Ecosystem

Life Science | Engineering Design Process

Engineering Challenge

Visible Elements in Photo

- Dense forest canopy covering foreground and middle ground (mix of deciduous and coniferous trees)
- A paved two-lane road cutting through the forest with vehicles traveling on it
- Cleared agricultural fields and pastures visible in the distance (background)
- Hilly or elevated terrain with the road following the contours
- Sky visible above, suggesting high-altitude aerial perspective

Reasonable Inferences

- From the road through forest: Humans need routes to move through natural barriers; the road creates both access and fragmentation of habitat.
- From cleared fields beyond the forest: Land use changes over distance—forests transition to human-managed agricultural areas, suggesting competing needs for space and resources.
- From the road's design: Engineers had to balance transportation efficiency with terrain constraints; vehicles depend on maintained pathways.

Engineering Task

K-2 Challenge:

Make a path through a forest! Use blocks, tape, or sticks to build a road through a pile of leaves, grass, or toy trees. Your road must be wide enough for a toy car to drive on without tipping. Can you keep your forest in place while the car travels through?

3-5 Challenge:

Design and build a forest pathway that allows vehicles to pass through while minimizing habitat disruption. Your road must:
- Be at least 15 cm wide (wide enough for a toy vehicle to travel safely)
- Use only natural or recycled materials (twigs, bark, leaves, cardboard, foam)
- Keep at least 60% of a designated "forest area" (a 60 cm × 60 cm space) intact and vegetated
- Support the weight of a toy vehicle without collapsing

Test your design: Does the vehicle stay on the road? Does the forest remain mostly undisturbed? Measure the actual forest coverage after the vehicle passes. Can you redesign to reduce forest damage?

EDP Phase Targeted

Ask / Define Problem — This phase fits best because the photo shows a real-world tension (transportation vs. conservation) without offering an obvious solution. Students must first identify what problem the road solves (human movement) and what problem it creates (habitat loss), then decide whether their design should prioritize speed, safety, or environmental protection. This requires exploration before building.

Suggested Materials

- Toy vehicles (cars, trucks, or blocks on wheels)
- Natural materials: leaves, twigs, bark chips, moss, grass clippings
- Structural materials: craft sticks, cardboard strips, foam board, or reclaimed wood
- Measurement tools: ruler or measuring tape
- A defined boundary: tape or rope to mark the "forest area"

Estimated Time

K-2: 30–40 minutes (exploration and one design cycle)
3-5: Two 40-minute sessions (Session 1: design, building, and first test; Session 2: measurement, analysis, and redesign)

Why This Works for Teachers

This task directly addresses NGSS K.ETS1.A (recognizing that people design solutions to problems they encounter) and 3-5.ETS1.B (evaluating designs by testing them against criteria and constraints), grounding infrastructure decisions in observable environmental trade-offs students can physically experience.