

Teacher Implementation Guide

Matched to the Signal Lab card system

Color System

The same visual language as the Challenge Cards: colored left borders signal category at a glance.

■ Blue	Planning + Assessment	■ Green	Science + Physics
■ Amber	Implementation + Testing	■ Cyan	Facilitation + Supports
■ Coral	Revision + Improvement	■ Purple	Schedule Models + Options

Model A: Traditional Schedule

- For 50–52 minute periods, use the 4-day model.
- Days: Launch → Plan/Build → Test/Revise → Explain.

Model B: Block Schedule

- For 80–90 minute periods, use the 2-day model.
- Days: Launch/Plan/Build → Test/Revise/Explain.

What teachers need

- Challenge Cards
- Signal System Design Workspace copies (one per team or student)
- Simple team kits
- Short launch video or teacher overview

Core teacher move

Before students build, ask: **What is the sender? What is the signal or cue? Who is the receiver? What should the receiver understand?**

Implementation Model A

Traditional schedule: classes of about 50–52 minutes

Recommended format

Use this model for traditional daily schedules. A 4-day sequence gives students clear stopping points and time for revision.

Day 1: Launch + Natural Models

Introduce sender, signal, receiver, and meaning. Show 2–3 natural models and one human-designed signal example. Students preview a Challenge Card.

Day 2: Plan + Begin Build

Teams use the Workspace to define the system, choose a signal or cue, sketch the design, and start building a first prototype.

Day 3: Test + Improve

One team acts as the receiver for another team. Students run a fair test, record what happened, and make a targeted revision.

Day 4: Retest + Explain

Teams test the revised design, complete the explanation frame, and share how the natural model, physics idea, and testing shaped the design.

If you need to shorten

Combine Days 3 and 4: one test, one revision, and a 60-second team explanation.

Teacher checkpoint

By the end of Day 2, every team should be able to explain the sender, signal, receiver, and meaning.

Implementation Model B

Block schedule: periods of about 80–90 minutes

Recommended format

Use this model for longer block periods. A 2-day sequence works well because students can plan and build in one sitting.

Day 1: Launch, Plan, and Build

Launch the challenge, introduce natural models, and define sender, signal, receiver, and meaning. Teams complete planning, sketch the design, choose materials, and build a first prototype. End with a readiness check before testing.

Day 2: Test, Revise, and Explain

Teams run a fair test with another team acting as the receiver. Students collect observations, identify what worked and what was confusing, revise, retest, and explain the natural model, physics connection, and final design.

If you have only one block day

Use one challenge card for the whole class, allow one round of testing, and finish with a short team explanation.

If you have extra time

Add a second revision cycle, a gallery walk, or a written reflection about how physics helped explain the design.

Setup and Facilitation

What to prepare and how to guide the activity

Before class

- Print or laminate the Challenge Cards.
- Print one Signal System Design Workspace per team or per student.
- Prepare team kits and a small testing area.
- Preview your launch materials and natural model examples.

Recommended team kit

- Flashlight or light source
- Mirrors or reflective material
- Paper, index cards, markers, tape
- String, cardboard, barriers, cups
- *Optional:* bells, color filters, foil, craft sticks

Teacher questions during planning

- What information are you sending or detecting?
- Who or what is the receiver?
- What should the receiver understand?
- Which natural model inspired your design?
- What signal or cue will carry the information?

Teacher questions during testing

- What do you expect to happen?
- What counts as success?
- What stayed the same during the test?
- What evidence or observations did you collect?
- What feedback did the receiver give you?

Assessment Strategy

A simple, physics-friendly way to assess the lab

Physics-teacher recommendation

Keep assessment simple and observable. Use three evidence sources: the student workspace, what you see during testing, and the team explanation at the end.

3-Step Assessment Routine

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|-------------------------------------|--|
| 1. Check the plan | Did the team identify the sender, signal, receiver, and meaning? |
| 2. Watch the test | Did the team run a fair test and use observations or feedback? |
| 3. Listen to the explanation | Can the team explain the natural model, the physics idea, and what changed after revision? |

Quick scoring checklist

- System is clearly defined.
- Nature connection is explained.
- Physics connection is reasonable and accurate.
- Testing includes evidence or feedback.
- Revision is purposeful.
- Team explanation is clear.

What strong evidence looks like

- Students talk about the system, not just the object they built.
- Students explain what signal carried the information.
- Students describe what the receiver was supposed to notice.
- Students name one improvement they made after testing.

Fast teacher note

You do not need a long rubric. For most classrooms, a short checklist plus a brief team explanation is enough.

Supports for Learners

Straightforward supports teachers can use immediately

Multilingual learner supports

- Preview vocabulary with visuals.
- Use sentence frames such as "*The sender is...*" and "*The signal means...*"
- Allow oral explanation, diagrams, and bilingual notes.
- Keep key terms visible during the activity.

Support for students who need structure

- Assign the natural model instead of offering multiple choices.
- Limit the number of materials or signal options.
- Pre-fill a few fields in the workspace.
- Check in before students start building.

Extension options

- Combine two signal types.
- Test with interference.
- Add a coded pattern.
- Design for limited visibility or hearing.
- Compare two iterations.

Pacing support

Use the traditional model for 50–52 minute periods and the block model for 80–90 minute periods. Keep the same learning sequence in both: **Launch** → **Plan** → **Build** → **Test** → **Revise** → **Explain**.

Discussion and Debrief

Closing prompts and fast wrap-up options

Good closing prompts

- What physics idea helped explain your design?
- What did the receiver notice first?
- What did your team learn from revision?
- What tradeoff did your team have to make?
- Where could this be useful in the real world?

Class discussion points

- What made a signal easy to detect?
- What made a signal confusing?
- How did testing change your design?
- How was your design similar to the natural model?
- What would you improve next?

Fast exit ticket

- Describe your sender, signal, receiver, and meaning.
- Name one physics concept that helped explain your design.
- Describe one change your team made after testing.

Gallery walk option

- Display each prototype and explanation frame.
- Ask peers for one clear signal and one next improvement.
- End with a short whole-class debrief using the prompts above.