what information is on the graphs (e.g., title, bars, data, scale, intervals). Ask students what is missing from the graph (e.g., labels, subtitles). Add the missing information.

2. Prompt students to practise reading and understanding the information shown on the bar graph. Ask:

    a. Which weeks did the students recycle the most and least paper?

    b. How much paper was recycled overall during the four weeks?

    c. Why might there have been a decline in the amount of paper recycled each week?

EDUCATOR'S NOTE: The questions above allow students to use the information in the bar graph to speculate and explain their thinking.

3. In groups of three to four, students will analyze the data from one of two graphs (**Blackline Master 2: Graphs About Computer and Television Usage**). Ask students to create questions about the graph, for example:

    a. Which year showed an increased usage of more than one computer per household?

    b. How many more households used more than one computer in 2007 vs. 2011?

    c. Why was there an increase in the number of households using more than one computer?

4. Ask groups to exchange questions with another group and answer them.

5. **RECOMMENDED ASSESSMENT AS LEARNING:** How can data from bar graphs about environmental habits and computer usage be used to create awareness? Check for understanding by observing group discussion and questioning students during the group work process. Decide which graph to use during the discussion. Ask students to justify the reasons behind their answers using information from the graph.

6. Ask students to share their thinking with the class in a creative manner. Students are able to use a song, role play, tableau or rap to discuss their findings.

7. **RECOMMENDED ASSESSMENT OF LEARNING:** Students will create a short summary that links their understanding about the data collected from the bar graph to creating awareness about environmental practices in Canada.

LESSON 2:

CREATING SIMPLE GRAPHS USING A POINT OF VIEW

SUGGESTED TIME:
75 minutes

EDUCATOR'S NOTE: Students are presented with data that reflects the perspective of the characters in **Blackline Master 3: "Whose Story Is It?"**.

1. Ask students to examine the graph from **Blackline Master 3: "Whose Story Is It?"** in pairs and infer which of the characters listed is telling the story. Students should use the think-pair-share model to discuss their thoughts and ideas. Ask students to provide reasons that justify their choice.

2. Discuss how the same set of data can be used to support differing perspectives to convince a reader to agree with alternate opinions. Have students compare the graphs to the characters and determine which features (data, scales, types of graph) were changed to support each point of view. Ask students: Why might this have been done? Do any of the graphs misrepresent the data? Students should explain their answers.

3. Ask students to form four groups and assign each group a different role:

    a. Grade 4 teacher
    b. Grade 4 student
    c. School principal
    d. Parent of a Grade 4 student

    Provide data about the water consumption of a Grade 4 student with **Blackline Master 4: Data for a Grade 4 Student at School**, ask students to present a different perspective on the data based on their assigned role. Have them create a graph that presents their perspectives on the data. Ask students to justify their point of view.

    For example: A Grade 4 student might choose September, May and June and the number of minutes spent sorting recycling each month. The statement could be, "Students in Grade 4 only spend about one hour sorting through recycling each month.

4. **RECOMMENDED ASSESSMENT OF LEARNING:** Write a short paragraph to answer the question: "How did my assigned perspective influence my choices and understanding about Canadian environmental practices?"

EXTENSION: Which type of graph is better to represent data? Justify your reasons using mathematical language that demonstrates your understanding of the data and content.

LESSON 3:

ANALYZING AN INFOGRAPHIC

SUGGESTED TIME:
75 minutes

1. **RECOMMENDED ASSESSMENT OF LEARNING:** Share the following environment-themed infographic with students. Review prior knowledge and understanding about water usage in Canada. Tell students that these are U.S. statistics, however, they are comparable to Canadian water usage.

2. As a class, read and analyze the information shown on the infographic "Water World (Health Infographics)" from designinfographics.com/health-infographics/water-world.

    a. What is the topic, purpose and audience of the infographic? How do you know?
    b. What are some features of the infographic (e.g., statistics, graphs and graphics)?
    c. What information is missing from the infographic?

