

Visible Elements in Photo



- Large cargo ship with red and black hull, labeled "DOCKSHIP"
- Multiple tall cargo cranes (booms) extending from the ship's deck
- Industrial port infrastructure visible in background (oil rigs, docking facilities)
- Open water (likely a harbor or bay)
- Ship designed to carry and unload heavy cargo

Reasonable Inferences

- From cargo cranes and hull design: The ship must load and unload cargo efficiently; the cranes suggest cargo is lifted vertically, implying a need to solve the problem of moving heavy materials on and off the vessel.
- From port infrastructure: Ships must work within busy harbors where space is limited and timing matters—solutions must be reliable and quick.
- From ship size and structure: Stability is critical; weight distribution affects whether the vessel floats evenly and safely during loading/unloading operations.

Engineering Task

K-2 Challenge:

Build a boat that can pick up blocks. Make a simple boat from a container or foam, and attach a stick or string to act like a crane. Can your crane pick up small blocks or toys from a table and move them to another spot? Test it to see if your boat tips over or stays steady.

3-5 Challenge:

Design a cargo-loading system for a ship. Your ship (a floating container) must pick up 5 identical weights (blocks or washers) using a simple crane mechanism (pulley, lever, or magnetic lift). Constraints: (1) The crane must lift each weight at least 15 cm, (2) The ship must not tip over while loaded, (3) The entire loading cycle must take no more than 3 minutes. Measure and record the ship's stability (does it list to one side?) and loading time. Redesign one part to make it faster or more stable.

EDP Phase Targeted

Ask / Define Problem — This photo shows a real-world solution (a cargo ship with cranes) but doesn't show an active engineering challenge. Students need to first identify the problem the ship solves: "How do we move heavy cargo on and off ships safely and quickly?" This frames the design task and lets students imagine their own solutions before building.

Suggested Materials

- Small plastic containers or foam trays (for ship hulls)
- Straws, dowels, or wooden sticks (for crane booms)
- String or fishing line (for cables/pulleys)

- Washers, blocks, or small weights (cargo)
- Plastic cups or small buckets (cargo holders)
- Tape and scissors (assembly)

Estimated Time

K-2: 20–30 minutes (minimal planning, quick build and test)
3-5: 45–60 minutes (planning, building, testing, measuring, one redesign cycle)

Why This Works for Teachers

This task directly addresses NGSS 3-5-ETS1-1 (Ask & Define) and 3-5-ETS1-2 (Design & Test) by having students identify a real constraint (stable loading of cargo), set measurable success criteria (weight lifted, stability, time), and iterate their design based on test data.