# Chasing the Echo

Investigate how a room treatment changes recorded sound

**PHS.6.5** "Design and conduct experiments to investigate technological applications of sound (e.g., medical uses, music, acoustics, Doppler effects, and influences of mathematical theory on music)."

NAME _____ DATE _____

## 1 READ AND MARK

Read it twice

**YOUR JOB** Underline what the team changes, circle what it measures, and number the conditions it keeps the same. Use your marks to judge whether the test supports the team's claim.

### A Quieter Podcast Room

1. When students record a school podcast in an empty classroom, their voices can sound muddy even when the microphone works well. Sound from each word travels directly to the microphone, but some also bounces off the walls and arrives later. Those delayed sounds overlap later words. Soft surfaces can reduce some reflections, so a student team wants to test whether a thick curtain on one wall improves the room's acoustics. Rather than asking listeners which recording sounds nicer, the team decides to measure how long sound persists after a sharp clap.

2. Before hanging the curtain, the team places a phone on a desk, marks a spot on the floor for the person clapping, and closes the door. A recording app displays the sound level over time. For each clap, they measure the time it takes for the recorded level to drop by 20 decibels from its peak. They record five claps with the wall bare and five after covering the wall. They leave the phone, clap position, door, and app settings unchanged. The curtain is the variable they change; the drop time is the outcome they measure.

3. In the bare-room trials, the drop times range from 0.73 to 0.85 seconds; with the curtain, they range from 0.49 to 0.62 seconds. The shorter times suggest that sound dies away faster with the curtain, but they do not prove every podcast will sound clearer. A phone may automatically adjust microphone sensitivity, and claps can differ in strength. The team checks that automatic level adjustment is off and repeats the test with another person clapping. They could also record the same spoken sentence in both conditions and ask listeners to compare how clearly they hear each word.

## 2 ANSWER WITH EVIDENCE

Use the passage

1. Suppose the phone is moved closer to the clap spot only for the curtain trials. How would that change affect the team's ability to test the curtain?

2. Use both ranges of drop times to make a claim about the curtain's effect. What is one limit on that claim?

3. The team wants to compare a thick curtain with a thin one. What should it change, what should it keep the same, and what should it measure?

4. Why would recording the same spoken sentence with and without the curtain test something the clap trials cannot?

## 3 YOUR TURN

Your own words

Design an experiment to test whether a cardboard cone around a phone speaker makes a voice message louder across a room. State your prediction, what you would change and measure, at least two conditions you would keep the same, how you would repeat the test, and how the results would support or challenge your prediction.

ANSWER KEY

# Chasing the Echo

HIGH SCHOOL · PHS.6.5

## PART 1 · READ AND MARK

Underline what the team changes, circle what it measures, and number the conditions it keeps the same. Use your marks to judge whether the test supports the team's claim. Accept any marking that follows this job and points at the right text.

## PART 2 · ANSWERS

| # | QUESTION | ANSWER |
|---|---|---|
| 1 | Suppose the phone is moved closer to the clap spot only for the curtain trials. How would that change affect the team's ability to test the curtain? | **It would make the comparison less reliable because phone position, as well as the curtain, would change. The team could not tell which change affected the measured drop time.** |
| 2 | Use both ranges of drop times to make a claim about the curtain's effect. What is one limit on that claim? | **All five curtain trials had shorter drop times than the bare-room trials, suggesting that sound died away faster. The clap results alone do not show whether spoken words are clearer.** |
| 3 | The team wants to compare a thick curtain with a thin one. What should it change, what should it keep the same, and what should it measure? | **Change the curtain thickness. Keep the phone and clap positions, door, and app settings the same, and measure the time for sound level to drop by 20 decibels in repeated trials.** |
| 4 | Why would recording the same spoken sentence with and without the curtain test something the clap trials cannot? | **The sentence recordings would let listeners compare word clarity, the goal of the podcast treatment. Clap drop times measure how long sound persists, not whether words are understandable.** |

## PART 3 · YOUR TURN (SAMPLE ANSWER)

I predict that the cone will make the message louder at a point directly in front of the speaker. I would play the same recording with and without the cone and measure sound level at that point using a sound meter. I would keep the phone volume, phone position, and meter position the same. I would take five readings in each condition and compare their average sound levels. A higher average with the cone would support my prediction; similar or lower averages would not.

Accept other controlled comparisons that isolate curtain thickness in question 3. For Your Turn, accept a measurable outcome other than sound level if the student explains how it tests the cone's effect and keeps the comparison fair.