2. In small groups, have students analyze the data from an environmentally themed infographic. Select appropriate infographics for each group to review from visual.ly/environment-infographics. Students can complete the following in groups:

    - Record the topic, purpose and audience of the infographic.
    - For each fact or statistic, write the missing data that is not represented (e.g., 40 percent of people recycle, therefore 60 percent of people do not).
    - Analyze the new data you have created that was missing from the infographic. If you were to create an infographic with this new information, how would your topic, purpose and audience change?

3. Ask groups to share their understanding about the infographic and present their new infographic to the class in a gallery walk. A gallery walk is a discussion or presentation technique that allows students to move from station to station around the classroom.

LESSON 4:

LET'S PLAN AND TAKE ACTION

SUGGESTED TIME:
150 minutes

Action Plan

1. Students should be adequately prepared to choose and research an environmental issue in their school or country, or from around the world. Encourage them to think about issues that others may not be aware of and that are having a negative impact (e.g., excessive water usage, pollution, depletion of natural resources) or that could offer an opportunity to make a positive impact. If students need support, provide a list of topics or research materials.

2. Have students collect data from websites and books and organize it within a chart, citing the sources of information.

    - Provide a list of websites where students can find information.
    - Students should look for recent statistics that show the impact of the issue on the environment.
    - Students can research and look for simple graphs. The teacher can help students who are finding it difficult to understand complex graphs.

3. Discuss how students can collectively share data about environmental issues. Ask students, "How can we use a bar graph to create awareness about our environmental impact within our local and national communities? Which set of data will be a good representation of the issue?"

4. Have students create groups and brainstorm ideas about how, as a school community, we can raise awareness about our individual and collective environmental impact.

Possible actions:

- Create visual displays/posters to put up within the school to raise awareness about different environmental issues and our impact, including simple graphs (bar, column, pie) created by students.
- Invite a guest speaker in from public work to share information about the impact we have as a town/city on the environment.
- Share research and collected data with the community via social media, ensuring that posts include a bar graph created by students.

5. Ask students to choose their favourite action idea and write a short summary about this action, its overall purpose and what the idea would look like in action.

6. Have the class create a bar graph to determine which idea is most popular based on their responses.

7. While talking through the activities, prompt students to think about creating their own graphs or infographics to share the research they have collected and their perspectives on the issue.

8. Ask students to think about their overall goals for the action. Ensure they set goals that are measurable and results based. How can students use a bar graph to demonstrate the impact of their action?

9. Create a timeline for achieving their goal, with actions, roles and responsibilities allocated for each student.

10. Students should ensure that they collect evidence and data while taking action. Collecting evidence and data allows students to reflect on their learning as they are actively creating a measurable outcome for their goals.

11. Prior to taking action, review the set goals and think about types of evidence that will demonstrate that the action was effective and the goal was met.

    Types of evidence:

    - Photographs or visual aids
    - Surveys and questionnaires
    - Website and Twitter posts
    - Oral and written feedback

12. **RECOMMENDED ASSESSMENT AS LEARNING:** Set up daily check-ins to monitor skills development. Students may also like to discuss any accomplishments or challenges they are facing during the planning process.

EDUCATOR'S NOTE: This lesson is an opportunity for students to apply learning about mathematical concepts as well as broader critical thinking skills. Depending on time constraints, one or several projects can be implemented consecutively or simultaneously.

Take Action

13. Before interacting on social media, review classroom and school guidelines on using social media. Ensure students are actively participating and collecting data throughout the Take Action section.

LESSON 5:

SHARE AND REFLECT ON OTHERS' WORK

SUGGESTED TIME:
60 minutes

Report and Celebrate

1. As a class, reflect on the learnings and experiences from the Action Plan and Take Action sections. Think about the measurable goals that were set for the Take Action section. Using the evidence collected, reflect upon how well these goals were achieved through the action.

2. Record the goals on the front board and ask students to create a simple question to measure the amount of evidence collected during the action. For example, how many photos were taken, questionnaires collected and social media posts made?

3. As a class, create a bar graph showing the number of different types of evidence collected during the event. Ask students: does this graph show the impact of the action to create awareness about environment issues? Why or why not?

