Angle of Impact Lab

Objectives:
- Students will be able to calculate the angle of impact using the length and width of each blood stain and a calculator.
- Students will be able to compare and contrast blood stain patterns relative to the angle of impact.
- Students will be able to use the angle of impact to estimate

Materials:
- White board
- Protractor
- Ruler
- Meter Stick
- 5 index cards
- Dropper of Blood
- 3 fold presentation board
- String
- Tape
- Axis
- Calculator

Part 1: Creating Drops at an Angle
Background:
One can't drop blood from different angles. Therefore, in this activity, you will angle the impact card to represent different angles of impact.
- Angle of impact is measured from the vertical.
- Protractor setting is 90° minus the desired angle of impact
  - Example 1: If the angle of impact is 60°, then the protractor setting will be
    Protractor setting = 90° - 60°
    Protractor setting = 30°
  - Example 2: If the Angle of impact is 20°, then your protractor setting will be
    Protractor setting = 90° - 20°
    Protractor setting = 70°
  - Fill in the following table for the remainder of the angles used in this lab.

<table>
<thead>
<tr>
<th>Angle of Impact (degrees)</th>
<th>Protractor Setting (degrees) (90° - angle of impact)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
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<tr>
<td>40</td>
<td></td>
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<tr>
<td>45</td>
<td></td>
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<tr>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>70</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td></td>
</tr>
</tbody>
</table>
Procedure:
1. Label five index cards with your names and then indicate the angle for each droplet: 15°, 30°, 45°, 60°, or 75°.
2. Place the first index card on the white board and align the white board with the protractor setting you calculated above. Hold the dropper of blood at a height of 50 centimeters from the top of the table.
3. Gently squeeze the dropper so that ONE drop of blood is released and lands on the index card. Repeat two more times at this angle.
4. Continue testing by dropping blood from a height of 50 centimeters at each of the other angles.
5. Let the drops dry while you complete part #2. Once, the drops are dry, measure the drops and calculate the average length and width of the drops at each angle.
6. Fill in the table below with your results:

<table>
<thead>
<tr>
<th>Angle (°)</th>
<th>Average Length of Drop</th>
<th>Average Max. Width of Drop</th>
<th>Sketch of Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>45</td>
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<td></td>
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<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Part 1 Analysis Questions:
1. What happened to the size and shape of the parent drop as the angle of impact decreased?

2. How can investigators estimate the angle of impact from the size and shape of the parent drop?

3. As the angle of impact changes, what happens to the satellite spatter or the spines produced? Why?
Part 2: Finding Area of Origin

Procedure:
1. Obtain a threefold piece of cardboard from the instructor.
2. Pick 3 blood stains and determine the direction of blood.
3. Take a piece of string and run it lengthwise through each of the three blood stains to determine the area of convergence.
4. Place the axis at this point.
5. For each droplet of blood:
   a. Measure the length and width of the stain and calculate the angle of impact. Use the table below to record your measurements and calculations.
   b. Place the protractor where the blood first struck the target.
6. Attach the string to the cardboard in front of the blood drop.
7. Then, line up the string to the appropriate angle of impact and attach the other end to the axis pole.
8. Do this for all three drops of blood to estimate the area of origin.
9. Measure the height from the table top of your area of origin and record it here:

<table>
<thead>
<tr>
<th>Drop #</th>
<th>Length of Drop</th>
<th>Width of Drop</th>
<th>Angle of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part 2 Analysis Questions:

1. Why is it important to find the area of origin?

2. What do you think the drops would look like if they were farther away from the surface? Closer to the surface?