Lesson Title: Weight of Pennies
Course: Grade 6 Mathematics
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Learning Outcomes/Intentions

Formal Unit Outcome(s):

Extend understanding of data analysis to include:

- line graphs
- graphs of discrete data
- data collection through questionnaires, experiments, databases, and electronic media
- interpolation and extrapolation.

[C, CN, PS, R, V, T]

(a) Explain the importance of accurate labelling of line graphs.
(g) Select a method for collecting data to answer a given question and justify the choice
(h) Answer a self-generated question by performing an experiment, recording

Objective:
Students will perform a small experiment, collect data from said experiment, and use their data to construct a "properly" labeled graph. Students will then use extrapolation and reasoning based of their data to answer questions while using their graph as additional support.

Mathematical Processes:
Learners will be able to (or be skilled at) … Constructing a graph and connecting the points on their graph using a best-fit line; students will extrapolate the graph to help the students answer questions. Students will also learn how to properly label a graph as well as how to create a data table.
Connection: Students will connect their experiment with their tables and then their tables with their graphs. As well as making connections from the data, graph, and questions that will be handed out once the experiment is done.

Essential Questions:
Learners will be considering …
What thought-provoking question/questions frame the big ideas, spark meaningful connections & foster inquiry?
Does the line on your graph cross all your points? Why or why not?
Estimate how many pennies you need to get a weight of 30 g.

Estimate the weight of 15 pennies using the graph.
What happens if we flip the x and y axis?
Why is it important to label a graph?
What happens if we add 3 pennies at a time?
What happens if we use quarters instead of pennies?
Can you start with 10 pennies and work down and still have the same data?
Can we put pennies, quarters, and toonies on the same graph? What will it look like?
NOTE: Different groups can be provided with different questions while participating

First Nations Content

Assessment Evidence

Formative Assessments (Assessment for Learning):

Learners will show they achieved the outcomes by… Creating a data table and plotting the data.
How will you assess what students already know at the beginning of the unit? By using our word wall to establish the students' understanding of data collection and graphing.
What evidence (quizzes, tests, academic prompts, observations, homework, journals, exit slips, questioning, etc.) will you use to assess how/what students are learning?
-Students will first be assessed on their participation in the activity (did they perform the experiment, collect data, and build their graphs?)
-Students will be asked to predict the weight of 15 pennies by extrapolating their graph.
-Have a question where you have the students determine the independent and dependent variables
Bonus: Provide the students with multiple incomplete graphs and ask them to highlight the missing exponent. OR allow the students to create a different type of graph (such as a bar graph).

Note: Students will be assessed based on their engagement level not the correction of their graph. Feedback will be given the following day to improve students' work.

How will you adjust your teaching based on this information?
A decision will be made by the teacher based on the teacher's observation of the class and the feedback. The teacher can decide whether to move on to the next outcome or revisit how to conduct this experiment as a class rather than in small groups, whether it be the penny experiment or a different experiment altogether.

Summative Assessments (Assessment of Learning):

Learners will show they really understand the outcome by evidence of …
How will students demonstrate their understanding through authentic performance tasks?
How can students demonstrate their understanding through:
- Conversations/conferencing
- Performances
- "Written" products

Materials

- A scale (digital?)
- Pennies
- Data Table Worksheet
- Graphing Paper (remind students to use the back of the paper not the front)
- Pencils
- Rulers
- Erasers

Learning Plan

Learning Experiences & Instruction:
Use the 5-E's

Engage	Engage the students with a hands-on activity where they are physically manipulating the pennies and scale to collect data.
Explore	Students will learn how to collect data and manipulate their data to construct their graphs through a real-life experiment using pennies.
Explain	Students will explain their choice for the x and y axis as well as independent and dependent variables. Students will also explain the characteristics of their graph.
Elaborate	Students will extend their graphs to answer questions. Students will be questioned on the structure of their graph using questions such as: -What happens if you swap your x and y axis? -Does your line include all points? Why? -Predict the weight of 15 pennies -Does your graph accurately represent your data?
Evaluate	Students will be asked to group evaluate their collection of graphs and compare characteristics. Have the students hand in their data tables and graphs at the end of class to make sure everyone grasped the lesson.

A detailed instruction of the lesson and the questioning.
Design this so that a substitute teacher could use this learning plan and teach the class.
Step-by-Step - a detailed description of the lesson.
1. Students will be introduced to the topic of creating a graph while providing a review in less than 5 minutes of the last class/lesson.
   a. The review would quickly cover key terms, important information, and reminders that would help students in today's lesson. Ex. where are the y and x axis? What does slope mean?
   b. To begin the lesson, using an already completed graphs, review over the components/characteristics of the graph (x,y,title,line, dots, etc.), and why we need them. Have student try to make real world connections and when/where they could be using it. Before beginning the activity, allow students to ask any questions or concern before starting
2. Students will be first asked to participate in an activity as follows:
   - Students will be split into groups of three (ex. using the 1-2-3 method to split them into random groups).
   - Students will be provided with a scale, fifteen pennies, a table worksheet - linked below (unless the students create their own), and graphing paper.
   - Students will be asked to determine the weight of different quantities of pennies in grams and collect their data on a table
     Note: Students must use the same increments when weighting the pennies; for example 123, or 2,4,6.
   - Students must be able to identify the independent and dependent variables.
   - Students will record the weight of the different numbers of pennies and they will construct their data table using the number of pennies and correlating weight.
   - The students will be given a graphing sheet and will use their table in order to construct their graphs. Note: Always write on the back of the graphing paper, not the front in order to avoid lines.
   - Students will use extrapolation to answer a question provided to them. .(What is the weight of 15 pennies)

Notes:
-We will then use the formative assessment strategies listed above to ensure proper understanding. (The number of assessments we do will vary based on the time we have left and will take place during and after the experiment)
-Ask students one or two questions from the questions listed above. The goal of these questions is to allow students to build further connections with their graphs.

Extra information:
https://www.solutiontree.com/blog/lesson-plan-assessment/

Weight of Pennies (Experiment) - Table

Name(s): _____, _____, _____, _____
Date: _____

Independent Variable	Dependent Variable

| | |
| | |

Notes: