

SECRET MESSAGES

Source: Adapted from "Mirror Messages," Zoom Sci, PBS Kids, Sent in by Candace from Fort Wayne, IN

Grade Level: 3-5

Objectives:

- To explore the properties of mirrors
- To engage youth in the scientific process of questioning, testing, occasionally failing, and communicating findings.

Time: 15-30 minutes

Materials (for each team):

- A mirror
- A magnifier
- Pen and paper
- Children's dictionary
- Optional secret message materials: White and blue crayons; lemon juice in a cup, Q-tips, and a small desk lamp (with a bulb that gets warm or some other source of heat)

Background Information: Mirror writing makes a great secret code because the message looks really different in the mirror than it does in real life. Most letters look like they got flipped inside out - but some letters, like "O", look exactly the same as their mirror images.

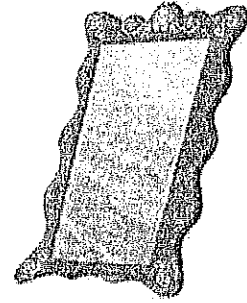
You can make this activity more fun by including some items that youth can use to create their own secret messages.

- If you write a message in white crayon and then use a blue crayon to highlight the whole message, the white message will be left on the paper.
- If you write a message on paper in lemon juice and then heat the paper, the lemon juice will darken and show up as the message.

Vocabulary: Mirror image, decode

Preparation (before the session):

1. Several days before the activity, write a few sample secret messages:
 - Write a short secret message on a piece of paper.
 - Next, hold a mirror up to your message. Place the mirror on its edge on the paper right next to your message.



- Now look in the mirror, and copy what you see onto a new piece of paper.
 - Create enough secret messages to give one to each small group.
 - To read your secret message, she'll have to hold the message up to a mirror and then look in the mirror to see what it says.
2. Just before the activity, place materials for each group on tables. The magnifiers and dictionary won't help with decoding, they are there to make the activity more challenging. The crayons, lemon juice and lamp are options for creating new secret messages.

Procedure:

1. **(Engage and Connect—2 minutes)** Begin by asking:
 - How many of you have ever sent someone a secret message?
 - How did you send it? How did you write or deliver the message so others couldn't read it?
 - I have a secret message that I want you to try to decode. Who thinks they can do it?
2. **(Introduction and Set Up—3 minutes)** Give this challenge:
 - I have written secret messages on sheets of paper.
 - You'll work in small groups. Each group will get some supplies to help you: a magnifier, a dictionary, a mirror, pencil, paper, crayons (and any other materials you've provided).
 - You'll have 5 minutes to decode the message.
 - Once you decode the message I wrote, you can experiment with creating your own secret message.
3. **(Decoding and Creating Messages—10 minutes)** Divide youth into small groups and make sure they have all their supplies. Have them begin. Circulate and ask each group to give make a prediction about how to decode the message. Ask purposeful questions such as:
 - How do you think you can decode the message?
 - How is it working?
 - What's happening?
 - What other methods can you try?
 - What interesting things do you see other people trying?
 - What ideas do you have for creating a different kind of secret message?
 - What material could you use to write a message that someone could only read if they knew the secret to decode it?
4. **(Communicating Findings –3-8 minutes)** Ask the teams to report their findings. Process with these questions:
 - Were you able to decode the message? How did you do it?
 - Did anyone else use a different strategy?
 - What was your secret message?

- How do you think the secret message was written?
- What letters are the same regardless of whether it's a real image or a mirror image?
- How many of you created your own secret message?
- How did you do it?
- What's the trick to decoding your message?
- How would you explain how this works?

5. **(Final Discussion and Reflection—2 minutes) Ask:**

- What did you learn in this activity?
- How could you use what you learned today in the real world?
- How could it serve a practical purpose or to help solve a problem?