LESSON DETAILS

Data in Canada

Lesson Summary

Students will extend their understanding of the use of large-scale national data sets by examining data sets at a specific moment in time and over a range of time to understand how each data set can be used to help guide government decisions and policy-making. Furthermore, they will examine how the data could potentially be misused. Students will also examine issues around the collection and storage of large-scale data.
Students will have an opportunity to explore data on a topic of their choice based on their interests within the Statistics Canada database.

Grade 9:

Big Ideas

Data is important in making decisions and Statistics Canada gathers, stores, and makes available a lot of data. This data can be used to provide insight into problems that need to be addressed, but it can also be misinterpreted to support a bias.

Learning Expectations

AA1. develop and explore a variety of social-emotional learning skills in a context that supports and reflects their learning in connection with the expectations across all other strands

- Developing critical and creative mathematical thinking
- Recognizing sources of stress that present challenges to mathematical learning

A1. apply the mathematical processes to develop a conceptual understanding of, and procedural fluency with, the mathematics they are learning

- Connecting
- Reasoning and Proving
- Communicating

A2. make connections between mathematics and various knowledge systems, their lived experiences, and various real-life applications of mathematics, including careers

D1. describe the collection and use of data, and represent and analyse data involving one and two variables

D1.1 identify a current context involving a large amount of data, and describe potential implications and consequences of its collection, storage, representation, and use

D2.1 describe the value of mathematical modelling and how it is used in real life to inform decisions

D2. apply the process of mathematical modelling, using data and mathematical concepts from other strands, to represent, analyse, make predictions, and provide insight into real-life situations

Cross Curricular Connections

Link with Geographic issues of Canada - CGC1D or CGC1P

Learning Goals and Success Criteria:

LG1: We are learning to consider the collection and use of data collected on a wide-scale.

SC1: I can explain how some information is required by the government in order for them to be responsive and responsible to the population they serve.
SC2: I can explain how a data set might be misused and misrepresented.
SC3: I can provide an argument that supports the need for the collection, storage, and sharing of national data.

LG2: We are learning to understand, appreciate, and describe the value of data gathering and analysis as a tool to inform decision and policy-making.

SC1: I can identify how large-scale data may be used to influence the decisions made by a government, institution, business, or individual.
SC2: I can identify how one data set may be used to support different opinions and perspectives.
SC3: I can explain how two data sets, one at a moment in time and one over a period of time, can each offer valuable information.
SC4: I can analyze secondary data and explain my analysis.

LG3: We are learning to collaborate with peers to research and analyze data.

SC1: I can demonstrate an openness to the ideas of others.
SC2: I can participate actively in the group discussions.
SC3: I can use active listening in order to understand others' ideas.

Learning Goal 3 and the associated Success Criteria should be used to collect evidence related to work habits and skills, not socio-emotional learning as outlined in MTH1W. These evaluation criteria must therefore not affect the student's grade in the course.

CONSIDERATIONS THROUGHOUT THE LESSON

Differentiated Instruction and Universal Design for Learning

- Allow for student choice in selecting a set of data that interests them.
- Use heterogeneous groupings where possible, based on areas of research interest, to support sharing of skills and strategies.
- Allow students to work alone on their research, if they so desire, but have them present their findings to another student or pair before presenting to the class.
- Ask some student pairs to do quick summaries periodically in the large group to ensure that students who have not had the chance to go deep in their learning to hear the voices of their peers.
- Previewing vocabulary for English Language Learners and students with special education needs would be beneficial. (Examples of terms that may be included: census, sample, survey, population, data set).

Assessment

- Observation and conversation during guided whole class discussion as well as while circulating as students are doing their research
- Assessment Mapping based on Success Criteria
- Journal Entry Checklist
- Research presentation (see Checklist)

RESOURCES AND LEARNING ENVIRONMENT

Educator Resources Needed

Access to Statistics Canada site
Shareable versions of the two data sets in Appendix 1
Copies of Assessment Mapping, Journal Entry Checklist, and Checklist

Student Materials Needed

Access to Statistics Canada site
Copy of Checklist

Learning Environment Considerations

During this lesson, students will be asked to focus on developing critical and creative mathematical thinking, and recognizing sources of stress that present challenges to mathematical learning. In particular, the following will all be valuable during the research component of the Action.
From the Curriculum Context :

Developing critical and creative mathematical thinking will include:

- making connections
- making decisions
- evaluating choices, reflecting on and assessing strategies
- communicating effectively
- managing time

Recognizing sources of stress that present challenges to mathematical learning will include applying strategies such as:

- "chunking" a task or problem into manageable components and tackling one piece at a time
- engaging in guided imagery and visualization
- stretching
- pausing and reflecting

Previewing vocabulary for English Language Learners and students with special education needs would be beneficial. (Examples of terms that may be included: census, sample,

survey, population, data set). The use of a word wall with visuals would be one way to ensure this is in place and would provide ongoing support that benefits all learners.

Consider “de-fronting” the classroom, allowing students to sit in groups rather than in rows facing the front of the room. This helps send the message to students that the space is safe and it is okay to not be perfect.

LESSON CONTENT

Minds-On (10 - 20 minutes)

Activate student prior learning about the purpose of large-scale data and how it can be useful.

Whole Class: Guided questioning.

- How can a government know how many people there are in its country?
- How can the Government of Canada get answers to the following questions:
    - In which province or territory do the majority of Canadians live?
    - What is the average annual income of a Canadian family?
    - How many children, on average, does the Canadian family have?
- Have you ever completed a census form?

Elicit students’ thinking about the following questions. Recognize that, for some students, this discussion may be delicate, depending on their past experiences.

- Does a country have a need to know the answers to these questions?
- Does a country have a right to know the answers to these questions?
- Does your answer depend on the country?
- Would you want to know how the country is collecting and storing the data before answering?
- Participation in Canada’s national census is mandatory. How do you feel about this?

Probe to determine if students understand the difference between a sample survey and a census as a means to collect data. If necessary, have a brief discussion about the differences. Note: Make sure students understand that both generate reliable and valid data provided the collection technique was valid.

Point out to the class that these questions are all geared towards single variable statistics (a snapshot of the country in time). Ask, “Why do we need to know what the country looks like at a particular moment in time?”

After allowing for some discussion, ask, “What other information might a country’s leaders need to know about the country?”

Action (60-90 minutes)

In this next section, always have at least 30 seconds of silence before accepting any answers from a student to allow every student a chance to formulate their own thoughts.

Small Group Research Exemplar

To promote student thinking about the differences between data, show them the two data sets, one that shows data at a point in time and one that shows the data from several months. Have students discuss how these are different. Now ask them what questions come to mind when you look at the first data set? Take some time to allow students to explore what they might find curious about this data set. Then ask them what questions they have about the second data set. Again, allow enough time for students to reflect on what they are seeing and to formulate some questions they might have. Finally, ask them what information one could get from the second data set that the first one cannot provide?

Now it is time to discuss the different ways we have to model these two different data sets. The first set of data uses unemployment as a percentage of the population as the mathematical model. The second uses unemployment rate against time as two related variables. One allows for the comparison between different subsets of the population. The other allows for tracking of one subset of the population over time to identify trends.

The final step is to lead students in a discussion about:

- the value of these two particular data sets and how each may be used in real life to inform decisions. (For example: The government might create job incentives for young workers.)
- the possible misuse of such data. (For example, a commentator might use this data to support the position that people aged 15 - 24 are lazy and not interested in getting a job.)
- why it is important for Statistics Canada to store the data that was gathered years ago
- why the decision has been made to make Census Data available to everyone

Before sending students to do their own research, demonstrate how the data they just saw was found.

- From the Data section of the Statistics Canada website
- Select Subject: (leading to Children and Youth)

- Select Unemployment rate (leading to Unemployment rate, participation rate, and employment rate by type of student during school months, monthly, unadjusted for seasonality)
- From here one selects the specific parameters they are interested in.

