Making Cents

Purpose
To investigate the effect of aging on a penny relative to its mass.

Required Equipment and Supplies
10 pennies per student
balances
graph paper

Discussion
The scientific method is an effective way of gaining, organizing, and applying new knowledge. The method is essentially as follows:
1. Recognize a problem.
2. Make an educated guess—a hypothesis.
3. Predict the consequences of the hypothesis.
4. Perform experiments to test predictions. If necessary, modify the hypothesis in light of experimental results. Perform more experiments.
5. Formulate the simplest general rule that organizes the three main ingredients—hypothesis, prediction, experimental outcome.

Procedure
Step 1: Propose a hypothesis to the following question (problem): What effect does time have on a penny’s mass?

Step 2: Based upon your hypothesis, predict the general form of a graph that plots the mass of a penny (y-coordinate) relative to its age (x-coordinate). Make no measurements before you predict your graph.


Year of Minting

Making Cents
Step 3: Using a balance, measure the mass of at least 10 individual pennies minted in different years. Enter the mass in grams of each penny relative to the year it was minted (Table 1).

<table>
<thead>
<tr>
<th>Mass of Penny:</th>
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</thead>
<tbody>
<tr>
<td>Year Minted:</td>
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Step 4: Pool your data with that of all other students on the class chalkboard and create your own graph using all this data. Show the mass of each penny in grams on the y-coordinate and the year the penny was minted on the x-coordinate. Alternatively, data may be entered into a computer program that will plot the graph for you.

Step 5: Are the experimental results consistent with your hypothesis? If not, propose a new hypothesis.

Step 6: If you have formed a new hypothesis, what additional measurements might you take to support this new hypothesis? Perform these measurements and record your results and observations here:

**Summing Up**

1. What conclusion can you draw from the results of your experimental data?

2. What effect might aging have on the mass of a nickel, a dime, a quarter?

3. Would using a balance that was many times more sensitive have made a difference in your conclusion about the effect of aging on a penny? Briefly explain.

4. What improvements might you expect in your graph if only one student had done all the weighing on a single balance?