

Visible Elements in Photo



- Two freight train cars (metal, cylindrical, large scale) connected by coupling mechanism
- Active railroad crossing signal with red light illuminated and crossing arm lowered
- Yellow and red striped safety barriers on road
- Metal railroad tracks below the train
- Road surface intersecting with train tracks at crossing
- Trees and utility lines in background

Reasonable Inferences

- From the lowered crossing arm and red signal light: The crossing system is designed to stop vehicle traffic and alert drivers to an approaching or present train, indicating a need to manage safety at intersections of two transportation paths.
- From the large mass and speed capability of the train: Objects crossing the rails need protection from collision; the barrier system must be strong enough to redirect or hold back vehicles.
- From the metal coupling and wheel design: Train systems involve forces (pulling, stopping, momentum) that require robust engineering to control safely.

Engineering Task

K-2 Challenge:

Your town has a train track that crosses Main Street. Cars and people need to cross safely. Design a barrier, gate, or signal system using blocks, cardboard tubes, or craft materials that stops toy cars or toy people from crossing the tracks when a train is coming. Test it by "rolling" a toy car toward the tracks—does your design work?

3-5 Challenge:

Design a railroad crossing warning and barrier system for a toy train set that:

- Uses at least two different materials (wood, plastic, cardboard, metal foil, etc.)
- Stops a rolling toy car traveling at medium speed from entering the track
- Can be raised and lowered by hand in under 5 seconds
- Includes a visible or audible warning signal (light, bell, or flag)
- Fits within a 12-inch x 12-inch footprint

Test your design by rolling toy cars at the crossing from different angles and speeds. Redesign any parts that fail.

EDP Phase Targeted

Ask / Define Problem

This photo shows a real-world safety challenge—managing two transportation systems (road and rail) that intersect. Students begin by observing what problem the crossing system solves (collision prevention, clear communication), then design their own solution. The visible signal and barrier provide a context for identifying constraints and success criteria without showing the "answer," keeping exploration open.

Suggested Materials

- Cardboard tubes or paper towel rolls
- Wooden dowels or craft sticks
- Craft foam or foam board
- Aluminum foil or shiny paper (for reflective signals)
- Small bells or buzzers (optional, for alert sounds)
- Toy cars and train set (if available)
- Tape and fasteners (hot glue gun with supervision, or white glue)

Estimated Time

3-5 class periods (45-60 minutes each) across one week:

- Session 1: Observe photo, define the problem, brainstorm (15 min)
- Session 2: Plan and sketch design, gather materials (20 min)
- Session 3: Build prototype (30-40 min)
- Session 4: Test and iterate (25-30 min)

Or condensed: Single 60-minute session for K-2 with pre-built barrier kits and quick testing.

Why This Works for Teachers

This task directly supports NGSS ETS1.A: Defining and Delimiting Engineering Problems by asking students to identify constraints (speed, size, timing) and criteria (stopping distance, visibility) from a real infrastructure challenge visible in the photo, making abstract safety engineering tangible and meaningful.