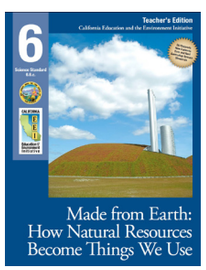
California Education and the Environment Initiative

The EEI Curriculum cohesively integrates science and engineering practices (SEPs), content (disciplinary core ideas/DCIs), and crosscutting concepts (CCs) within its lesson procedures. This preliminary analysis intentionally teases apart the individual SEPs, DCIs, and CCs as a means of correlating the EEI unit with specific performance expectations; however, the EEI lessons weave these components back together to provide three-dimensional learning for students.

Middle School (Grades 6, 7, and 8 in the Integrated Course Model)

6.6.c. - Made from Earth: How Natural Resources Become Things We Use

"Made from Earth: How Natural Resources Become Things We Use" engages students through a story about the manufacturing of surfboards in California as the starting point for students exploring the interactions between the natural resources humans use and the effects of related activities on ecosystem dynamics and interactions. Students engage in engineering practices as they design their own toys and then use what they have learned about the scientific principles of natural resource consumption and ecosystem dynamics to analyze the costs and benefits that may result from the consumption of different resources. In this process they examine the potential impacts on the natural environment of the resource extraction, harvesting, and transportation that would result from manufacturing the designs they have created. Finally, they create an input-output diagram related to the toys that they designed to evaluate the success of their design solution in relation to the effects on the natural environment.



Next Generation Science Standards* Correlation with the California Education and the Environment Initiative (EEI) Curriculum

The EEI Curriculum is a great choice for transitioning to NGSS and contributes toward achievement of the performance expectations for the disciplinary core ideas reflected in the Summary Chart below: MS-LS2 Ecosystems: Interactions, Energy, and Dynamics; MS-PS1 Matter and Its Interactions; MS-ESS3 Earth and Human Activity; and MS-ETS1 Engineering Design. Each EEI unit highlights a small number of performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts. Therefore, the EEI units contribute to students' overall achievement of the performance expectations by the end of a school year, where they will have had multiple opportunities to engage in all appropriate science and engineering practices, disciplinary core ideas, and crosscutting concepts. While EEI was designed to teach the 1998 California science standards to mastery, it reflects the real world interconnections in science and already incorporates many of the paradigm shifts reflected in the NGSS. To learn more about how EEI supports NGSS, visit http://californiaeei.org/NGSSGuides/.

	Next Generation Science Standards											
	MS-LS2			MS-PS1			MS-ESS3			MS-ETS1		
California Connection					✓	✓			✓			
Lesson 1 – Explore surfboard manufacturing as an example of natural resources people use.	✓			✓	✓	✓	✓			✓	✓	
Lesson 2 – Examine the design process and selection of materials for manufacturing.	✓	✓		✓	✓	✓	✓			✓	✓	
Lesson 3 – Identify the sources of natural resources and methods of transporting raw materials.	✓	✓		✓			✓	✓	✓	✓	✓	
Lesson 4 – Compare methods used to extract and harvest natural resources in a mock convention.	✓	✓		✓			✓	✓	✓	✓	✓	
Lesson 5 – Assess how human consumption can influence natural systems.	✓	✓		✓			✓	✓	✓	✓	✓	
Lesson 6 – Create input-output diagrams for the toys students have designed over the course of the unit.	✓			✓			✓	✓	✓	✓	✓	
Traditional Unit Assessment	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
Alternative Unit Assessment	✓	✓		✓	✓	✓	✓	✓	✓	✓		
	SEP	DCI	CC	SEP	DCI	CC	SEP	DCI	CC	SEP	DCI	CC

Correlation Chart Key

SEP (Science and Engineering Practices)
DCI (Disciplinary Core Ideas)
CC (Crosscutting Concepts)

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EEI Unit 6.6.c. - Made from Earth: How Natural Resources Become Things We Use

Disciplinary Core Ideas Supported by this EEI Unit

MS-LS2 Ecosystems: Interactions, Energy, and Dynamics
MS-PS1 Matter and Its Interactions
MS-ESS3 Earth and Human Activity
MS-ETS1 Engineering Design

Performance Expectations	Suggestions for Using the EEI Unit to Support NGSS
MS-LS2-4 *(Grade 7 in the Integrated Course Model):* Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect ecosystems.	Use this unit to have students discover that the extraction, transportation, and use of natural resources can alter ecosystems and populations of organisms living in those ecosystems.
MS-PS1-3 *(Grade 7 in the Integrated Course Model):* Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	Use this unit to have students learn that the process of manufacturing a product includes using natural resources to develop the synthetic materials needed for production, and that the use of natural resources impacts society and natural systems.
MS-ESS3-4 *(8th Grade in the Integrated Course Model):* Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	Use the unit to have students understand that through the process of designing and manufacturing goods for human consumption, Earth's resources are extracted, processed, and transported, and that this process can have a significant effect on natural systems.
MS-ETS1-1 *(6th, 7th, and 8th Grades in the Integrated Course Model):* Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that they may limit possible solutions.	Use this unit to have students understand that as people design and manufacture products, the impacts of natural resources extraction should be considered as humans strive to design products that limit resource use and lessen risks to human and environmental health.