4. Have students reflect further to understand the deeper impact of the Take Action section and to consider how they can continue the process of informing others about their environmental impacts and ways to reduce their impact.

    - How does knowing about your environmental impact support a community?

    - Why might knowing how you affect the environment help to reconsider your actions?

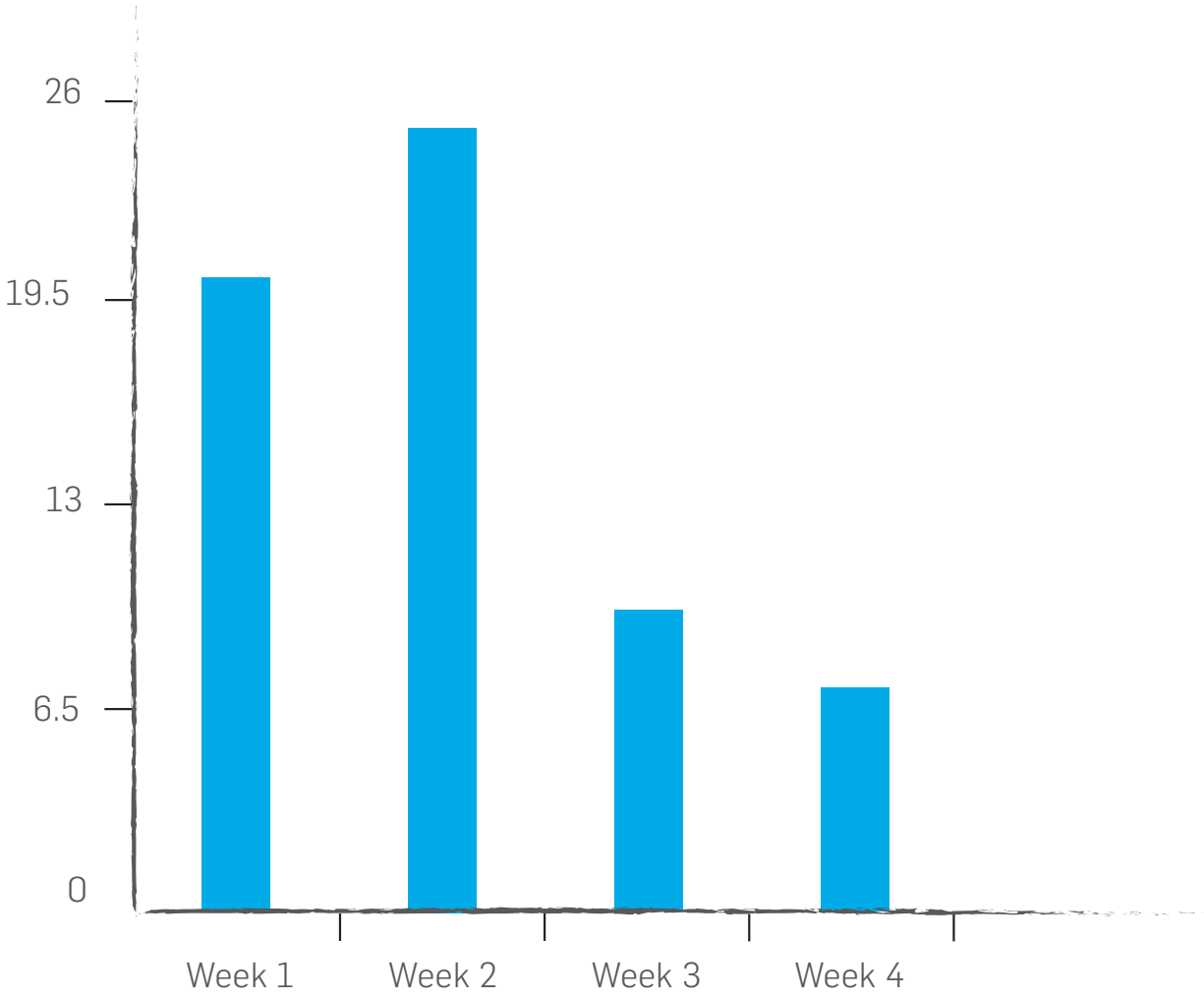
5. Ask students to consider if the environmental issue they studied is only a local issue, or if it extends to communities around the world. Have a discussion with the class and brainstorm environmental issues that students are aware of globally.