Student Research Task
Students should ideally be working with a partner, but allow a student who wishes to work alone to do so. However, let any such students know that they will have to share their research and analysis with someone else before presenting it to the class. Partners should be selected based on shared interests wherever possible, and pairs should be heterogeneous so that different skills are brought to the team. (For example, one student might be especially interested in finding data, but another might be really interested in sharing their findings with the class.)

Pre-research:
Share the research task components with the students. Supply each student with a copy of the Checklist. Ensure that every student understands the components of the research task.

Before beginning the research task, students will:
- search the Statistics Canada Data or 2016 Census Datasets
- identify a subject/topic of interest to you
- make sure that historical data is available (at least 5 other years)
- report back to the teacher what subject they have selected

This may take 5 - 15 minutes, but give the students a hard timeline as they may get lost in the availability of data.
From this information, form the pairs.

Research task components:
- Explore the Statistics Canada Data site or their 2016 Census Datasets and locate the available data that is of particular interest.
- Capture the two data sets - the snapshot (single variable) data and the historical (two variable) data.
- Describe what conclusions might be drawn from looking at data that represents that subject at a particular time (a snapshot). Be creative and imagine many different people with many different opinions and lived experiences looking at this data. What might they see?
- Looking at the historical data, does it show that the data changes over time, or is the data relatively stable? Support your conclusion.

- How could the historical data be used to support different points of view or different conclusions? Explain why/how the historical data could support those conclusions and what perspective or bias the individual drawing that conclusion might have.
- Write a personal statement that describes your feelings about the value of these two particular data sets and how each may be used in real life to inform decisions.
- How likely is it that this data could be misused? What ideas can you think of that might reduce the potential for its misuse?
- Based on what you have found when searching the data, how has Statistics Canada protected the individual's right to privacy in the way the data has been shared?

The product:
Students will decide on how they would like to share their data and analysis with the rest of the class. (Presentations, role plays, and scripted debates are all appropriate to this task.) They should have 3 - 5 minutes to give their presentations or present their role play/debate. After they have shared, there should be another 2 minutes for questions.

It may be useful to chunk the research task and work with the students to establish a timeline for following up with the students on the progress of their research. The research task can be combined alternately with other math lessons such that it becomes a portion of a math period rather than the entire period. Varying the types of learning experiences will help students persevere while completing the research project. It also supports students' socio-emotional learning needs.

Consolidation (30-40 minutes)

Quickly recall the research subjects investigated by the students in the class.

Lead a discussion about what the students have observed during their research:

- Do you personally feel comfortable about the way(s) that Statistics Canada collects, stores, and shares data? What reservations, if any, do you have?
- What types of decisions do you think are best made using data that represents a snapshot (a single point in time; single variable data) such as the Canadian Census? What about historical data (the type of data that might show a trend; two variable data)?
- Apart from numerical data (tables), did you find any other representations of data on the Statistics Canada site? If so, what did you see?
- When can we represent the data in a data set with a scatter plot? (Students will recognize that one needs two variables, such as is seen in the historical data, where time is the independent variable).

- What ways can we represent Canadian Census data? (Students will note that, with only one variable (the subject being studied), the choices are different -- we might use bar graphs, histograms, pie charts, etc, but we would need to look through several sets of Census data in order to be able to create a scatter plot or a trend line graph.

Students will create a journal entry which will be collected by the teacher. Explain the journal entry task to ensure that students understand what is expected of them.

Appendices

Appendix 1: Single variable (snapshot) data versus two variable (historical) data

Age group: 15 - 24

Unemployment Rate (%)	**September 2021**
Total, all students and non-students	11.4
Students	11.5
Full-time students	12.1
Part-time students	6.4
Non-students	11.4

Age group: 15 - 24

Unemployment Rate (%)	Sept 2020	Oct 2020	Nov 2020	Dec 2020	Jan 2021	Feb 2021	March 2021	April 2021
Total, all students and non-students	19.0	17.9	16.5	15.6	19.9	17.0	14.6	16.3
Students	21.7	18.9	16.4	15.2	21.0	18.3	15.9	17.9
Full-time students	21.9	19.2	16.6	14.0	21.1	19.0	16.1	18.8
Part-time students	19.4	16.7	14.8	23.0	19.9	13.6	14.0	10.8
Non-students	16.5	16.9	16.6	15.9	19.0	15.9	13.4	14.9

