Chapter (Lesson) 6. Energy

Lesson Six Intentions:

- Students examine the relationship between energy-Earth-humans.
- Students consider social-environmental impacts of energy use and who is most harmed by fossil fuels.
- Students explore connections between oil-energy-plastic.
- Students reflect on their own community/community action.

Lesson Six Overview:

While many sources often talk about different forms of energy, matter (all atoms, molecules and the very substance of mountains, oceans, the atmosphere, and our bodies) is actually **light** that has condensed under pressure and heat to become protons, neutrons and electrons. And, we are all the light and energy of stars in another form; the echoes and evolution of stardust. **How do we become aware of this relationship? Who has the opportunity to know themselves in this way, or to think about the origins and impacts of energy?** What can we learn from thinking more deeply about this,, and what is our relationship to energy (solar and otherwise)? This lesson invites students to explore what "energy" is, where electricity comes from, and how different communities access, utilize, and generate the energy needed to live? What difference does it make how we relate to energy. Or, from another angle, **what kind of energy do we bring to the world by the choices we make and by our sense of agency to address choices that harm communities ?** What might our relationship to "non-renewable" and "renewable" energy show us about how we are, and could be, living; and who is most impacted by these decisions about energy use? Dependence on fossil fuels has devastating effects on the planet and communities – why and how?

Key Themes:

- ➔ Reflection, observation and dialogue
- ➔ Human impact on the natural world and human communities
- ➔ The origin, production and use of energy and electricity
- ➔ Relationship between fossil fuels and pollution, and between fossil fuels and plastic
- ➔ Changes and innovations in energy use

Duration: *This lesson is designed for 30 mins., but can be done in 15-20, or expanded to 45-80 mins.*

Lesson Components:

- Slides (in Google slides format; adaptable for educator needs/preferences)
- VIDEO: "A Guide to the Energy of the Earth"; "Bottle, Bottle"; "Happening"; "Community Power AZ"
- WRITING/REFLECTION: environmental justice
- Resources and extension ideas (see end of lesson)

Materials:

- Educators: Lesson PDF, access to online media (for video viewing), slide deck (customizable)
- Students: pencil/pen and paper

Connections (see extensions/resources and standards below; full standards for this project here):

Justice, Environment; Film, Reading/Writing; History; STEM
Mini-challenge (can be used as a way of assignment/assessment); Further Reading; Watching; Exercises

What is Energy?

Slide 3

Invite students to consider and discuss: **What is** "**energy"**?

Scientists describe energy as the ability of a body or system to do work. Energy is all around us and is constantly changing. When you feel the warmth of the sun on your back, you're enjoying the heat energy from the sun. If you cook over a campfire, you're using heat energy converted from the stored energy in the wood you're burning. There is energy in the food that we eat. This energy comes from plants that absorbed, converted and used the energy from the sun. And there is the energy we use making electricity...

Where does electricity come from?

Slide 4

Continuing further, invite students to consider and discuss: **Where does electricity come from?**
And, why does it matter?

Have you ever considered……?

- Why do you need and use electricity?
- What would life be/was life like without electricity? What was different 100 years ago, or even 20 years ago?
- How is energy/electricity *production* important for the future–for the Earth and communities?

Slide 5

A Guide to the Energy of the Earth
(video)

You might show the short TEDEd video ***A Guide to the Energy of the Earth***, which explores where energy comes from and how it's used, from the food chain to electricity and technology.

How much do we know about energy?

What about energy use?
(Could do as small group activity)
Slide 6

What About Energy Uses?

- Energy consumption in the U.S. is_____every 20 years!
- The U.S. uses around_____of the world's energy, yet only holds about 5% of the world's population.
- K-12 schools in the U.S. spend more than 6 ____ dollars on energy use.
- It's estimated that the U.S. spends more than $300 billion a year on energy that goes to drafty doors and windows, inefficient appliances or other energy _____ that could be easily remedied.
- Currently, non-renewable fuels (which include coal, oil, and natural gas) supply about _____percent of the world's energy.
- Decomposing plants and other organisms, buried beneath layers of sediment and rock, have taken millennia to become the carbon-rich deposits we now call_____.

Answers:

doubling
25%
billion
wasters
80%
fossil fuels

* See link in "non-renewable" or HERE for a National Geographic resource on renewal/non-renewable energy.

Fossil fuels and plastic
(video)
Slide 7

Fossil fuels not only power our lives, producing electricity and heat, and powering engines, over 99% of plastic is made of chemicals from **fossil fuels**, found in the Earth–the fossil fuel and plastic industries are connected (In how many ways?).

As just one example of the impact of this connection, you might show Stories student video ***Bottle, Bottle*.**

- What stood out to you in this video?
- How was the story of plastic bottle told? Was it effective?
- What about the story of a plastic spoon (where would it begin/end)?
  - Who would/could tell this story?
- What about the story of a plastic bag (where would it begin/end)?
  - How could this story be told without words?
- For whom is it easy to find and purchase a metal spoon? For whom is it not?
- Why might you have to rely more on "single-use" plastics?

