Penny Lab: Exploring Scientific Method
• Examination of changes in surface tension of a liquid between water and water with soap added

• The effects of soap on the surface tension of water

• How soap affects the number of drops of water that can fit on a penny
Purpose/Question

• Does adding soap to a penny reduce the surface tension of the water being added?

• How does adding soap to a penny affect how many drops can fit on it?
Hypothesis

• *If* soap is added to a penny, *then* I think more drops of water will fit on the penny
Variables

- **Independent** – *the addition of the soap (what is added, or the “treatment”!)

- **Dependent** - *number of drops of water that are able to be added (what is in the data table!)

- **Control**: *adding water to the penny without soap*
Procedure

- Step by step instructions

“I think you should be more explicit here in step two.”
Materials

• penny, soap, water, 1 ml pipette, forceps
### Effects of Adding Soap to a Penny

<table>
<thead>
<tr>
<th></th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Trial 4</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No soap added</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># of drops</td>
<td>37</td>
<td>45</td>
<td>39</td>
<td>42</td>
<td>40.8</td>
</tr>
<tr>
<td><strong>Soap added</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># of drops</td>
<td>23</td>
<td>28</td>
<td>32</td>
<td>22</td>
<td>26.3</td>
</tr>
</tbody>
</table>

The data shows that adding soap to the penny significantly reduces the number of drops needed to displace the penny, with an average of 26.3 drops compared to 40.8 drops without soap.
Claim

With soap on penny, fewer drops of water can be added!
Evidence

Average for no soap on penny is 40.8 drops of water

Average with soap on penny is 26.3 drops of water
Explanation

Because soap reduces cohesion of water, surface tension decreases and water molecules break apart and can’t stay on the penny
Vocabulary

- surface tension
- cohesion
- variables
Hypothesis Refuted or Supported?

My hypothesis was supported. Soap did decrease the number of drops of water that could be added.
I believe that we added too much soap to the penny
In the future, I will examine if other items reduce the surface tension of water.
Analysis

CEE

Evidence

Average for no soap on penny is 40.8 drops of water

Average with soap on penny is 26.3 drops of water

Because soap reduces cohesion of water, surface tension decreases and water molecules break apart and can’t stay on the penny

With soap on penny, fewer drops of water can be added

In the future, it would make sense to see if other items reduce the surface tension of water

I believe that too much soap was added to penny

My hypothesis was supported. Soap did decrease the number of drops water that could be added

Errors

Vocabulary

Explanation

Further Investigation

Hypothesis

Claim