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UNIT

Closing the Loop: Toward a Circular Economy

Engage students in making an impact through circular economies that encourage reuse and recycling of everyday objects. Students focus on lithium-ion batteries which power many common electronic devices. For the final product of the unit project, students create a social media video challenge for a particular target audience to encourage them to recycle their used electronic devices.

GRADES
6 - 8

SUBJECTS
Biology, Ecology, Health, Chemistry, Conservation, Earth Science, Geology, Engineering, Social Studies, Economics, Storytelling, Filmmaking

CONTENTS
3 Lesson plans

For the complete unit with media resources, visit:

http://www.nationalgeographic.org/unit/closing-loop-towards-circular-economy/

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UNIT OVERVIEW

This unit introduces students to circular economies and their benefits, using lithium-ion battery recycling as a model. Students begin by contrasting the concepts of linear versus circular economies, using several case studies of successful circular economic systems. Then, they dive deep into the life cycle of lithium-ion batteries, including how mining for component minerals impacts the environment and communities, the hazards associated with

improper disposal of lithium-ion batteries, and the circular process of properly collecting and recycling lithium-ion batteries from the devices that commonly contain them. Finally, students design and launch a video challenge to be shared over social media, explaining to a target audience of their choosing what they have learned and encouraging viewers to recycle their used electronic devices appropriately.

Use this Unit at a Glance to explore a brief outline of the materials included in this resource.

Unit Driving Question: How can we make our economy more circular, and why does it matter?

LESSON 1: THE CIRCLE OF STUFF | 3 HRS 45 MINS

Students are introduced to the concept of a circular economy and how it contrasts with the linear economies that prevail for many products. Students connect to these ideas by considering the life cycle of their favorite belonging, learning key aspects of reusing and redesigning products and processes, and engaging with case studies of successful circular economic systems.

LESSON 2: THE SECRET LIVES OF BATTERIES | 3 HRS 20 MINS

Students engage with a variety of multimedia resources to determine the benefits and challenges of using and disposing of lithium-ion batteries. They complete a *Circular Economy Analyzer* about lithium-ion batteries and create the storyboard and script for their video challenge that comprises the final product for the unit project.

LESSON 3: SPREAD THE WORD TO MAKE AN IMPACT | 2 HRS 55 MINS

As the culmination of the unit, students leverage what they have learned about recycling lithium-ion batteries and circular economies to peer review, finalize, produce, and present their video challenges for the unit project.

BACKGROUND & VOCABULARY

Vocabulary

Term	Part of Speech	Definition
circular economy	noun	a system of production that extends the lifespan of consumer goods by maximizing reusing and recycling, and minimizing throwing things away.
collection	noun	gathering used materials for recycling or waste disposal.
conservation of matter	noun	principle that matter cannot be created or destroyed; it can only change form.
consumable	noun	something that can be used up (consumed), such as food or fuel.
consumption	noun	process of using goods and services.
distribution	noun	the way something is spread out over an area.
downcycling	verb	recycling material to make a product that is of lower quality than the original.
e-waste	noun	electronic devices or their parts that have been thrown away.
economy	noun	system of production, distribution, and consumption of goods and services.
extraction	noun	process by which natural resources are extracted and removed from the earth.
greenhouse gas	noun	gas in the atmosphere, such as carbon dioxide, methane, water vapor, and ozone, that absorbs solar heat reflected by the surface of the Earth, warming the atmosphere.
hierarchy	noun	identification of certain actions or items as having greater or lesser relative impacts.
landfill	noun	site where garbage is layered with dirt and other absorbing material to prevent contamination of the surrounding land or water.
linear economy	noun	system where raw materials are collected and transformed into products, which are eventually discarded as waste.
lithium	noun	chemical element with the symbol Li; the lightest metal known, often used in lithium-ion batteries.

Term	Part of Speech	Definition
lithium-ion battery	noun	lightweight, high-density rechargeable battery commonly used for electronics.
mineral	noun	inorganic material that has a characteristic chemical composition and specific crystal structure.
mining	noun	process of extracting ore from the Earth.
natural resource	noun	a material that humans take from the natural environment to survive, to satisfy their needs, or to trade with others.
nonrenewable resource	noun	natural resource that exists in a limited supply.
ore	noun	deposit in the Earth of minerals containing valuable metal.
peer review	noun	the many ways in which students can share their creative work with peers for constructive feedback and then use this feedback to revise and improve their work.
production	noun	making or manufacturing of a product from parts or raw materials.
raw material	noun	matter that needs to be processed into a product to use or sell.
recycle	verb	to clean or process in order to make suitable for reuse.
redesign	noun	in the zero-waste hierarchy, modifying how products are produced, sold, and how waste is managed.
renewable resource	noun	resource that can replenish itself at a similar rate to its use by people.
storyboard	noun	panel or series of panels where sketches are arranged in chronological order; used to prepare for a film, TV show, commercial, etc.
upcycle	verb	to recycle one or more items to create an object that is worth more than the original product.
waste	noun	material that has been used and thrown away.
zero waste	noun	process and philosophy that advocates for redesigning products and patterns of consumption with the goal of producing no waste.

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