

Design, Test, Improve

Read how a team uses tools and evidence to build a useful device.

6.1.b.iv "planning and carrying out investigations use tools and materials to design and/or build a device to solve a specific problem"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline the problem and design criteria, circle the tools and materials, and number the steps the team took from planning through revision.

A Slow-Water Test

- ① At the school garden, Maya's team noticed that lettuce seedlings dried out when nobody could water them from afternoon until the next morning. They decided to build a slow-water device from a clean plastic bottle. Their design criteria were clear: the device had to release water slowly for 15 hours, stand safely beside a plant, and use materials available at school. Before building, the team listed a bottle, a cap, a pushpin, tape, a ruler, water, and a measuring cup. An adult helped with the pushpin.
- ② First, the team made two cap versions. With adult supervision, they made one tiny hole in one cap and three tiny holes in another. They filled identical bottles with 500 milliliters of water, attached the caps, and placed each bottle upside down in separate trays. Tape held the bottles in place, and rulers helped them keep both bottle openings the same height. The team chose a 30-minute test because it was long enough to show a difference but short enough to repeat.
- ③ After 30 minutes, the one-hole bottle released 15 milliliters, while the three-hole bottle released 45 milliliters. The team selected the one-hole cap because it met the slow-release criterion better. They then tested it beside a seedling for one afternoon. The bottle stayed upright, but soil near the plant became too wet. For their next version, they planned to place the bottle farther from the stem and repeat the test with the same water amount and time.

2 ANSWER WITH EVIDENCE Use the passage

1 What problem did Maya's team want their device to solve, and how long did the device need to release water slowly?

2 Which tool required adult help, and what did the team use it to do?

3 Give two details that made the cap comparison a fair test.

4 What evidence made the team choose the one-hole cap, and what change did they plan after testing near a seedling?

3 YOUR TURN Your own words

Use the three rows to plan a small device, its parts, tools/materials and tests. With teacher-approved tools and materials, actually build it and check its success criterion. A supported option is a cardboard tray with folded sides and two dividers to hold ten pencils for forty minutes. Measure and cut safely with adult support. On extra paper record the actual pencils retained, tipping observations and test duration. Revise if evidence calls for it, then repeat the same test; if no change is needed, explain why. Keep your real results separate from the sample plan.

PROBLEM AND SUCCESS CRITERIA	DEVICE PART AND JOB	TOOLS AND MATERIALS	TEST OR REVISION

PART 1 • READ AND MARK

Underline the problem and design criteria, circle the tools and materials, and number the steps the team took from planning through revision. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What problem did Maya's team want their device to solve, and how long did the device need to release water slowly?	The team wanted to keep lettuce seedlings from drying out when no one could water them. The device needed to release water slowly for 15 hours.
2	Which tool required adult help, and what did the team use it to do?	The pushpin required adult help. The team used it to make tiny holes in the bottle caps.
3	Give two details that made the cap comparison a fair test.	Answers include: the team used identical bottles, put 500 milliliters of water in each bottle, kept both bottle openings at the same height, and tested both bottles for 30 minutes.
4	What evidence made the team choose the one-hole cap, and what change did they plan after testing near a seedling?	The one-hole bottle released 15 milliliters, compared with 45 milliliters from the three-hole bottle, so it released water more slowly. Because the soil became too wet, the team planned to place the bottle farther from the stem and repeat the test.

PART 3 • YOUR TURN (SAMPLE ANSWER)

PROBLEM AND SUCCESS CRITERIA	DEVICE PART AND JOB	TOOLS AND MATERIALS	TEST OR REVISION
Pencils roll off a shared table; hold 10 pencils during a class period	Cardboard base with folded-up sides stops pencils from rolling	Cardboard, ruler, scissors, tape	Put 10 pencils in it for 40 minutes and count any that fall out
Same problem and criterion	Two taped dividers make three sections	Cardboard strips, ruler, scissors, tape	Check whether each section holds pencils without tipping
Same problem and criterion	Add a wider base if the tray tips	Extra cardboard, ruler, scissors, tape	Repeat the 40-minute test with the same 10 pencils

Accept equivalent descriptions of the problem, criteria, materials, controlled conditions, and revision. For the open task, accept any realistic device plan that names a specific problem, appropriate tools or materials, and a test or revision based on evidence. Teacher setup: supply cardboard, ruler, safe scissors, tape and ten pencils for the tray option, or approve an equally accessible device. Arrange the stated test time and supervise tools; no pushpin is required for this option. Observe actual tool use and construction. Require completed test observations and duration, an evidence-based retain/change decision and repeat-test records. Accept a device that fails its criterion if observations and revisions are accurate. The sample table is a plan; the source 30-minute bottle test does not establish performance for the full 15-hour goal.