

UNIT 1: ELECTRIFYING GAMES

IN THIS UNIT: Students explore circuits by designing a pinball-style game that uses motors, balls, and buzzers.*

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Kick Stick challenge (pages 6–9)

- **Overview:** Students build a “kick stick” by attaching a set of arms to a battery-operated motor, mounted on a paint stirrer. When the motor’s shaft spins, it rotates the arms, which students use to kick a Ping Pong® ball across the floor. Students then design and build a switch to control the motor and troubleshoot the circuit.
- **Learning outcomes:** Students will be able to design and build an electrical circuit and discuss how a switch opens and closes it. They will be able to explain why the circuit is a series circuit and identify materials as conductors or insulators. Finally, they will be able to describe how they used the design process to design and build their kick sticks.

Electric Gamebox challenge (pages 10–13)

- **Overview:** Students use their kick sticks to launch a Ping Pong ball at a target, which has a pressure-sensitive switch. This switch activates a buzzer when the ball hits it. Students apply what they learned about circuits and the design process in *Kick Stick* to design and perfect the switch and troubleshoot the circuit.
- **Learning outcomes:** Students will be able to explain how switches and series circuits work and describe how they used the design process to design and build a pressure-sensitive switch.

Making It Real (pages 14–15)

- **Overview:** Students present their games and discuss the science and engineering behind their designs. They also watch two short videos: They meet a young engineer who designs toys, and they see how the *Design Squad* teams use the design process to refine their automatic ball kickers.
- **Learning outcomes:** Students will be able to identify the science concepts exhibited in their work (e.g., electric current, conductors, insulators, circuits, and switches), explain how the design process encourages them to think creatively to tackle a challenge, point out how they are thinking and working like engineers, and cite examples of how engineering is a profession centered on improving people’s lives.

PLANNING YOUR TIME

Only have one class period available? Do *Kick Stick*.

Two class periods? Do *Kick Stick* and *Making It Real*.

Three? Do all three sessions.

“My students are far more receptive to learning things if they can actually do it, try it, and play with it.”

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*For specific STEM standards, see Appendix, page 48.

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