

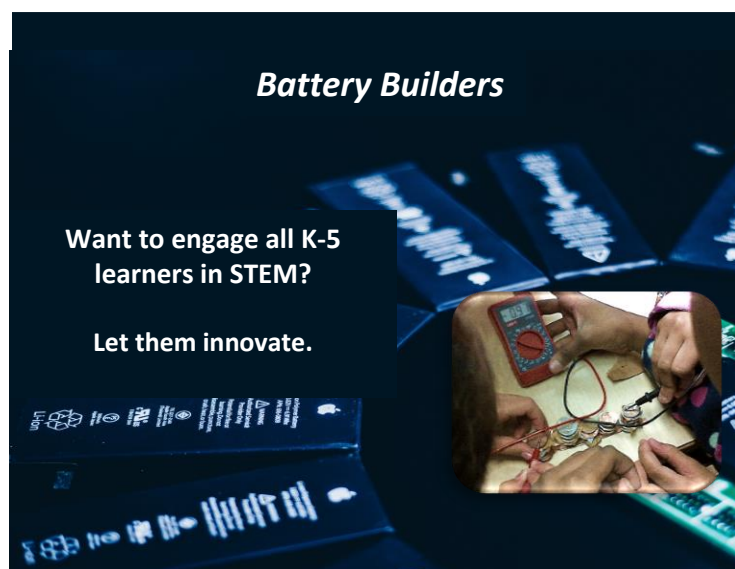
CreositySpace Educator Guides and curricular materials are designed to support a variety of implementation methods:

For the Classroom Teacher

- A variety of introduction tools to assess prior knowledge and create common experiences.
- Detailed **weekly learning objectives** and instructional lessons lists/pacing guides.
- **Cross-curricular activities** to support ELA and math learning objectives.

For the STEM/Afterschool Teacher

- A variety of introduction tools to assess prior knowledge and create common experiences.
- **Flexible lesson plans** that can adjust to your instructional method and schedule
- **Leveled content** that supports students at different reading, writing, and language levels.



Battery Builders

Primary Curriculum	Grade 5
Supplemental Curriculum	Grades 4–5+
Notes	Standard unit/refill kit comes with enough materials for 30 students.


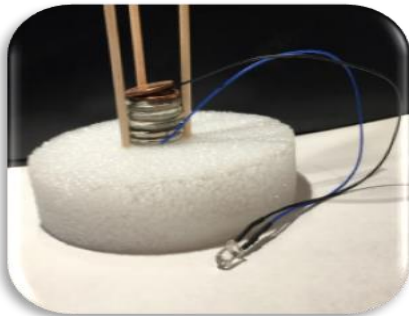
Description

How can the properties of objects affect how we use them?

Are you tired of your tablets, phones, and toys losing power when you're in the middle of using them? Join Fernando as he talks about his drive to understand how things work and design a better battery.

Using the overarching goal of designing improved devices, students explore properties of materials and engineering as they ask themselves: *"How can we make a better battery?"*

Main Investigations

<p>Materials Investigation with Coin Cell Batteries</p> 	<p>Battery – LED Design Challenge</p>  <p><i>Supplies for battery holder included</i></p>
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Number of Lessons*

Full unit – 25 lessons

Supplemental program – minimum 5 lessons

**Lesson = 30–40 min. block, 50% of full unit lessons can be delivered in non-science classes*

Best Suited For

- Classroom science instruction
- STEM class instruction (with regular attendance)

To see our full K-5 innovation-based science and engineering curriculum please visit our website:

www.creosityspace.com/k5science.html

Overarching Enduring Understanding

How can the properties of objects affect how we use them?

Number of Lessons*

Full unit – 18-20 lessons

Supplemental program – minimum 5 lessons

*Lesson = 30 – 40 min block, 50% of full unit lessons can be delivered in non-science classes

FLOW OF INSTRUCTION

Introductory Investigation: Materials Mix-Up (hands-on investigation, occurs during week 1)

Note: This introductory investigation serves two purposes—it generates student excitement and student wonderings for the unit ahead and also enables the teacher to assess student foundational knowledge and understanding about observable properties.

In this investigation students start with a bag of objects and must organize them in a number of different ways. For the initial sorting cycles groups can use any criteria to sort their objects (color, feel, etc.). As you progress through various cycles of sorting, students must categorize objects based on their assumed electrical conductivity (insulators vs. conductors) and on their ability to absorb water. Students will revisit this activity when they begin to build their batteries.

Investigation: Building a Basic Battery (hands-on investigations, occurs during week 2)

In this investigation students become familiar with the different parts of a battery through the creation of coin cell batteries. For this part of the investigation their materials set is limited to pennies, nickels, paper towels, and lemon juice. Once they have gained some experience with generating coin cell batteries of various strengths from this limited set of materials, they will move on to a more detailed exploration of material properties in **Building a Better Battery**.

Investigation: Building a Better Battery (hands-on investigations, occurs during week 3–5)

In this follow-up investigation to **Building a Basic Battery** students explore using different materials as electrodes, separators, and electrolyte to assess battery performance. While students will be given the opportunity to explore a variety of materials of their choosing the following comparisons will be made:

- As part of the electrode investigation they will evaluate materials that are either conductors or insulators.
- As part of the separator investigation they will evaluate materials that absorb liquid or don't absorb liquid.
- As part of the electrolyte investigation they will make up a number of solutions with more and more salt added to determine both the requirements for the electrolyte and the properties that result from mixing the salt and the water. The electrolyte will also provide the opportunity for students to create a model of the dissolved salt in the water.

Part A: Materials Matter

Students will be able to choose from a variety of alternative materials, which they can test out as electrodes, separators, and electrolyte.

Part B: The Solution Solution

Students will complete a quantitative series of tests of increasing salt content in the saltwater and determine the correlation between salt content and battery voltage.

Investigation: I Can See the Light! (design challenge, occurs during weeks 5–7)

In this design challenge students must take what they've learned from Building a Basic Battery and Building a Better Battery to put together a powerful enough battery to turn on an LED. It is likely students will need to design a battery holder to help keep their battery in place while still being able to connect the copper tape and LED wires.

Investigation: Why We Should Build a Better Battery (summative challenge, occurs during weeks 7–8)

Building off the knowledge they have amassed during the unit students must complete the following summative challenge.

Batteries do more than just power our cell phones and tablets. For a number of people batteries make a huge difference in how they live. Some examples include a hearing aid worn by someone who is older or has trouble hearing or an electric wheelchair that helps someone who can't walk get around. For this challenge you need to create a poster, brochure, or public service announcement that does the following things:

- Explains what the different parts of the battery are and how they work. (A)
- Explains how batteries are used in everyday life with at least two examples. (B)
- Some scientists and engineers think the biggest obstacle to replacing fossil fuel usage with sources of renewable energy is that battery technology, and energy storage technology in general, isn't good enough. Do you agree or disagree? Justify your opinion with at least three pieces of evidence from various sources. (C)