

Sample Natural Resource Lesson Module
Healing Earth

The *Healing Earth* team asks that when you use any aspect of this lesson module that you please send an email sharing: 1) how you used the resource, 2) how your students responded to the resource, activity, or lesson, and 3) what changes you would recommend for future versions. Please email Dr. Michael Schuck (mschuck@luc.edu) and Dr. Nancy Tuchman (ntuchma@luc.edu). The information that you share will help improve these resources for your and others' use. We appreciate your feedback.

Instruction Level	Approx. Time (min)	Activities	Materials Needed	Main Content Area(s)
ENGAGE	45-60	<p><i>Relevant sections of the Natural Resources Chapter: "Earth: A Terrestrial Planet," "Natural Resources and Spirituality"</i></p> <p>Is there a natural area close to your school related to natural resources, such as a mine, a cave, a forest, a farm, a river or lake, a prairie, or something else? Consider taking your students to visit this area or assigning them to visit an area on their own. While visiting the location, tell your students to make a list of all the natural resources they can see or that they know are present nearby (at least five resources). For each of these resources, assign them to write a specific statement of gratitude for how the resource supports the area, such as: "I am grateful for this grass, which uses the sun's energy to convert carbon dioxide and other chemicals into plant matter to nourish the soil and animals in this region." Sit in a circle as a class and ask each student to read one of their statements out loud, with the whole class responding after each statement by saying, "We are grateful for _____," filling in the blank with the name of each natural resource. For Christian and Jewish students, this type of verbal list might be familiar as a litany prayer.</p> <p>Have the students turn in their five statements to be graded. This activity should help prompt students to consider the physical locations of natural resources and to frame this chapter in a spirit of gratitude. You should also be able to tell how much students know about particular resources and their purposes by the ways they choose to phrase their statement of gratitude.</p>	Paper or a journal for students to write on	Spirituality

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EXPLORE	90	<p><i>Relevant sections of the Natural Resources Chapter: “Earth: A Terrestrial Planet,” “How Matter Cycles on Earth – The Biogeochemical Cycles,” “Earth’s Finite Resources and Human Extraction”</i></p> <p>After your students have a chance to read about the spheres and biogeochemical cycles, tell them that they will be exploring visual evidence of these spheres and cycles through photographs taken from outer space. Split the students into groups of three or four and have them go online to the Astronaut Photography Gateway (http://eol.jsc.nasa.gov). They should search for key words to find examples of each of the spheres mentioned in this chapter (hydrosphere, lithosphere, atmosphere, biosphere). For example, they could search “forest” for the biosphere or “mountain” for the lithosphere. Searching simply “lithosphere” would not work though. Alternatively, they can search on the interactive map in locations they expect evidence of each sphere to be shown. Have them compile one image of each sphere into a single document or presentation to be presented to the class later. They should be prepared to explain how each picture highlights the particular sphere.</p> <p>Then, tell them to review the four biogeochemical cycles included in the chapter (Carbon, Nitrogen, Phosphorous, and Sulfur). In their small groups, they should brainstorm a list of key words or locations to search for images showing examples of locations of the cycles. They can then search for images to show one part of each of the cycles. It might be helpful for your students to crop the images for a more focused example, or they might need to imagine where these cycles might take place but not be directly visible, such as oceanic sulfur. Encourage them to be creative and not find the easiest example for each. Again have them compile their four images into a document or presentation. If groups have extra time, have them find additional examples of different parts of each cycle. Challenge them to find images to display a complete, closed loop for any of the cycles.</p> <p>When all groups have finished, allow them to present their images to the class, explaining the visual evidence they found for each sphere and cycle. If there is</p>		Science

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		<p>extra time, consider having the class compile their images to make a collage of each sphere or a diagram for each cycle, showing the flow of chemicals between the images, stimulating cooperative spirit and collective construction, avoiding competition between groups. The final results could be shared with students from other classes, teachers, and parents.</p>		
EXPLAIN	<p>30-50</p> <p>30 (plus individual time for students)</p>	<p><i>Relevant sections of the Natural Resources Chapter: “Earth’s Elements,” “How Matter Cycles on Earth – The Biogeochemical Cycles”</i></p> <p>This activity will allow students to dive deeper into one of the biogeochemical cycles. First, depending on your students’ chemistry background, prepare a presentation including information about chemical processes in nature, focusing on the ways that individual atoms are rearranged and transported, but not created or destroyed. When students have read the relevant sections from <i>HE</i> and have an initial grasp on chemical processes, move on to the activity.</p> <p>Primo Levi was an Italian chemist and author. His book <i>the Periodic Table</i> includes an imaginative story about an atom of carbon travelling around the world through various chemical processes. Give the reading to your students as homework. Then, assign them to pick one type of atom (Carbon, Nitrogen, Phosphorous, or Sulfur) and write a short story in the style of Primo Levi, imagining one of these atoms travelling through a biogeochemical cycle as described in the Natural Resources chapter, beginning with a natural source of the element. The story should be 1-2 pages in length and include at least 10 different chemical processes, with realistic timescales for each process. As an additional challenge, encourage them to try to incorporate different geographic locations mentioned in <i>HE</i> into their stories, or they could choose to base their story on the photos they found in the “Explore” activity.</p> <p>Their stories can be evaluated for scientific accuracy and completeness. Consider reading out loud some excellent examples for the class or displaying well-written quotes from a few of their stories in your classroom.</p>	<p>Digital or physical copies of the story found at https://transitionnetwork.org/sites/www.transitionnetwork.org/files/CarbonStoryByPrimoLevi.pdf</p>	<p>Science</p>

