

Helpful Review of Science Covered in This Module

Read this information to boost your understanding of the science behind the circuits youth will create. Remember, participants do not need to use these terms when experimenting. Feel free to introduce these concepts only if they come up organically. Rather than focusing on teaching scientific terms and concepts, facilitate youth asking questions and making careful observations during each session.

Alligator Clip: A spring-loaded clip with serrated edges that is used for temporary circuit connections.

Battery: A combination of cells in a series. *Note: In conversation, people use “battery” when they actually mean “cell.” Don’t get overly technical in these sessions with youth. Allow everyone to use “battery” to mean one cell or a series of cells.*

Cell: A single unit that converts chemical energy into mechanical energy. Common cells are known by letters AAA, AA, C and D.

Circuit: A path for electricity to flow. An electrical circuit requires:

- A power source, such as a battery
- A conductor that creates a path for electricity to flow through, such as the wires
- A load that changes electricity into another type of energy, such as a lightbulb

Conductor: Material that allows electrons to flow.

Energy: Scientists define energy as the ability to do work. Modern civilization is possible because people have learned how to change energy from one form to another and then use it to do work. Forms of energy include heat, light, motion, electrical, chemical and gravitational.

Insulator: Material that does not allow electrons to flow freely.

LED: Light-Emitting Diode; a semiconductor device that emits light when an electric current is passed through it.

Load: Any component in a circuit that consumes power or electricity.

Parallel circuits: A circuit with multiple paths for electricity to flow. If each resistor, such as a lightbulb, creates its own circuit, each light will be as bright as if it were the only resistor in the circuit. Parallel circuits allow you to turn on multiple lights in your house without the light getting dimmer each time you turn on an additional light.

Series circuit: A single path for the electricity to flow. If two resistors, such as lightbulbs, are in the series, the lights will be dimmer because they share the electrical current.

Switch: A device in a circuit that causes electricity flow to stop.

Voltage: The amount of force pushing electricity along its path.

Links to Science and Teaching Resources for Staff *(not intended for youth)*

Use the following resources to increase your understanding of the following concepts. Feel free to preview and share these resources with youth as needed.

- Scientists and engineers work in teams: **“Teamwork Wins! Why Science Is Not an Individual Sport”** (sustainable-nano.com/2013/06/25/teamwork-wins-why-science-is-not-an-individual-sport)
- Scientists display effective teamwork and social-emotional skills: **“Collaboration and Team Science: From Theory to Practice”** (ncbi.nlm.nih.gov/pmc/articles/PMC3652225)
- Science careers and what it means to be an engineer:
 - **“The Science of Team Science”** (chemistryworld.com/careers/the-science-of-team-science/4014201.article)
 - **“What’s an Engineer? Crash Course Kids #12.1”** (youtube.com/watch?v=owHF9iLyxic)
 - **“What Is an Engineer? (Types, Salaries and Responsibilities)”** (indeed.com/career-advice/finding-a-job/what-is-an-engineer)
- Engineering Design Process:
 - **Engineering Design Process | NASA** (nasa.gov/wp-content/uploads/2012/09/630754main_nasasbestactivityguide6-8.pdf)
 - **“Defining a Problem: Crash Course Kids #18.1”** (youtube.com/watch?v=OyTEfLaRn980)
 - **“Comparing Science and Engineering | NGSS Demystified”** (gpb.pbslearningmedia.org/resource/comparing-science-and-engineering/professional-development-activity)
- Circuitry and electronics extension for youth: **DK Learning** (learning.dk.com/us)