Scientific Investigation

Procedure

Step 1: Question

Step 2: Relevance

Step 3: Variables (if applicable)
Independent variable (also known as the manipulated variable)

Dependent variable (also known as the responding variable)

Control variable(s) or group, also known as constants

Step 4: Hypothesis
Is a hypothesis needed? If so, what is it?

How will the responding variable change when the manipulated variable changes?

Step 5: Materials

Step 6: Safety Considerations
Scientific Investigation, continued

Step 7: Sample Procedure

Part I: Provided Motion Graph
1. Obtain a motion graph printout.
2. Connect the motion detector to the calculator/handheld computer with the cable. Verify that the calculator is connected properly and receiving data from the motion detector with your instructor.
3. Use the motion detector equipment to act out one of the three different graphs.
4. Mark out one-meter intervals on the floor using a meterstick and masking tape strips.
5. Experiment using different speeds and moving different directions.
6. See how your motion is reflected in the graph you make.
7. Repeat the investigation until the graph you generate matches the graph provided.

Part II: Create Your Own Motion Graph
1. Create a motion graph in the provided space for data collection.
2. Act out your motion graph using the motion detector. Repeat this process until the graph you generate matches the motion graph you created.
3. Now, change something about your motion—for example, moving faster or slower, or reversing direction.
4. Sketch this new motion graph in your data collection space.
Relationship between Motion, Position, and Velocity

Scientific Investigation, continued

Step 8: Data Collection
Use the motion graphs to record your data.
Scientific Investigation, continued

Step 9: Data Analysis
Make a general statement about the results from your investigations and answer the questions below based on your results from the investigation.

1. What does a zero slope (horizontal graph) mean in a distance versus time graph?

2. What does a positive slope mean in a position versus time graph?

3. What does a negative slope mean in a position versus time graph?

4. If you have two objects moving at different speeds, how could you tell which one is moving fastest from the position versus time graphs?
Scientific Investigation, continued

Step 10: Conclusion and Scientific Explanation
What information does the motion graph for an object convey to us?

Claim:

Evidence:

Reasoning:

Rebuttal:
# Explore Student Journal

## Relationship between Motion, Position, and Velocity

### Rubric for Writing a Scientific Explanation

<table>
<thead>
<tr>
<th>Points Awarded</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Claim</strong></td>
<td>Not applicable</td>
<td>Answered the question and was accurate based on data</td>
<td>Made no claim or did not answer the question</td>
</tr>
<tr>
<td><strong>Evidence</strong></td>
<td>Cited data and patterns within the data and used labels accurately</td>
<td>Cited data from the data source, but not within the context of the prompt</td>
<td>Cited no evidence or cited changes, but did not use data from the data source</td>
</tr>
<tr>
<td><strong>Reasoning</strong></td>
<td>Cited the scientifically accurate reason using correct vocabulary, connected this to the claim, and showed accurate understanding of the concept</td>
<td>Cited a reason that was inaccurate or did not support the claim; did not use scientific terminology or used it inaccurately</td>
<td>Provided no reasoning or restated the claim; but offered no reasoning</td>
</tr>
<tr>
<td><strong>Rebuttal</strong></td>
<td>Provided reasons for different data or outliers in the data; may have also provided relevance to the real world or other uses for the findings</td>
<td>Was not connected to the data or was not accurate</td>
<td>Did not offer a rebuttal</td>
</tr>
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