Cooler Choice

Use evidence, criteria, and constraints to judge a design.

8.2.D "evaluate experimental and engineering designs."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Circle the two sentences that state what the team decided to do after reviewing the results. These sentences show how evidence can guide an engineering decision.

Testing a Lunch Container

1 A student team designed an insulated lunch container for a field trip. Their criterion was clear: after four hours, 250 mL of water must be 5°C or colder. Constraints included a cost below $12, no electricity, and a size that fits in a backpack. Design A used one foam layer. Design B used foam and a reflective inner liner.

2 To compare the designs fairly, the team filled each container with the same amount of water at the same starting temperature. They set both containers side by side in sunlight and closed their lids. In each of four trials, they measured the water temperature exactly four hours later. The table shows the endpoint temperatures. All materials except the liner were identical.

WATER TEMPERATURE AFTER FOUR HOURS

Trial	Design A endpoint temperature (°C)	Design B endpoint temperature (°C)
1	6.2	4.7
2	6.0	4.9
3	6.3	4.6
4	6.1	4.8

3 Design B stayed at or below the temperature criterion in every trial, while Design A did not. However, B cost $13 because its reflective liner cost $5, so it missed the cost constraint. The team chose not to recommend either design yet. Next, they will replace B's liner with a $3 liner and repeat the four-trial test.

2 ANSWER WITH EVIDENCE

Use the passage

1. Which design has stronger evidence that it meets the temperature criterion? Use the trial data in your answer.

2. Name two parts of the procedure that made the comparison fair. Explain why controlling those parts matters.

3. Which design met the cooling criterion but failed a constraint? Identify the constraint it failed.

4. If the $5 liner is replaced with a $3 liner and every other cost stays the same, what would Design B cost? Would the team still need to retest it? Explain.

3 YOUR TURN

Your own words

A group is designing an egg-drop holder. It must keep an egg uncracked when dropped from 1 m, weigh no more than 30 g, and use only paper, tape, and string. In 3 or 4 sentences, propose two designs, describe a fair comparison, and state how you would decide which design to improve or choose.

ANSWER KEY # Cooler Choice

GRADE 8 · TEKS 8.2.D

PART 1 · READ AND MARK

Circle the two sentences that state what the team decided to do after reviewing the results. These sentences show how evidence can guide an engineering decision. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Which design has stronger evidence that it meets the temperature criterion? Use the trial data in your answer.	**Design B. Its temperature was 5°C or colder in all four trials, while Design A was above 5°C in all four trials.**
2	Name two parts of the procedure that made the comparison fair. Explain why controlling those parts matters.	**The team used the same amount and starting temperature of water, and placed both containers side by side in sunlight. Controlling conditions helps show that the liner, not another difference, caused the temperature results.**
3	Which design met the cooling criterion but failed a constraint? Identify the constraint it failed.	**Design B met the cooling criterion but failed the cost constraint because it cost $13, not below $12.**
4	If the $5 liner is replaced with a $3 liner and every other cost stays the same, what would Design B cost? Would the team still need to retest it? Explain.	**Design B would cost $11, so it would meet the cost constraint. The team would still need to retest it to find out whether the cheaper liner keeps the water at 5°C or colder.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Design A would use rolled-paper tubes around the egg, and Design B would use a folded paper cradle with string supports. I would drop each holder from one meter three times, using identical eggs and measuring each holder's mass. I would choose a design only if its eggs stay uncracked and it weighs 30 g or less, then improve a design that fails one requirement.

For the marking job, students should circle the third and fourth sentences of paragraph 3. Accept equivalent evidence-based explanations that compare results with both the temperature criterion and the cost constraint.