

Combining Machines

Machine Heart Vault with Gearling

Learning target

Combine simple machines to solve a stated problem.



Before you begin

Use the reference page and discussion prompts on their own, or open the optional browser adventure. No earlier lesson or physical kit is required.

For online play: use an internet-connected current browser with local storage enabled. Read the three-part Gemling briefing, answer the quick check, and apply the evidence at three checkpoints. Retry feedback supports review; results are not a secure test or gradebook.

Use for teacher-led review, science centers or partner practice. Independent readers may need support with the vocabulary below. The design target is grades 3-5; choose support based on the learner.

Vocabulary and concepts to discuss

Compound tools; identifying parts; design constraints; testing

Open Machine Heart Vault - direct lesson link

Scan the QR code or use the clickable link. This guide is usable offline; the adventure runs on an external educational website.



Combining Machines - key ideas

1. The first clues

Compound machines combine simple mechanisms. Identify what each part does before deciding how to improve a design.

2. How the clues connect

Criteria and constraints guide testing. A useful change should address observed performance while respecting available materials and space.

3. Our evidence record

Our model combines a wheel-and-axle cart, a ramp and a lever latch. A tested stronger latch holds the cargo when the original fails. Improve that part rather than claiming the entire machine creates energy.

Keep the science accurate

Teach all six traditional simple machines in grouped lessons. Gears connect to wheels/axles, not a new seventh classical type. No efficiency equations.

Apply the evidence

Use a specific observation from this lesson to explain one choice. Point to a clue, then connect that clue to a scientific idea.

Curriculum reference: <https://www.nextgenscience.org/dci-arrangement/3-ps2-motion-and-stability-forces-and-interactions>

Talk through the evidence

1. Which mechanisms are in our model?

Expected answer: Wheel and axle, ramp and lever

Reasoning: Our model combines a wheel-and-axle cart, a ramp and a lever latch. A tested stronger latch holds the cargo when the original fails. Improve that part rather than claiming the entire machine creates energy.

2. What failed in the supplied test?

Expected answer: The original latch

Reasoning: Our model combines a wheel-and-axle cart, a ramp and a lever latch. A tested stronger latch holds the cargo when the original fails. Improve that part rather than claiming the entire machine creates energy.

3. Which improvement has supporting evidence?

Expected answer: The tested stronger latch

Reasoning: Our model combines a wheel-and-axle cart, a ramp and a lever latch. A tested stronger latch holds the cargo when the original fails. Improve that part rather than claiming the entire machine creates energy.

4. What should the final design explanation include?

Expected answer: Functions, test evidence and limits

Reasoning: Our model combines a wheel-and-axle cart, a ramp and a lever latch. A tested stronger latch holds the cargo when the original fails. Improve that part rather than claiming the entire machine creates energy.

Guide the discussion

Ask learners to name the evidence that supports their answer. If an answer differs, revisit the matching key idea on page 2 and invite a revised explanation.

Online rewards: this lesson grants one fixed digital Expedition Discovery. Five saved digital Gemling friends become available only after all six distinct subject lessons are complete, in any order. Digital rewards do not establish physical ownership.