6. Encourage students to think about how as individuals they are able to raise awareness about various environmental issues within different communities. As young members of society, what issues are they passionate about and how can they make small changes in their actions to make less of an environmental impact? How can they become involved in raising awareness in their communities about small changes that can start the process of change globally?

7. As Canadians and global thinkers, what are they learning about how individual actions can have an impact on the greater community? How can they be the voice of change now and in the future?

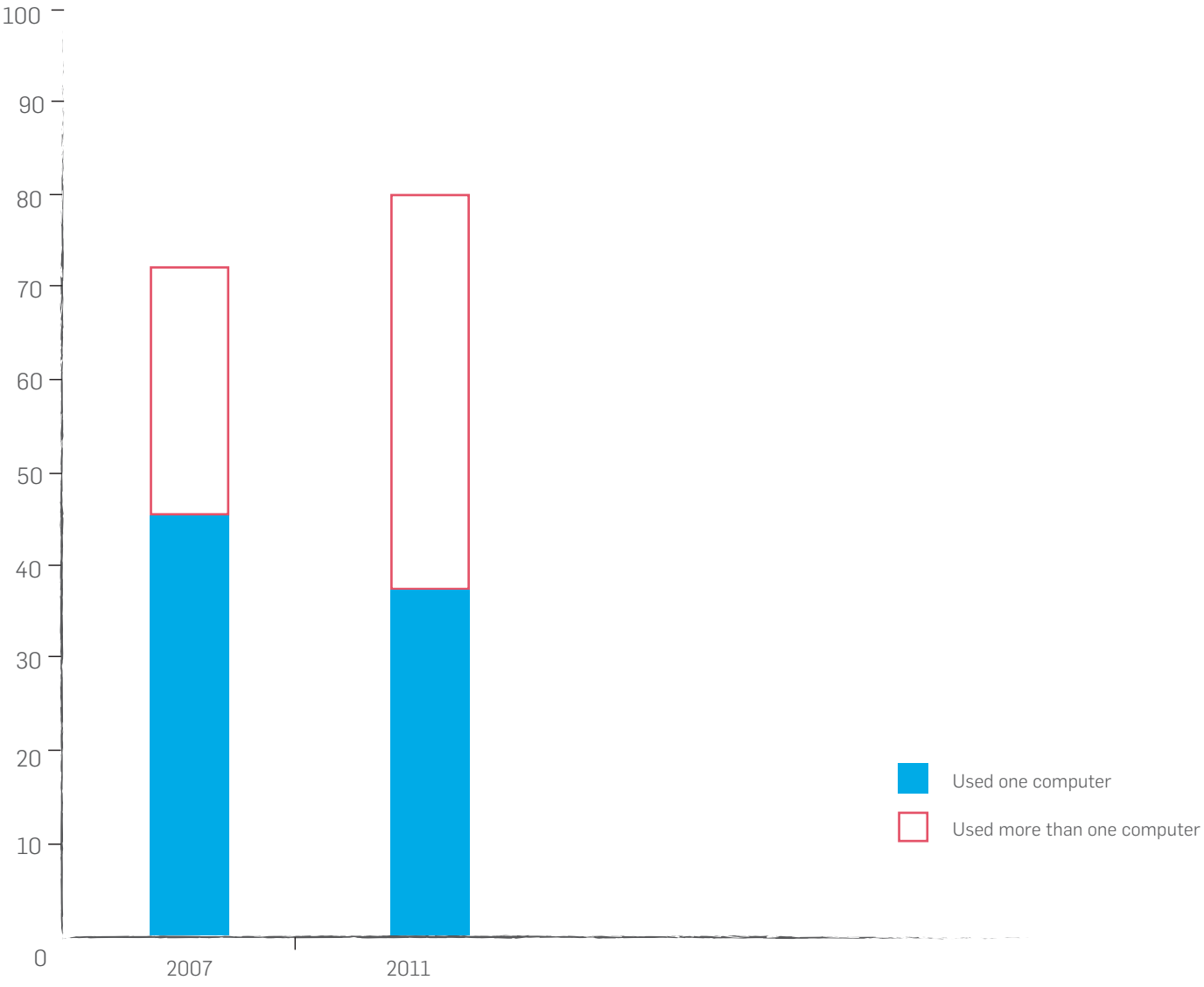
Blackline Master 1: Example Bar Graphs

Amount of paper recycled by class 4B during October



Blackline Master 2: Graphs About Computer and Television Usage

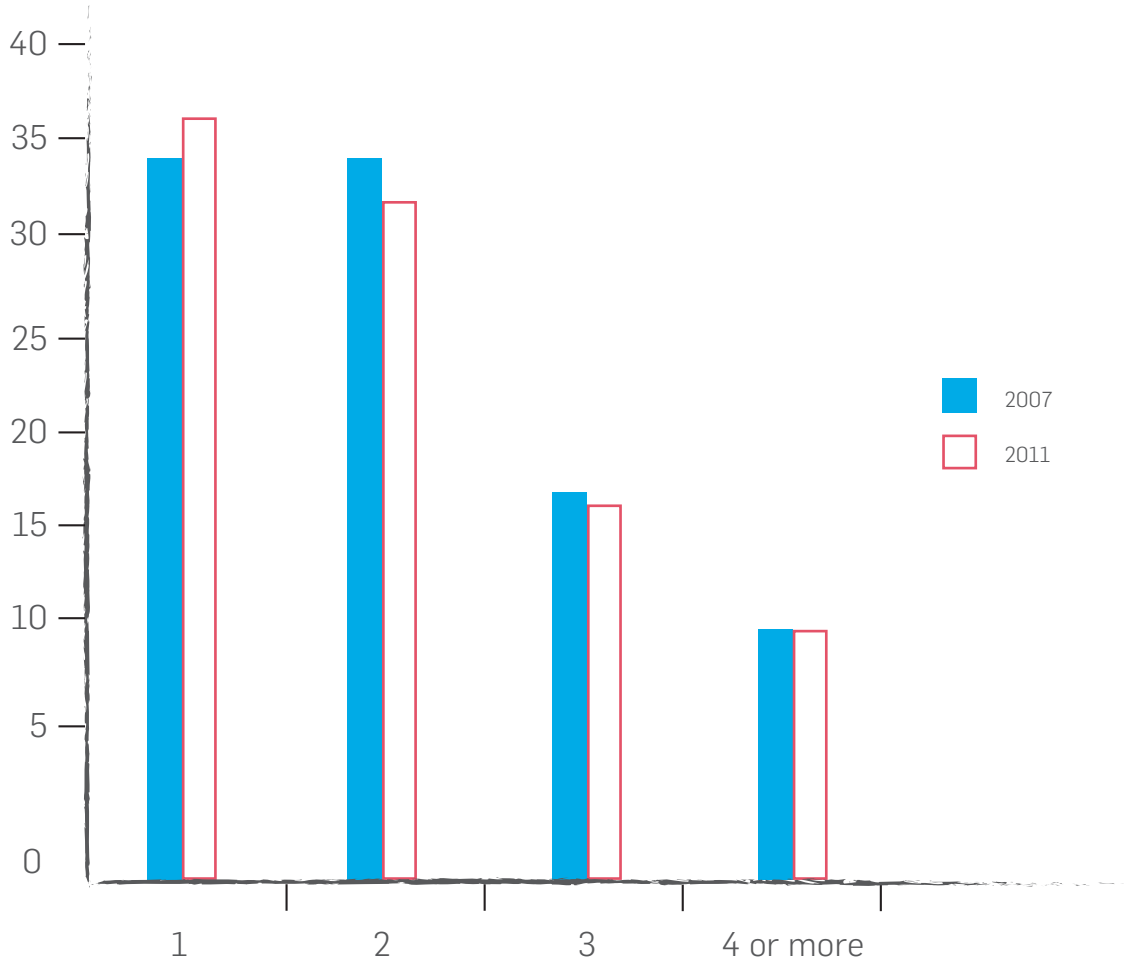
Use of computers, 2007 and 2011



Source: Statistics Canada, Environment, Energy and Transportation Statistics Division, Households and the Environment Survey (survey number 3881), 2007 and 2011.

