Solar Oven Detectives

Trace a testable question from a design problem to a possible solution.

6.1.a "asking questions and defining problems ask questions to determine relationships between independent and dependent variables develop hypotheses and identify independent and dependent variables offer simple solutions to design problems"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the team's test question, circle the independent variable, box the dependent variable, and draw a star by the hypothesis and the design solution.

Testing a Solar Oven

1. Our science club wanted to warm a cup of water outdoors without using electricity. The design problem was to make a small solar oven that heats water as much as possible in 20 minutes. Maya asked, "How does the lining inside the oven affect the water temperature?" This question connects a change the team can make, the lining material, with a result they can measure, the water's temperature. They chose foil, black paper, and white paper linings.

2. To make a fair test, the team used identical boxes, equal cups, 100 milliliters of water, and the same sunny location. They changed only lining material. The independent variable was lining material. The dependent variable was temperature increase after 20 minutes. Maya made a hypothesis: If an oven has black paper lining, then its water temperature will increase the most, because dark surfaces absorb more sunlight than white paper or shiny foil in direct sunlight.

3. After testing, the black paper oven gave the largest temperature increase. The team also noticed that heat escaped through the open top. They offered a simple design solution: cover the opening with clear plastic wrap, which lets sunlight enter while helping hold warm air inside. The group planned another fair test using the black lining in both ovens. Their next question was, "How does a clear cover affect the water temperature in each oven after 20 minutes?"

2 ANSWER WITH EVIDENCE

Use the passage

1. What design problem was the science club trying to solve?

2. In Maya's first question, what change did the team make, and what result did they measure?

3. Name the independent variable and the dependent variable in the first fair test.

4. What was Maya's hypothesis, and what simple solution did the team offer after testing?

3 YOUR TURN

Your own words

Choose a simple school design problem. In 4 sentences, state the problem, ask a testable question that names what you would change and measure, write a hypothesis, and offer one simple solution.

ANSWER KEY

Solar Oven Detectives

GRADE 6 · 6.1.a

PART 1 · READ AND MARK

Underline the team's test question, circle the independent variable, box the dependent variable, and draw a star by the hypothesis and the design solution. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What design problem was the science club trying to solve?	**They were trying to make a small solar oven that heats a cup of water as much as possible in 20 minutes without electricity.**
2	In Maya's first question, what change did the team make, and what result did they measure?	**They changed the lining material and measured the water's temperature.**
3	Name the independent variable and the dependent variable in the first fair test.	**Independent variable: lining material. Dependent variable: temperature increase after 20 minutes.**
4	What was Maya's hypothesis, and what simple solution did the team offer after testing?	**Maya hypothesized that black paper lining would produce the greatest temperature increase. The team suggested covering the opening with clear plastic wrap.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The problem is that pencils roll off desks during group work. How does the height of a cardboard edge on a desk tray affect the number of pencils that roll off during a 10-minute activity? If the edge is 2 centimeters high, then fewer pencils will roll off than with a 1-centimeter edge. A simple solution is to add a 2-centimeter recycled-cardboard edge to each tray.

Accept equivalent descriptions of the variables, as long as the student identifies what is changed and what is measured. For Part 3, accept any safe, testable school design problem with a clear question, hypothesis, and practical solution.