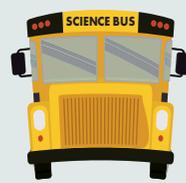


Space Hands



VIRTUAL
Field Trip

to the California Science Center

Focus

Question:

How do you choose the best materials for a design?

Buzzword:
Properties

NGSS Standards

Performance Expectation: 2-PS1-2

SEP: Analyzing and Interpreting Data

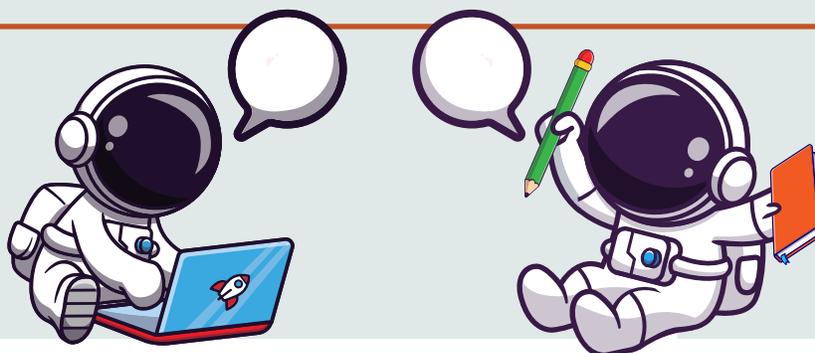
CCC: Cause and Effect

OBJECTIVE

Students will analyze and interpret data generated by testing various materials in order to choose which ones are best suited to the purpose of making an astronaut's glove.

MODIFICATIONS

- Students can work in teams or individually.
- Materials can be found at home or supplied by the teacher. It is okay for students to use different materials. Use the opportunity to discuss a wider variety of properties and to look for patterns across materials.
- **No materials:** Gather student suggestions for test materials and select ones that are accessible to you. Demonstrate the tests, allowing students to make and record observations about each material. Students can analyze the class data in order to decide which materials to include in their glove design.
- Students can record their data on a separate piece of paper, such as a notebook, or on an electronic device, such as a computer or tablet. Just make sure students test their materials far away from the electronics!

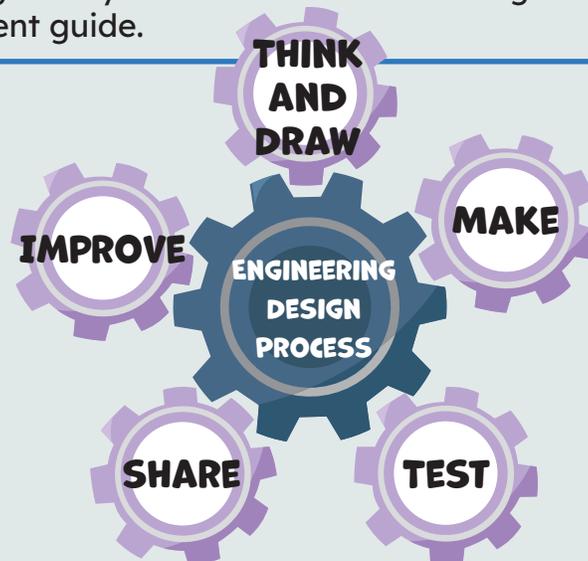


FACILITATING THE EXPERIMENT

- 1. Before students start the experiment:** Engage students in a conversation about the situation in the guide. Discuss that an astronaut's glove is designed using materials that are chosen for a specific purpose. Emphasize that an astronaut's glove, like the rest of their suit, must be strong so it doesn't rip or tear if astronauts become sweaty or have to work with heavy or rough tools in space. Tell students that their job will be to test materials from their home or classroom and decide which ones will create the best astronaut glove. Emphasize that their design may use more than one material in order to pass the tests.
- 2. Set up the experiment:** Gather a variety of test materials, or guide students and families in identifying test materials they can use at home. It is okay for students to use different materials from one another. Make sure students have their materials, testing tools, and a copy of the data table to record their results.
- 3. During the Experiment:** Encourage students to make and share observations about each material. Guide students in analyzing their data and thinking about the cause and effect relationship they observe in each test using guiding questions: *"What happened to the (material) when you did (action) in test?"* *"Based on that test, what purpose could the (material) serve in an astronaut's glove?"*
- 4. Wrap Up:** Lead a discussion about the results of the materials tests. How did testing help them decide on materials for their design? If students are not familiar with the term **properties**, introduce it. The properties, or characteristics, of a material are things we can observe that describe how they look, feel, or behave. Have students share the designs they drew in the "What's Going On" section of the student guide.



Researching possible solutions and communicating results are important parts of the engineering design process. These steps can happen before, during and after making a design.



WHAT'S GOING ON?

Support students in sharing their designs verbally, in writing, or through detailed labeled drawings. They should be able to answer each of the following questions:

1. What materials did you choose to make your glove?

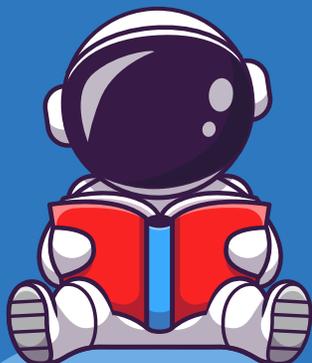
Students may have chosen similar or different materials for their designs. There is no one right answer for the best materials. Rather, it is important that students analyze and interpret the data from their tests. Students can do this by comparing and making meaning of their test results to determine which material(s) work best for the purpose of an astronaut glove. If there is wide variance in material choices, this is an opportunity to discuss patterns in the data and reinforce that problems have multiple solutions.

2. What are some of the properties of that material?

Students should share about the material's strength, flexibility, and water resistance. They may also choose to share other observable properties such as color, shape, texture etc.

3. Why did you choose each material?

Support students in a collaborative conversation about their design. Guide students toward using the data from their tests to support the choices they made in their designs. You may wish to give them the following sentence frame to help scaffold the conversation: I chose _____ because _____ i.e. *I chose tinfoil because it passed all three tests.* Students can also connect the properties they described to their purpose in the astronaut glove. i.e. *I chose plastic wrap because it is waterproof and flexible, so it can bend with the astronaut's hand.*



Literacy Connections:

As students write or share the reasoning behind their design choices, there is an opportunity to address Common Core ELA and literacy standards W.2.8 and W.2.7.



Additional Resources

Share your students' designs and experiments with us on social media for a chance to be featured!



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CONNECT WITH US

Visit the California Science Center virtually or in person to explore this standard and extend the activity with related content.

- **Watch a free Virtual Field Trip video episode:** Join our educators in testing and learning about different properties of materials as they design a space suit. You might be inspired to do some testing of your own, too!
- **Reserve a live interactive Virtual Field Trip experience:** Our educators will take your class on a virtual field trip and participate in hands-on investigation that will leave you thinking about what goes into the making of a spacecraft.
- **Visit us in person:** Check out the Space Shuttle Endeavour in the Samuel Oschin Pavillion.

Website: www.californiasciencecenter.org

Phone: 213-744-7444

EXTENSION



Build your design: Have students work individually or in teams to build their designs using the materials they chose. Note: It is expected for students to modify their designs as they build to improve them. In order to succeed, the glove must fit on a human hand, and pass the strength, flexibility, and water resistance tests.

Testing suggestion: Rather than repeating the above tests, students can attempt to retrieve an object (apple or ball) from a container of water without breaking their glove.