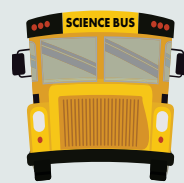# Secret Sundae

VIRTUAL Field Trip
to the **California Science Center**

Focus Question:

What affects how information moves from one place to another?

Buzzword:
Code

NGSS Standards

Performance Expectation:
4-PS4-3

SEP: Constructing Explanations and Designing Solutions

CCC: Patterns

OBJECTIVE

Students will design a code that will allow them to share information with a friend in order to build an ice cream sundae in secret. They will consider a variety of factors that affect how well they are able to send information with their code before putting their code to the test.

MODIFICATIONS

- Students can draw their sundaes using colored writing instruments and paper, digital tools on a tablet or computer, or create a physical representation with materials like building blocks or counting cubes.

- You may choose to allow students to gather and use additional props or tools to signal one another through light or sound. See suggestions on page 2.

- The design criteria and constraints can be modified to accommodate a variety of teaching situations. For example:

  - Distance between partners can be varied to accomodate your teaching setup.

  - Partners can communicate by video/audio/written messages during remote learning.

  - Students can create their own codes or utilize coded communication styles they have learned about (i.e. Morse code).

FACILITATING THE EXPERIMENT

Additonal props/tools:

Students can use flashlights, drums, noise makers, colored paper, flags or other objects as part of their communication method.

Note: Emphasize that in part 1, students are only designing a communication pattern, NOT agreeing on a sundae recipe.

1. **Before the Experiment:** Discuss the situation with students. Allow them to share prior knowledge and ideas about the kinds of secret messages they might create using patterns, such as a secret written or audio language. It may be helpful to discuss common types of communication which use symbols or patterns that students may already be familiar with, such as hand signals used in sports, American Sign Language, Morse code, or Emoji.

2. **Set Up the Experiment:** For part 1, situate students so that they can design their communication method in secret from their peers. In part 2, situate students so that they are distanced from their partner. Each student will need to be able to view the "menu" sheet on page 4 of the student guide. They will also need a drawing utensil or device.

3. **During the Experiment:**

   PART 1: Encourage students to decide how they will design a communication method which will allow them to signal their sundae recipe to their partner. When designing, students should consider the constraints of the challenge, as well as the types of information (numbers, words, and yes or no answers) that they need to communicate. Before moving on to part 2, discuss student answers to "What's Going On?".

   PART 2: Separate students and allow them to test their method of communicating. You may wish to guide the whole class though the steps on page 3 of the student guide together, or allow them to test at their own pace. If time permits, students can attempt to communicate more than one sundae recipe.

4. **Wrap Up: Discuss students' answers to the "What's Going On?" questions.** Allow students to share whether or not their communication method, or **code,** allowed them to send information to each other accurately. Encourage them to compare multiple communication solutions designed by their classmates and discuss the successes and challenges of each.

Focus Question Connection:

As students recognize and design for the challenges that face their communication method, they will identify factors that affect how information moves from one place to another.

Social Studies connection:

Students can research how indigenous peoples in their area have used language, signals, and code to communicate throughout history.

1. **What challenges did you face when you tried to communicate with your partner using the method you designed?** Students may share that it was difficult to send or receive information correctly if their code was not well suited to the conditions of the test. If, for example, students relied on a verbal pattern that required them to hear words or sounds accurately, but the room was very loud, they may have heard information incorrectly. As students share, highlight that by designing a way to communicate in secret, they created a **code**. Coded messages use patterns to assign meaning to words, images, sounds or symbols. These patterns can then be used to send information from one place or person, to another. When designing a code, designers need to consider how far it needs to travel, how it will be sent or transferred, and what kind of information is being communicated.

2. **Was the method you designed the best solution for your situation? Why or why not?** Encourage students to consider how the code they designed helped them to meet the parameters of their design challenge. Highlight that there are multiple solutions to sending information over a distance, and allow students to point out the strengths and weakenesses of each. Students may point out that it was difficult to understand their code because it was too complex, or that it would be easy for an outsider to understand their secret code. Some codes may be simple to use, but not capable of sending detailed information, such as flavor or toppings. Other codes may have required a lot of effort, equipment, or special conditions in the room to be successful. Help students draw connections to how codes are used to move information in different real-world scenarios using the resource on page 5 of the teacher guide.

3. **If you were to try this again, what would you change about your method?** Student responses to this question will vary, but should help them to reflect on how well they were able to design a code for the criteria and constraints of the challenge. They should offer solutions that might improve their design based on the strengths and weaknesses they discuss in questions 1 and 2.

Additional Resources

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 as they guide you in finding the cause and effect relationship between the speed of a moving object and energy.

- **Reserve a live interactive Virtual Field Trip experience:** Our educators will get your students thinking about communication and how information can be transferred through light, sound, and even binary code!

- **Visit us in person:** Discover how astronauts and their equipment use code to communicate from space in our Endeavour Together exhibit.

Website: www.californiasciencecenter.org

Phone: 213-744-7444

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

@californiasciencecenter

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EXTENSION

Spy in the sundae shop: Allow students to test their codes further by assigning one or two "spies" to observe a pair communicating in code. The spies should try to decode the messages the partners send. If they are able to successfully recreate a sundae recipe in under 3 turns, the spies win! If the code stays a secret, the code-sending partners win! After 3 turns, the code-sending partners and spies can switch roles.

Communicating in Code

Codes are used to send information in many different situations. People, animals, and computers all communicate, or send information back and forth, using code.

Codes can be **audial** (sounds), **visual** (light, colors, pictures, signals), or **written text** (numbers, words, symbols).

Braile uses bumps to stand for letters. People who cannot see can feel the patterns of the bumps to read.
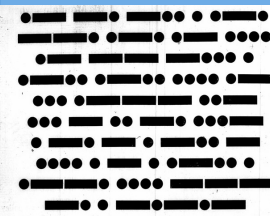
American Sign Language (ASL) uses hand signals to communicate letters and words.

Binary code uses patterns of 0's and 1's to program computers and other tech devices.
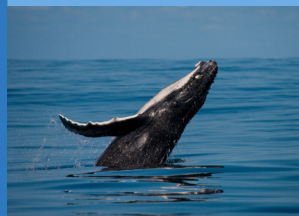
Morse code uses patterns of "long" and "short" to make letters. It can be audial, visual, or written.
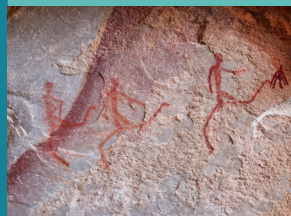
Some animals, such as chameleons, can **change color** to send messages to other animals.

Some animals, such as whales and birds, **make sounds** to communicate with each other.

Hieroglyphics are pictures and symbols that were used by ancient civilizations, such as the Egyptians.

Smoke signals use puffs of smoke to send messages across distances.

Emojis use pictures to communicate words or feelings when sending written messages.

Barcodes and QR codes use black and white lines or squares to send information to our tech devices.

People of the **Navajo Tribe** used their coded language to communicate during World War II.

Tools, such as **ciphers or decoders,** can be used to reassign meaning to letters in written messages.