Investigating Temperature

Sunlight vs. Shade Investigation

Summary—Develop an investigation to study the relationship between direct sunlight or shade and temperature.

Materials Needed—
- Thermometers (2 per group)
- White Temperature Tents (2 per group)
- Data collection and graphing sheet (1 per group)
- Stopwatch, clock or timer
- Clipboard & writing utensil
- Cameras (optional)

Scientific Question—
Is temperature affected by whether something is in the sun vs shade?

Possible Hypothesis—
- Whether something is in the sun or shade has no relationship to it’s temperature because...
- An item in the sun will be warmer than the same item in the shade because...
- An item in the shade will be warmer than the same item in the sun because...

Surface Color Investigation

Summary—Develop an investigation to study the relationship between surface color and temperature.

Materials Needed—
- Thermometers (2 per group)
- White Temperature Tents (1 per group)
- Black Temperature Tent (1 per group)
- Data collection and graphing sheet (1 per group)
- Stopwatch, clock or timer
- Clipboard & writing utensil
- Cameras (optional)

Scientific Question—
Is temperature affected by surface color?

Possible Hypothesis—
- Surface color has no relationship to temperature because...
- Lighter colored items will be warmer than darker colored items because...
- Darker colored items will be warmer than lighter colored items because...

Procedure—For the teacher

1. Discuss what the students already know about sun, shade and temperature.
2. Present the students with the scientific question.
3. Break students into groups and ask each group to develop a hypothesis. Provide the possible hypothesis for younger students. Each group should select a hypothesis, explain the reason for the hypothesis selected and describe what evidence would support their hypothesis.
4. Provide the student procedures to groups (or for older students, provide materials and ask them to develop procedures).
5. Discuss possible sources of error and how to avoid:
   - Control of Variables—place both tents on grass or both on concrete to control ground cover, etc...
   - Human error—be sure everyone knows how to read the thermometer, etc...
   - Instrument error—be sure all thermometers read the same temperature to begin, etc...
6. Provide time to conduct the investigation and collect data.
7. Assist students in organizing and analyzing their data.
8. Ask each group to prepare a poster of presentation explaining what they found. Each presentation should include the scientific question, the hypothesis an rational, a short description of the procedures, a data table and a graph or other visual of the data, an explanation of the results including if the hypothesis was supported, a description of anything that went wrong and how it could be avoided in the future, and what scientific question the group might want to investigate next.
Investigating Temperature Procedures

**Sunlight vs. Shade Investigation**

Procedures—

1. Collect all of your required materials (2 thermometers, 2 temperature tents, data collection sheet, clipboard and pencil)
2. Cutout your temperature tents (see teacher’s sample)
3. Complete the top of your data sheet.
4. Go outside.
5. Select the location for each tent. Place the first tent in full sunlight with the picture of the sun facing the sunlight. Place the second tent in full shade with the picture of the sun facing the same direction as the first tent.
6. Write down the starting temperature for each thermometer.
7. Place one thermometer in each tent.
8. Read and record on your data sheet the temperature of each thermometer every _____ minutes.
9. Repeat _____ times.
10. If a camera is available, take a photograph of each tent.
11. Graph your data.
12. Complete the bottom of your data sheet.

**Surface Color Investigation**

Procedures—

1. Collect all of your required materials (2 thermometers, a white temperature tent, a black temperature tent, data collection sheet, clipboard and pencil)
2. Cutout your temperature tents (see teacher’s sample)
3. Complete the top of your data sheet.
4. Go outside.
5. Select the location for each tent. Place one both tents in full sun, about 10 cm apart so that the side of each tent with the picture of the sun on it is facing the sun.
6. Write down the starting temperature for each thermometer.
7. Place one thermometer in each tent.
8. Read and record on your data sheet the temperature of each thermometer every _____ minutes.
9. Repeat _____ times.
10. If a camera is available, take a photograph of each tent.
11. Graph your data.
12. Complete the bottom of your data sheet.
Investigating Temperature
Shade vs. Sun Data Sheet

Names: ____________________________________________

Date: _______________________________ Time: _______________________________

Describe the Weather, including Cloud Cover: ______________________________________

What is the scientific question you are studying? __________________________________

Write your group hypothesis here: ______________________________________________

What evidence would support your hypothesis? _____________________________________

Questions (Answer after you collect and graph your data):

How much did the temperature change in the shade? ________________________________

How much did the temperature change in the sun? _________________________________

Did the data support your hypothesis? ____________________________________________

If yes, how? ___________________________________________________________________

If no, why not? __________________________________________________________________

Explain anything that went wrong and how you could redesign the investigation for the future. __________________________________________________________________

What would your group like to investigate next? _____________________________________

______________________________________________________________________________
# Investigating Temperature

Shade vs. Sun Data Sheet

## Data Table

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature Shade</th>
<th>Temperature Sun</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting Temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1:</td>
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<td></td>
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<tr>
<td>Time 2:</td>
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<td>Time 3:</td>
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<td>Time 4:</td>
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<td>Time 5:</td>
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<tr>
<td>Time 6:</td>
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<td></td>
</tr>
</tbody>
</table>

**Graph Title:**

(Write the lowest recorded temperature at the bottom of the graph (*), then step count by twos up the side)

## Key

- = In the Shade
- = In the Sun
Investigating Temperature
Surface Color Data Sheet

Names: 

Date: Time:

Describe the Weather, including Cloud Cover:

What is the scientific question you are studying?

Write your group hypothesis here:

What evidence would support your hypothesis?

Questions (Answer after you collect and graph your data):

What was the warmest temperature for the white tent?

What was the warmest temperature for the black tent?

Did the data support your hypothesis?

If yes, how?

If no, why not?

Explain anything that went wrong and how you could redesign the investigation for the future.

What would your group like to investigate next?
# Investigating Temperature
## Surface Color Data Sheet

## Data Table

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature White Tent</th>
<th>Temperature Black Tent</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting Temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1:</td>
<td></td>
<td></td>
<td></td>
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<td>Time 2:</td>
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<td>Time 5:</td>
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<tr>
<td>Time 6:</td>
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</tr>
</tbody>
</table>

## Graph Title:

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## Temperature

(Write the lowest recorded temperature at the bottom of the graph (*), then step count by twos up the side.)

<table>
<thead>
<tr>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
</tr>
<tr>
<td>Time 1</td>
</tr>
<tr>
<td>Time 2</td>
</tr>
<tr>
<td>Time 3</td>
</tr>
<tr>
<td>Time 4</td>
</tr>
<tr>
<td>Time 5</td>
</tr>
<tr>
<td>Time 6</td>
</tr>
</tbody>
</table>

## Time

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## Key

[ ] = White Tent  [ ] = Black Tent