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| **Handouts:**   * Tints and Temps Task | **Materials:**   * TI Nspire Calculator * TI Nspire thermometer probes * Pencil & Paper for data collection |

**Objectives:** Students will use several science process skills to compose and test hypotheses regarding color of car and temperatures. These scientific process skills include: observing, predicting, collecting and recording data, comparing and contrasting, controlling for variables, generalizing, and applying. Students will formulate a hypothesis to test, identify variables, create a plan to test the hypothesis, execute the plan, interpret the data, and share their findings with peers.

**Questioning Portion (15 min):**

Ask students to share their ideas and understandings regarding color and temperature. Ask students to brainstorm a list of questions they would like to ask/answer regarding color and temperature – give **3 minutes** to write questions.

1. *What questions can we ask and/or suppositions can we make regarding how temperature impacts color? Where do some of these ideas come from?*

Anticipated responses:

* Are dark cars warmer than light cars?
* Are dark colored cars more popular in the south?
* Does color of a car impact the external temperature (hood)?
* Does color of a car impact the internal temperature?
* Does the type of material a car is made of impact the temperature (fiberglass vs. metal)?
* Do these trends relate to other materials? Say clothing (tee shirt colors?)?

Use the random name generator to call on students to share their comments – post on board (**2 minutes**). Be sure to write some non-statistical questions on the board.

Think-pair-share (**1 min, 2 min, 2 min**) - Ask students which of the questions on the board they would consider to be statistical questions, and why? Lead a discussion about statistical questions in the final 2 min sharing portion. (Statistical questions are those that can be answered with data that varies … example of non-statistical questions are: How tall am I? and Which tastes the best?).

Ask students the following question regarding questions on the board or new questions that come to mind. Ask students to focus on *statistical* questions here. Give students **3 minutes** to settle on questions.

1. *Which question can we answer today using the instruments available to us?*

Anticipated responses:

* Does color of a car impact the external temperature (hood)?
* Does color of a car impact the internal temperature?

Report out answers to #2. As a large group we will investigate today ways astronomers estimate the number of stars in a particular area. (**3 minutes**).

**Data Collection Planning Portion (15 min)**

Once groups have decided on which question they will investigate, give them **5 minutes** to answer the following:

1. *To answer our question, what information will we need?*

Anticipated responses:

* Who drove to work today? And do they still have their keys?
* What is the temperature of the hood?
* What is the internal temperature?
* What is the color of the car?
* What is the size of the car?

Each group should agree on the information we will need to get to answer our questions. Share this information in a large group setting. This discussion should last no longer than **5 minutes**.

1. *How will we collect this information?*

Agree as a class how we will use ourselves to collect the data. We are using a sample of convenience (our cars) because we have access to them. How will this impact our findings? How will it impact our ability to generalize? (**10 minutes**).

**Data Analysis Planning Portion (10 minutes)**

1. *How might you use the collected information as a basis for answering your question?*

Some students may not have a clear vision for how they will use the information gathered to make an estimate. Discuss in small groups.

**STOP**. *Before you begin collecting data, clear your plan with one of the StaRT Team members.*

**Data Collection Portion (30 min)**

Take a few minutes for a parking lot field trip to collect data.

**Data Analysis and Interpretation Portion (20 min)**

Ask class to answer the following question.

1. *What does your information tell you about the answer to your question? Use pictures, symbols, and/or words to clearly communicate and support your conclusions.*

Give students **10 minutes** to work. Circulate around the class and note different strategies groups are using. Anticipated strategies include comparing means, comparing boxplots, and doing t-tests

Ask students to put their results on chart paper.

**Communicating Results and Assessment (30 minutes)**

Have each group communicate their results using their chart paper and their Nspires in Presenter mode on the Navigator system.

**Total time: 2 hours 05 minutes = 15+15+10+30+20+30**

**Extensions!**

This activity was inspired by Tints and Temps, an activity from Popping with Power, AIMS Activities, 1996 (ISBN 1-881431-68-1).

Investigating the impact of color and material on the heat of an object can be extended to include color of clothing, type of clothing, temperature of liquid in different colored cans that can be insulated in a variety of ways (foam, cotton, etc.).

NASA Educator’s Guide, Functions and Statistics: Dressed for Space is available here (<http://www.knowitall.org/nasa/pdf/connect/dressed-space.pdf>) and involves students in collecting data regarding transfer of heat energy and materials of containers.

This YouTube video explains thermal conductors and the impact of materials on the way an object “feels”. <https://www.youtube.com/watch?v=vqDbMEdLiCs> This is a great discussion of misconceptions. Note: Aluminum is pronounced aluminium (and spelled that way too) in the UK.