# Robot

Physical Science | Lesson Guide

2nd Grade

## Photo Description

This image shows a bright blue toy robot sitting on a rock surrounded by grass and soil. The robot has a round head with an orange ring and purple center eye, a body with two large round sections that look like wheels or feet, and small black openings. The robot appears designed to move around, explore, and interact with its environment.

## Scientific Phenomena

Anchoring Phenomenon: How can machines move and explore on their own?

This toy robot represents a simple programmable robot designed for movement and exploration. Scientifically, this happens because robots contain:
- Motors (tiny machines powered by batteries) that make parts spin or roll
- Programming or sensors that help the robot decide where to go
- Wheels or moving parts that push against the ground to create motion

Young learners observe that objects need a force (push or pull) to move. Robots apply this force automatically through electrical energy, allowing them to explore spaces where humans might not fit or can observe difficult-to-reach areas.

## Core Science Concepts

1. Forces and Motion: Robots use motors to create forces that push or pull them across surfaces. Different surfaces (grass, rocks, soil) affect how easily the robot moves.

2. Energy Transfer: Batteries store electrical energy that powers the motors, converting that energy into movement and light (the glowing eye).

3. Simple Machines: The robot likely uses wheels or gears inside—simple machines that help it move more efficiently.

4. Input and Output: The robot receives input (programming or sensor information) and produces output (movement, light from the eye).

**Pedagogical Tip:**

For Second Grade students, avoid technical jargon like "programming" or "circuits." Instead, use concrete language: "The robot has a battery that gives it energy to move, just like food gives you energy to run and play." Encourage students to observe what the robot does rather than focus on how it works internally.

**UDL Suggestions:**

Multiple Means of Engagement: Allow kinesthetic learners to act out robot movements (rolling, spinning) while others draw or describe what they see. Provide the robot image as a tactile model or 3D print so students with visual impairments can explore the shape and texture. Offer both guided exploration and choice-based discovery stations.

## Discussion Questions

1. What do you observe about how this robot moves? (Bloom's: Remember | DOK: 1)

2. Why do you think the robot's eye lights up? Where do you think the energy comes from to make it light up and move? (Bloom's: Infer | DOK: 2)

3. If we put this robot on different surfaces—like carpet, sand, or ice—how might its movement change? Why? (Bloom's: Analyze | DOK: 3)

4. What could we design a robot like this to do? How would we need to change it to help us explore a place like the ocean or the moon? (Bloom's: Evaluate/Create | DOK: 3-4)

## Extension Activities

1. Robot Obstacle Course: Create a simple obstacle course using blocks, tape lines, and ramps. Let students predict how fast the robot will move on different surfaces and challenges. Have them observe and compare actual speeds. Students can redesign the course to make it easier or harder for the robot to complete.

2. Design Your Own Robot: Provide students with craft materials (boxes, paper towel tubes, plastic containers, aluminum foil) and ask them to design and build a robot that could help with a specific job (cleaning, delivering messages, exploring a garden). Students explain what their robot would do and what energy source would power it.

3. Speed Investigation: Race the robot alongside toy cars or rolling balls down a ramp. Use simple timers or count seconds to compare speeds. Create a chart showing which objects moved fastest and slowest. Discuss why some objects move faster than others.

## NGSS Connections

Performance Expectation:
2-PS2-1: Plan and conduct an investigation to provide evidence that objects in motion have different speeds.

Disciplinary Core Ideas:
- 2-PS2.A: Motion and Stability - Objects move in certain ways; movement can be described as fast or slow.
- 2-ETS1.B: Engineering Design - Designs can be improved based on how well they work.

Crosscutting Concepts:
- Cause and Effect: The robot moves because energy from the battery causes the motors to turn.
- Systems and System Models: The robot is a system with parts working together (battery, motor, wheels, eye).

## Science Vocabulary

* Robot: A machine that can move and do tasks on its own or by following directions from a person.
* Motor: A device that uses electricity to create movement and spinning.
* Energy: The power that makes things move, light up, or change.
* Force: A push or pull that makes something move or change direction.
* Battery: A container that stores electrical energy and powers machines.
* Sensor: A part that helps a robot notice things around it, like light, heat, or obstacles.

## External Resources

Children's Books:
- Robots by Demi (introduces robot types and functions in simple language)
- The Busy Robot by Lorraine Cohen (story about a helpful robot)
- Robots, Robots, Robots by Violet Findley (exploration of how robots help humans)

YouTube Videos:
- "How Do Robots Work? Easy Science for Kids" — A short, animated introduction to basic robot parts and functions. URL: https://www.youtube.com/watch?v=BzcKj2FceWI (approximately 4 minutes, appropriate for Second Grade)
- "Building a Simple Robot Lesson for Elementary Students" — Demonstrates how wheels, motors, and batteries work together. URL: https://www.youtube.com/watch?v=F1ey1X1BX3g (approximately 5 minutes, teacher-friendly preview available)

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Teacher Tip: Before the lesson, test the robot on various classroom surfaces (carpet, tile, sand table) to anticipate student questions. This hands-on familiarity will strengthen your ability to guide student investigations authentically.