Science and Engineering Practices (SEPs)	Suggestions for Using EEI to Support SEPs	Disciplinary Core Ideas (DCIs)	Suggestions for Using EEI to Support DCIs	Crosscutting Concepts (CCs)	Suggestions for Using EEI to Support CCs
Engaging in Argument from Evidence (MS-LS2-4, MS-ESS3-4)	Use the unit to have students review natural resources that are used in the manufacturing of common objects (Lesson 1). Through the study of design and manufacturing processes, students examine how the extraction and use of natural materials in manufacturing affects people and the environment (Lessons 2 and 3). Have students gather more information on natural resource extraction and consider how all aspects of manufacturing affect natural systems, including the population of living organisms within those ecosystems (Lessons 4 and 5). Have students draw	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience:** Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4) **PS1.B: Chemical Reactions:** Substances react chemically in characteristic ways. In a chemical process, the atoms that make up	Use this unit to have students gather evidence showing that when humans manufacture and use products made from Earth's resources, there can be impacts on natural systems (Lessons 2, 3, and 4). Have students engage in an examination of habitats after resource extraction and consider how plant and animal populations have been negatively impacted as a result of extracting the resources (Lesson 5). Use this unit to have students explore how surfboards are made from natural resources, such as petroleum and silica, which undergo a chemical process to	**Cause and Effect (MS-ESS3-4)**	Use the unit to have students analyze the effects that specific resource extraction will have on ecosystems (Lessons 3 and 4). Have students evaluate before and after pictures of resource extraction sites and consider how different extraction methods have different effects on the environment (Lesson 5). Have students predict the impact their own design solution will have on the environment as they evaluate the relationship between resource extraction and environmental impact (Lesson 6).

Science and Engineering Practices (SEPs)	Suggestions for Using EEI to Support SEPs	Disciplinary Core Ideas (DCIs)	Suggestions for Using EEI to Support DCIs	Crosscutting Concepts (CCs)	Suggestions for Using EEI to Support CCs
	conclusions as to what impacts their designs will have on natural systems (Lesson 6).	the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-3)	become the synthetic materials used to construct surfboards (Lessons 1 and 2).	**Structure and Function (MS-PS1-3)**	Use this unit to have students study the manufacturing process of a surfboard and determine how the surfboard structure can be designed to serve particular consumer wants and needs. Students explore how certain synthetic materials are used in the surfboard manufacturing process to create particular design functions (Lessons 1 and 2).
Asking Questions and Defining Problems (MS-ETS1-1)	Use the unit to have students consider consequences the design and manufacturing process has on Earth's resources (Lessons 1, 2 and 3). Have students define specific impacts directly related to the production, extraction and transportation of natural resources (Lessons 4 and 5). Have students define problems throughout the design process as they develop their own product and apply scientific reasoning regarding cost, resource and energy use, and impacts to natural systems (Lessons 1, 2, and 6).	**ESS3.C: Human Impacts on Earth Systems:** Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise (MS-ESS3-4)	Use the unit to have students calculate the potential distances natural resources and raw materials (such as bauxite and petroleum) must travel to be used in manufacturing (Lesson 3). Have students review the impacts natural resource extraction has on ecosystems (Lesson 4 and 5). Have students consider how choices they make in their own design process can help mitigate negative impacts on Earth (Lesson 6).	**Influence of Science, Engineering, and Technology on Society and the Natural World (MS-PS1-3, MS-ETS1-1)**	Use each lesson in this unit to help students discover that humans depend on natural resources for almost all of their needs, and as humans develop and use technologies to meet those needs, there are consequences to humans and environmental health, such as global warming, water and air pollution, and habitat destruction.
Obtaining, Evaluating, and Communicating Information (MS-PS1-3)	Use this unit to have students read about surfboard manufacturing and chart the steps through which natural resources become objects useful to people (Lesson 1). Throughout the unit, students will gather additional information about the manufacturing process that they can use to evaluate the costs and benefits of the surfboard (Lessons 1 through 6).	**ETS1.A: Defining and Delimiting Engineering Problems:** The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and the other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)	Use the unit to have students explore how problems associated with the design and manufacturing process include impacts to natural systems (Lessons 1, 2 and 3). Guide students to evaluate the success of a design solution as they consider environmental impacts to people and on the environment (Lessons 4, 5, and 6).		