Blackline Master 2:
Graphs About Computer and Television Usage

Number of televisions used, 2007 and 2011 (as percentage of households with televisions)



Source: Statistics Canada, Environment, Energy and Transportation Statistics Division, Households and the Environment Survey (survey number 3881), 2007 and 2011.

Blackline Master 3:
"Whose Story Is It?"

Salima, Adam and Simona were given the following information:

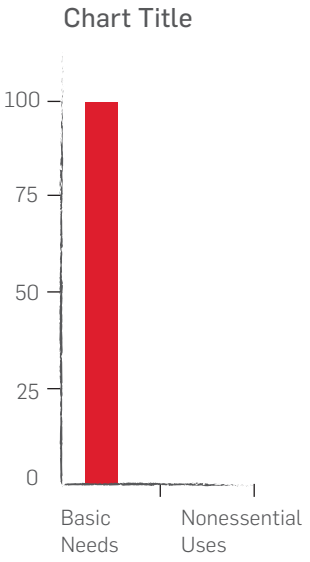
Residential indoor water use in Canada is as follows: toilet, 30%; bathing and showering, 35%; laundry, 20%; drinking and cooking, 10%; cleaning, 5%.

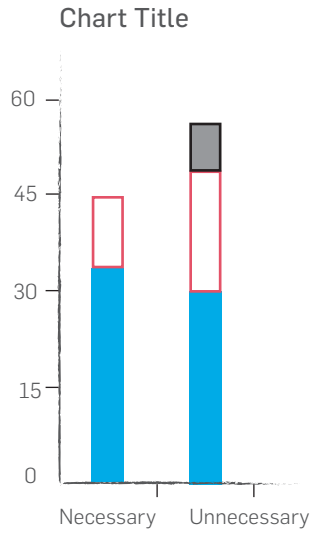
Examine the three graphs below about water usage. Who do you think could have prepared each graph?

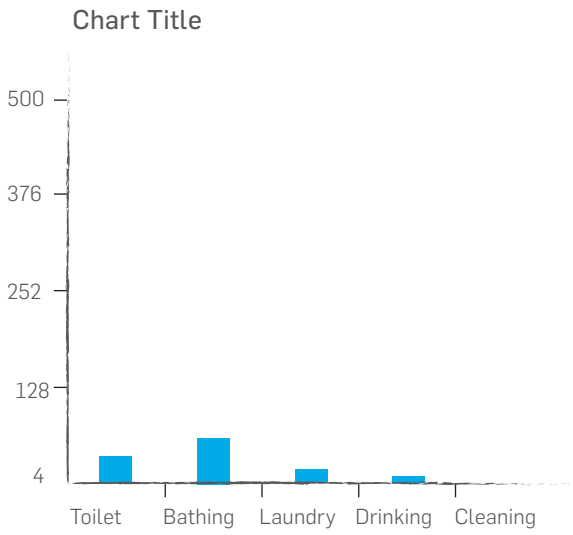
Salima believes water usage data is reasonable
Conclusion: "100% of water usage in Canada is spent on basic needs."

Adam believes in conserving water
Conclusion: "Some water usage is unnecessary."

Simona doesn't conserve water
Conclusion: "Water usage in Canada is low."







Water usage statistics from: http://www.canadiangeographic.ca/article/infographic-canadian-water-facts-world-oceans-day

Blackline Master 4:
Data for a Grade 4 Student at School

	Cups of water consumed at school	Daily amount of time spent sorting recycling in minutes
September	85	64
October	79	116
November	48	183
December	15	212
January	39	205
February	8	215
March	10	198
April	14	168
May	26	83
June	30	45

BLM Adapted from TIPS4RM, Grade 7, Unit 3, day 5