Establish your research question and variables. Once you know the topic or have an observation in mind it is time to figure out your question. A research question should ask a specific question you want to answer through your experiment. Write your question on the activity sheet.

Next establish the variables that will help answer your question.
- What is the control? A control group or trial is used to show a baseline or in our case a normal situation. You will be able to compare the control trials to the trials with the independent variable.
- What is the independent variable? What are you testing?
- What is the dependent variable? What are you measuring?
Write your variables on the activity sheet.

Hypothesis. Pick a specific, quantifiable, testable statement that address your research question. The experiment will either support or not support your hypothesis. Write your hypothesis on the activity sheet.

Design the Experiment. Establish how you will change the independent variable. Establish how many trials you will conduct. Keep in mind, reliable repetition of the experiment is important. Reference the video for tips.

Tips:
- Conduct at least 5 trials for the control and each independent variable tested. Record your experiment setup as accurately and with as much detail as possible.
- Reduce all possible external impacts such as wind, room temperature, and human error. Write what you will keep constant on the activity sheet.
- Do not let your expectations bias the experiment.

Write your methods (plan) on the activity sheet. Your experiment plan should include a list of materials and any exact details someone would need to replicate your experiment. This is known as the methods section in a scientific report.
Step 4

Results. Record the results of each trial conducted. Once all trials are complete summarize the results. This information will influence your experiment discussion and recommendations.

Tips:
• Record results as soon as each individual trial is done.
• Do not infer or extrapolate your results, record only exactly what happened.
• Do not let your expectations bias how you record the results.

Write your results on the activity sheet.

Step 5

Discussion. After you have your results it is time to share your findings. Offer suggestions on what to study next, infer how your results might impact future actions.

Optional discussion points:
• What do the results tell you? What did you discover?
• Did the results support your hypothesis?
• Is there any error that needs to be discussed?
  ◦ Human error is common and often not 100% preventable.
• Were there any trends or correlations?
• Were any findings inconclusive?
• What would you test next?

Write your discussion on the activity sheet.
Experimental Design Worksheet

**Research question:**

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**Control Trial** (what is the “normal”):

**Independent Variable** (what are you testing?):

**Dependent Variable** (what are you measuring?):

**Experiment Title:** The effect of (independent variable) on the (dependent variable(s)).

**Hypothesis:** If (what you do in the experiment), then (what you think will happen).

**Constants** (what will stay the same in every experiment?):

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**Plan/Method:** Step by step what did you do? What materials did you use? Ask yourself, can someone repeat your exact experiment with this information?

**Materials:**

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**Experiment Setup:** Remember, only test one variable at a time. Ask yourself, what variable am I testing? Have I introduced any other variables by accident?
**Results:** What did you find? Talk about your quantitative and qualitative findings.

<table>
<thead>
<tr>
<th>Trial #</th>
<th>Control</th>
<th>Mask 1:</th>
<th>Mask 2:</th>
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<tbody>
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</table>

**Results Summary:**

**Discussion:**
Was your hypothesis correct?

What do your results mean?

**What should be studied next?**