National Aeronautics and Space Administration

WHAT'S HIDDEN INSIDE?

Student Section   Student Name _____

Lesson Objective

In this lesson, you will gather information about items you cannot see, using limited senses.

During this lesson, you will

- gather data through observations using your senses.
- make inferences about hidden items based upon your data collected.
- develop a conclusion based upon the results of this activity.

Problem

How can I determine what's hidden inside the bag?

Observation

Why should robots travel places before people? Robots can be programmed to do amazing things, but they can only do what they have been programmed to do. Robots, sometimes called uncrewed space probes, are tools for astronauts and scientists to safely gather information about the planets and moons.

Robots become a human's virtual eyes and ears in new places. They can observe from a distance. Some robots land, explore, and gather samples for close inspections. They search for sites for human landing and look for needed resources. Working together, astronauts and robots may make human space exploration more efficient.

In this activity, you will try to identify what's been hidden inside a bag. Similar to robotic exploration, you will use limited senses to predict what's inside the bag.

Use the first column of this KWL chart to organize your observations about robotic exploration.

Brainstorm with your group what you want to know about robotic exploration, then list in the second column of this KWL chart.

KNOW	WANT TO KNOW	LEARNED

Hypothesis
Based on your observations, answer the "problem question" with your best guess. (How can I determine what's hidden inside the bag?) Your hypothesis should be written as a statement.

My hypothesis: _____

Materials
Per student
- 1 small paper bag prepared by a student before this activity
- 2 clues about the bag you prepared for this activity
- 1 modified wooden skewer
- 1 pair of safety glasses

Safety
Review your classroom and lab safety rules. Put on safety glasses when instructed.

Test Procedure
1. Put on your safety glasses.
2. Your teacher will give one bag to each person. You will work with a partner.
3. Brainstorm with your teacher and class what properties you can observe to find out what is in the bag. Record these properties under "The property I want to explore…" column of the Hidden Object Data Sheet.
4. Use your senses to gather information about the properties of what's inside the bag. Investigate the properties that you listed in the data chart one at a time.
   - What did you do to the bag to observe the first property? Record these properties under the "What I did to the bag…" column of the Hidden Object Data Sheet. CAUTION: Handle bags gently.
   - By testing this property, what did you discover about the hidden object? Record these properties under the "What I discovered…" column of the Hidden Object Data Sheet.
   - Now, predict what you think is inside the bag and record your prediction under the "Predict what is in the bag…" column of the Hidden Object Data Sheet.
5. Your teacher will show you how to put a wooden skewer through the top of your bag. Use this skewer to gather more information about what's inside the bag and record on the data chart. This is called "extended touch". CAUTION: Only poke one small hole in the bag. Do not rip the bag.
6. Share with other groups what you have done to your bag. If you discover new properties you would like to observe to find out what's inside the bag, record them under "The property I want to explore…" column for New Properties on the Hidden Object Data Sheet.
7. Use your senses to collect data about the new properties of what's inside the bag. Investigate the new properties that you listed in the data chart one at a time.
   - What did you do to the bag to observe the new property? Record these properties on the Hidden Object Data Sheet.
   - By testing this property, what did you discover about the hidden object? Record these properties on the Hidden Object Data Sheet.
   - Now, predict what you think is inside the bag and record your new prediction on the Hidden Object Data Sheet.
8. Find the person who made the bag you are investigating. That person will give you 2 clues about what's inside the bag. Record the clues on your Hidden Objects Data Sheet and again, predict what is inside the bag.

9. Based on data gathered in your data chart, make your final prediction about the item inside the bag. Be as detailed as possible. Record this final prediction on your Hidden Objects Data Sheet.

10. Open the bag to see what's inside. Is it what you predicted? Record the actual item on your Hidden Objects Data Sheet.

11. After recording all data, study the data and draw conclusions by answering the questions following the Hidden Objects Data Sheet.

Record Data

Hidden Objects Data Sheet

Brainstorm Properties

The property I want to explore…	What I did to the bag…	What I discovered…	Predict what's inside the bag…

Extended Touch

What I discovered…	Predict what is in the bag…

New Properties (from other groups)

The property I want to explore…	What I did to the bag…	What I discovered…	Predict what is in the bag…

Clues

	Record the clue	My prediction
Clue # 1		
Clue # 2		

Final Prediction:	
Actual:	

Study Data

1. The more data collected from probes sent to other places, the more we know about those distant places, making travel to them easier for humans. As you collected more data and recorded it on your data sheet, did your prediction about what was hidden inside the bag change?

2. Your senses were like tools, gathering information about the properties of what was hidden inside the bag. Which "tools" gave you the best information or clues to what was inside the bag? Why?

3. Describe and sketch the environment that your item inside the bag came from.

4. Does this data support your hypothesis? Why or why not?

5. How do robots and humans work as a team? How will this teamwork help us in our quest for space exploration?

Conclusion
- Update the LEARNED column in your KWL chart.
- Restate your hypothesis and explain what happened during testing.