Cows

Life Science | Engineering Design Process

Engineering Challenge

Visible Elements in Photo

- Large pasture with mixed herd of cattle (white, black, and black-and-white spotted)
- Wire fencing in foreground (appears to be standard farm fence)
- Dense tree line forming a natural boundary at rear of field
- Flat, grassy terrain with good visibility
- Multiple animals at varying distances, some clustered together

Reasonable Inferences

- From fencing visible: Farmers need barriers to keep livestock contained and prevent escape or entry of predators; fencing must be sturdy enough to withstand animal contact and weather.
- From mixed herd composition: Different breeds/sizes may require different enclosure heights and spacing; farmers must design fences that work for the smallest and largest animals.
- From open pasture + tree line: Animals need both grazing space and shelter/shade options; infrastructure must allow safe movement between zones.

Engineering Task

K-2 Challenge:

"Design and build a fence that keeps toy animals inside a play pasture and keeps them safe. Your fence must be at least 6 inches tall, use only string and paper cups or straws, and keep the animals from escaping when you gently shake the table."

3-5 Challenge:

"Design a portable farm fence system that can contain cattle of different sizes (use toy animals ranging from 2–5 inches tall). Your fence must:
- Be at least 8 inches tall
- Use only wood sticks, wire or string, and paper or cardboard
- Withstand a gentle 5-second shake without collapsing
- Cost no more than $5 in materials
- Be movable (able to be relocated in less than 2 minutes)

Test your design with different animal sizes and document which animals it successfully contains."

EDP Phase Targeted

Ask / Define Problem

This photo is ideal for starting with problem identification. Students can observe real animals in a real farming context and identify the actual need: "How do farmers keep animals safely contained while allowing them to graze and move?" The visible fencing and animal behavior make the challenge authentic and tangible—students aren't guessing at an abstract problem; they can see why the solution matters.

Suggested Materials

- Wooden dowels, craft sticks, or thin branches
- String, yarn, or wire
- Paper cups, cardboard strips, or poster board
- Tape (masking, duct, or clear)
- Toy animals (farm animal figurines, 2–5 inches)

Estimated Time

- K-2: 30–45 minutes (15 min. discussion, 20 min. building, 10 min. testing)
- 3-5: 60–90 minutes (15 min. research/sketching, 30 min. building, 15 min. testing, 10 min. redesign if needed)

Why This Works for Teachers

This task directly aligns with NGSS 3-5-ETS1-2 (Generate and compare multiple possible solutions based on how well they meet the criteria and constraints of a design problem) by asking students to iterate on a real-world agricultural need and test their designs against measurable criteria.