Appendix 2: Assessment Mapping

Lesson Section	Task	Assessment	Success Criteria
Throughout the lesson		Observation and Conversation Track evidence of achievement of learning goals and success criteria at any time it is observed	Checklist ☐ explains how some information is required by the government in order for them to be responsive and responsible to the population they serve ☐ explains how a data set might be misused and misrepresented ☐ provides an argument that supports the need for the collection, storage, and sharing of national data ☐ identifies how large-scale data may be used to influence the decisions made by a government, institution, business or individual ☐ identifies how one data set may be used to

			support different opinions and perspectives ☐ explains how two data sets, one at a moment in time and one over a period of time, can each offer valuable information
Minds-On		Conversations	Checklist: ❏ identifies a component of a census as a type of survey ❏ describes a component of the role of a census ❏ anticipates how data may be inadequate for effective decision making
Action Part 1	Small Group Research Exemplar	Observation and Conversation	Checklist: ❏ articulates the difference(s) between single variable data (snapshot) versus two variable data (historical)
Action Part 2	Research	Observation and Conversation; Collection of evidence	See Appendix 3: Students Research Task Checklist

		(ex. photos of student work)	Scaffold/ask probing questions as necessary to guide students to successfully completing all the components of the research task.
	Research presentation	Product	See Appendix 3: Students Research Task Checklist
Consolidation	Journal entry	Product	May include some or all of the success criteria ☐ explains how some information is required by the government in order for them to be responsive and responsible to the population they serve ☐ explains how a data set might be misused and misrepresented ☐ provides an argument that supports the need for the collection, storage, and sharing of national data ☐ identifies how large-scale data may be used to influence a

			government's, institution's, business's, or individual's decision-making ☐ identifies how one data set may be used to support different opinions and perspectives ☐ explains how two data sets, one at a moment in time and one over a period of time, can each offer valuable information ☐ analyzes secondary data and explains analysis

Appendix 3: Students Research Task Checklist

Research Component	Met	Not Met
Captures the two data sets about the same subject.		
Describes what conclusions might be drawn from looking at data that represents that subject at a particular time.		
Draws a reasonable conclusion about the stability of the historical data and provides supporting arguments.		
Identifies different points of view or different conclusions that could be supported by the historical data and explains why and/or how the historical data could support those conclusions and what perspective or bias the individual drawing that conclusion might have.		
Writes a personal statement that describes their feelings about the value of their two particular data sets and how each may be used in real life to inform decisions.		
Identifies ways in which their data could be misused and offers suggestions to mitigate the potential for its misuse.		
Explains how Statistics Canada protects the individual's right to privacy in the way the Census Data is shared.		
Presentations, role plays, or scripted debates are reasonably within the 3 - 5 minutes time frame.		

Appendix 4: Journal Entry Checklist

Select **one** Success Criterion from **each** of the two Learning Goals listed below. Create a journal entry that demonstrates how you have successfully achieved the learning goal. Include specific details and examples that clearly demonstrate your learning.

LG1: We are learning to consider the collection and use of data collected on a wide-scale.

- ☐ I can explain how some information is required by the government in order for them to be responsive and responsible to the population they serve.
- ☐ I can explain how a data set might be misused and misrepresented.
- ☐ I can provide an argument that supports the need for the collection, storage, and sharing of national data.

LG2: We are learning to understand, appreciate, and describe the value of data gathering and analysis as a tool to inform decision and policy-making.

- ☐ I can identify how large-scale data may be used to influence the decisions made by a government, institution, business or individual.
- ☐ I can identify how one data set may be used to support different opinions and perspectives.
- ☐ I can explain how two data sets, one at a moment in time and one over a period of time, can each offer valuable information.