

## Photo Description



This image shows a white Ford truck with a tall crane arm mounted on the back, lifting a large white spherical object high into the air. A worker in the yard is operating the crane using a long rope or cable system. The crane is using a machine to lift something very heavy that a person could not lift by themselves.

## Scientific Phenomena

Anchoring Phenomenon: A simple machine (the crane/pulley system) is being used to lift a heavy object that would be impossible to move by hand alone.

Why This Happens (Scientific Explanation):

Cranes and pulleys are simple machines that make work easier by distributing force. Instead of lifting the entire weight directly, the crane uses mechanical advantage—the pulley system multiplies the force applied by the worker, allowing a relatively small input force to lift a much heavier load. The truck provides a stable base and additional structural support. This demonstrates the principle of mechanical advantage, where machines help us do work that would otherwise require more human strength than we possess.

## Core Science Concepts

1. Simple Machines (Pulleys & Levers): The crane contains pulleys and lever systems that change the direction and reduce the amount of force needed to lift heavy objects.
2. Force and Motion: A force (pulling/pushing) is being applied through the rope system, causing the spherical object to move upward against gravity.
3. Work: Work is being done when the crane lifts the object—work = force applied  $\times$  distance moved.
4. Mechanical Advantage: Machines help us do tasks by making the effort easier, even though the total amount of work stays the same.

### Pedagogical Tip:

For First Grade, focus on the observable action rather than abstract physics. Use language like "The machine helps make the heavy thing easier to lift!" Avoid technical terms like "mechanical advantage" in student discussions—instead ask, "Could you lift that big ball with your hands? How does the machine help?" This builds foundational understanding before formal terminology.

### UDL Suggestions:

Universal Design for Learning Strategies:

- Representation: Provide pictures of different simple machines (ramps, pulleys, levers) alongside the crane photo so students can see how machines help in different ways.
- Action & Expression: Allow students to demonstrate understanding through movement (acting out pulling vs. lifting), drawing, or building with blocks—not just verbal explanations.
- Engagement: Connect to student interests by showing cranes at construction sites, playground equipment (seesaws are levers!), and tools they've seen adults use.

## Discussion Questions

1. "What do you think would happen if someone tried to lift that big white ball with just their hands?" (Bloom's: Remember | DOK: 1)
2. "How is the machine helping the person lift the heavy ball?" (Bloom's: Explain | DOK: 2)
3. "Where else have you seen machines that help people lift or move heavy things?" (Bloom's: Apply | DOK: 2)
4. "Why do you think the truck is so big and strong? What job does it have?" (Bloom's: Analyze | DOK: 3)

## Extension Activities

### 1. Pulley Exploration (Hands-On):

Set up a simple pulley system using a string and a plastic cup. Have students take turns pulling the string to lift a small bucket filled with lightweight objects (cotton balls, foam pieces). Discuss: "Is it easier to lift it this way or without the string?" This directly models how the crane's pulleys work.

### 2. Ramp & Rolling Balls (Hands-On):

Create simple ramps using wooden boards and blocks. Have students roll balls down and observe how the ramp helps the ball move. Compare to trying to "throw" a ball upward. This explores how simple machines help move objects.

### 3. Machine Hunt Around School (Observational):

Take students on a "machine walk" around the classroom and playground. Point out and discuss: door handles (levers), swings (pivots), slides (ramps). Create a class chart showing pictures of each machine and what it helps us do.

## NGSS Connections

### Performance Expectation:

K-PS2-1: Plan and conduct investigations to provide evidence that vibrations make sound and that various materials can be used to block sound.

(Note: While this image primarily relates to force and motion, the foundational understanding of how forces work connects to subsequent grades.)

### Disciplinary Core Ideas:

- K-PS2.A (Forces and Motion)
- 1-PS4.A (Wave Properties)

### Crosscutting Concepts:

- Cause and Effect
- Systems and System Models

Connection Explanation: This image exemplifies how a system (the truck + crane + rope) works together, demonstrating cause and effect: when the worker pulls the rope, the crane lifts the object. For First Grade, this builds the foundation for understanding that forces cause changes in motion.

## Science Vocabulary

- \* Crane: A big machine with a long arm that lifts and moves heavy things.
- \* Machine: A tool that helps us do work more easily.
- \* Force: A push or pull that makes something move or change.

\* Pulley: A wheel with a rope that helps lift heavy objects by changing the direction of force.

\* Work: A job that uses force to move something from one place to another.

### External Resources

Children's Books:

- Simple Machines by David Adler (illustrates pulleys, levers, and ramps with kid-friendly examples)
- Machines Go to Work by William Low (celebrates different machines in action)
- Click, Clack, Moo: A Counting Book by Doreen Cronin (includes machinery themes with engaging illustrations)

YouTube Videos:

- "Simple Machines for Kids - Pulleys" by Crash Course Kids (2:45 minutes) — Clear, animated explanation of how pulleys make lifting easier. <https://www.youtube.com/watch?v=0mhoLaUdR0c>
- "How Do Cranes Work?" by National Geographic Kids (3:30 minutes) — Engaging overview of real cranes and their mechanical systems with stunning visuals. <https://www.youtube.com/watch?v=9jKfAVXAYIE>

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Teacher Tip: This image is perfect for a "Forces and Machines" unit and can anchor discussions about why we need machines in everyday life. Connect it to students' experiences with playground equipment, tools at home, and community workers they've seen!