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EVALUATE	90+ for individual student research	<p><i>Relevant sections of the Natural Resources Chapter: “Case Study: Coltan and Cell Phones,” “The Future of Our Resources: Sustainability & Innovation,” “Action Ideas”</i></p> <p>The case study mentions one example of a little-known story behind the natural resources use to make a product many people use every day. Other products must also be made from natural resources with their own stories, sources, and potential ethical issues. Our purchase and use of consumer products depends on the availability of these natural resources. A helpful introduction to this activity is the 20-minute video “Story of Stuff” available at http://storyofstuff.org/movies/story-of-stuff/. After watching the video, ask your students to think of one product they buy or use regularly. Examples include: blue jeans, cell phones, toothpaste, coffee (including both the cups and coffee beans), take-out food and containers, pens or pencils, or plastic water bottles. Assign them to research the natural resources that contribute to these products, considering the following questions: What natural resources are used to create this product including any packaging? What are the main chemicals or elements in these resources? Where might these resources come from? How are the resources transported to be processed or manufactured and sent to you? What happens after the product is used? How are leftover materials disposed? Ultimately, have the students come up with ideas about how their personal actions can be more sustainable by using less resources or by using resources more efficiently, based on their research of this product. Can they buy more locally? Can they bring a reusable cup or bottle? Should they buy paper rather than plastic? Remind them that it is usually preferable to reduce rather than reuse, to reuse rather than recycle, and to recycle rather than throw out. There can be a lot of pseudo-science or confusing information involved in consumer products, or the information might be hard to find since companies might not want to disclose all of their manufacturing information. You might need to give students advice about where to find valid information, or students might need to choose a different consumer product based on what information they are able to find.</p>		Global Awareness, Action
	Depends	After conducting their research, students should put together a short, 5-minute		

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	on class size	presentation or recorded video explaining the natural resources used in their chosen product and their proposed action ideas to use this product more sustainably. These presentations should help students to think about the backgrounds of the products they use and how their daily actions can affect the world. You could also review their written reflections on each of the previous questions in order to assess their progress towards awareness.		
ELABORATE		<p><i>Relevant sections of the Natural Resources Chapter: “Natural Resources and Ethics”</i></p> <p>Make sure your students read the sections in the chapter related to the tragedy of the commons and the universal destination of goods. Perhaps have one or two students define these ideas and give an example in their own words before beginning this part of the lesson.</p>	Posters, markers, notecards or sticky-notes	Ethics
	20	<p>Is there a shared space such as a cafeteria, a park, athletic field, or a library in or near your school that is regularly used by different groups of people? Your students should all be familiar with this area for the activity to work best. Consider using the space from the Engage activity as one example. Ask them to imagine first that no one owned that space and that there were no rules about how, when, and by whom it could be used. Discuss with your students what might then happen to the space if several groups (teams, clubs, other schools, or community organizations) tried to use that space at the same time. Their answers might include that the space would be crowded and possibly ruined after several days or weeks. Prompt them to consider if any group would take responsibility for cleaning the space or not. Explain this destructive competition for the space as one dimension of the tragedy of the commons: that groups with their own interests for a space or natural resource might not take into consideration how other groups also need to use that resource, and they may end up collectively damaging the resource to the detriment of all. It is important to note that these groups may not have bad intentions, but they still might end up ruining the resource for everyone.</p>		
	45	Next, have your students imagine that your school (or class, club, or team) has		

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	20	<p>been asked to develop a plan for how to share this space. Ask your students to draft a plan for how they would manage this shared space most efficiently to meet all the needs of each group. Would they limit groups to certain hours? Would certain groups get priority? How would cleaning or maintaining the space be provided? They should create a poster to hang in the classroom, outlining their plan. Then allow students a few minutes to walk around the room, look at each poster, and offer a comment on a notecard or sticky-note to put on or near each poster about what works well or what could be improved.</p> <p>Finally, extend the discussion of managing shared space to managing natural resources around the world. Ask your students to discuss with a partner one natural resource from this chapter for which the tragedy of the commons might be an issue and why they think so. Some examples to mention if students need more guidance are: privatization of water by drink companies, deforestation of the Amazon or other forests, overfishing in marine areas, or the competition for oil, coal, and natural gas. Have the students write the names of their chosen resource on the board. As a large group, discuss how enforceable rules and mutual sharing of natural resources can regulate the way natural resources are used, both in positive and negative ways. It will be an important lesson for your students to grapple with the inadequacy of rules and regulations to solve problems related to governing shared resources. Sometimes there are no perfect solutions, but resources can often be better managed through collective action in consideration of the common good rather than an individual's or group's limited interests.</p>		