Shade by Design

A plant-based solution for a hotter bus stop

BOT.6.3 "Enrichment: Use an engineering design process to define a problem, design, construct, evaluate, and improve a societal concern with the aid of plants (e.g., irrigation, water conservation, urban shading, green-space development..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the problem and the team's goal, circle two limits on the design, and number the steps they took to build, test, and improve it. Use your marks to trace how the team made its decisions.

A Cooler Place to Wait

1. At a city bus stop beside a wide parking lot, riders waited on pavement that felt hottest in the afternoon. The only nearby tree stood across a busy street. A student engineering team defined the problem as reducing sun exposure where people actually queue, without blocking the sidewalk or bus doors. They counted riders and measured the sunny area at 3 p.m. for five school days. Before choosing plants, they checked the city's planting rules, the location of buried utilities, and how much soil the narrow strip could hold. Their goal was six square meters of shade during summer afternoons without creating a tripping hazard.

2. The team chose a climbing vine suited to local summers and built a narrow trellis in the approved soil strip. They anchored the frame below the permitted height and planted the vine so no stems reached the walking path. Mulch helped slow water loss from the soil, and the team watered the vine during dry weeks. Over the next growing season, they trained its stems along the frame and checked its growth each week. They knew a young vine could not shade riders immediately. By late summer, however, they expected its leaves to cover enough of the trellis to begin testing their design.

3. By late summer, the team measured the shaded area at 3 p.m. on five clear days. Its average was four square meters, short of their six-square-meter target. They also checked that riders still had at least 1.8 meters of clear sidewalk and could see the arriving bus. Photographs taken from the same standing point showed that the trellis cast shade behind the line, not across it. Instead of adding another trellis, the team proposed moving the frame within the approved strip, with city permission, before the next growing season. They would repeat the measurements before recommending the design for other stops.

2 ANSWER WITH EVIDENCE

Use the passage

1. What problem did the team define, and what were two limits their design had to respect?

2. How did the team use a plant to address the problem while keeping the walking path clear?

3. Did the design meet its shade goal by late summer? Use the team's measurements to explain.

4. What change did the team propose after testing, and how would they find out whether it worked?

3 YOUR TURN

Your own words

Choose a local concern other than this bus stop that plants could help address. In 5 to 7 sentences, define the problem and one design limit, explain what you would build, set a measurable goal, and describe how you would test and improve your design.

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PART 1 · READ AND MARK

Underline the problem and the team's goal, circle two limits on the design, and number the steps they took to build, test, and improve it. Use your marks to trace how the team made its decisions. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What problem did the team define, and what were two limits their design had to respect?	**They wanted to reduce sun exposure where riders queue. Accept two limits such as keeping the sidewalk and bus doors clear, avoiding buried utilities, fitting the soil strip, or following city planting rules.**
2	How did the team use a plant to address the problem while keeping the walking path clear?	**They planted a climbing vine beside a narrow trellis in the approved soil strip and trained its stems along the frame, away from the walking path.**
3	Did the design meet its shade goal by late summer? Use the team's measurements to explain.	**No. The average shaded area was four square meters at 3 p.m. on five clear days, below the six-square-meter target.**
4	What change did the team propose after testing, and how would they find out whether it worked?	**With city permission, they proposed moving the frame within the approved strip, then repeating the shade measurements the next growing season.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

At our community center, rain from a roof downspout leaves puddles across the entrance path. My goal is to keep the path clear after ordinary rain, but the garden cannot cover the wheelchair ramp. With permission and a utility check, I would build a shallow rain garden beside the path and plant locally native species that tolerate wet and dry soil. I would time how long puddles last after five similar storms before and after planting, aiming for no puddles after one hour. If water still reaches the path, I would ask to enlarge the garden within the approved area and repeat the measurements.

Accept other passage-supported limits and clear descriptions of the team's test. For the original design, look for a feasible plant-based build, a measurable goal, a way to test it, and a revision tied to the results.