Energy use and impact

Slide 8

"I was more than a decade into being an environmental activist when I saw it: **energy. It was everywhere**. In the fuel for our cars, in the fertilizer in our food, in the plastics at the grocery store, in the electricity lighting our homes. We were relying on fossil fuels for everything.

Once I learned to see them, I could find fossil fuels wherever I looked. And it wasn't hard to see their harms either: coal, oil, and gas make people pick, pump pollution into our air and water, and push up carbon concentrations in our atmosphere, driving dangerous weather." And the impact on communities is *not* the same."

– Dr. Leah Cardamore Stokes (policy expert on energy and climate change)

- Thoughts about anything that is being shared here?
- Have you had an experience where you start to notice something, and then notice it "everywhere"?
- What changes in our attention that we start to "see" something that was already there, but we were not noticing yet, or were not willing to look?
- What does it mean that the "impact on communities is *not* the same"?

Environmental justice

(video) **Slide 9**

It is increasingly understood and recognized that pollution and climate change negatively affect people's health and quality of life around the world. But what is not as frequently talked about or made clear is which people and communities are most exposed and impacted, and why. Show ***Environmental Justice, explained.***

- How did this video make you feel?
- What information stayed with you, if anything? Or was it something different that most affected you?
- What questions are you left with?
- Have you heard the term "differential impact" or "frontline communities"?
    - What do you think are some of the underlying reasons for differences in impact?
- How might/can thinking about "differential impact" change how we talk about, research, create solutions?

Solutions

Slide 10

What solutions exist? That protect + support all people and communities?
How do we begin to see energy differently?

As a possible extension, students might try this game in envisioning solutions: HERE.

Slide 11

Community Power Arizona and Happening (videos)

To move further into research and discussion of solutions and shifting to clean energy sources and practices, show the short videoCommunity Power Arizona, a video that links clean energy with community health and community activism. You also might show the trailer from the film ***Happening: A Clean Energy Revolution***.

Filmmaker James Redford embarks on a colorful personal journey into the dawn of the clean energy era as it creates jobs, turns profits, and makes communities stronger and healthier across the US. Unlikely entrepreneurs in communities from Georgetown, TX to Buffalo, NY reveal pioneering **clean energy solutions** while James' discovery of how clean energy works, and what it means at a personal level, becomes the audiences' discovery too. Reaching well beyond a great story of technology and innovation, "Happening" explores issues of human resilience, social justice, embracing the future, and finding hope for our survival.

* Please contact the Redford Stories Project if you are interested in access to *Happening* and curriculum developed for this film.

Slide 12

★**Lesson Six Challenge Prep: Visual Communication**

Watch the following clips as examples from the film Watershed:

Watershed Intro Sequence

Water Basin

Introduction:

We have all experienced information communicated visually. What is an example of information or data that is presented visually? Perhaps graphs, charts, elevation maps?

As visual storytellers, you may want to show places, concepts, or information that is difficult to demonstrate literally or access easily. Sometimes, a simple reference visual or an artistic rendering of a concept can be the most effective way to demonstrate ideas that we may not have access to.

For example, in this lesson, we have discussed different types of energy, but how can you show energy? What does it look like? You might think of electricity waves or an outlet on the wall, but does that really reflect "clean energy?" In the TED video, we saw the use of animation, but that process might not be possible for everyone. What if you wanted to show how wind power works but there are no wind power facilities where you live or maybe you can't get permission to film near one. This is where art becomes a practical solution. In this exercise we will explore how to create supporting visuals using artwork or abstract references.

In the film, Watershed, it would have been impossible to show the time lapse of historical water displacement over time. The filmmakers utilized dirt, sand, and stop motion to recreate the feeling of a time-lapse and a historical passage of time.

Assignment:

Make a 1 minute video that demonstrates a type of renewable energy and how it works.

Suggested ideas:

- Make a paper windmill to demonstrate wind energy. Film it and add text or voice over to explain how wind power works.
- Film a video of yourself drawing the process of solar panels and then speed up the video so it functions like a time-lapse.

Suggested Standards: Language Arts and History/Social Studies

This lesson gives students multiple opportunities to engage with **language, images and text**, with particular focus on how point of view impacts the story one tells. Students also have a chance to reflect on their own experience and point of view in **conversation and writing.**

CCSS.ELA-LITERACY.CCRA.R.7
Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

CCSS.ELA-LITERACY.CCRA.SL.2
Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

CCSS.ELA-LITERACY.CCRA.L.3
Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

CCSS.ELA-LITERACY.CCRA.W.6
Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

CCSS.ELA-LITERACY.CCRA.W.7
Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

CCSS.ELA-LITERACY.CCRA.W.9
Draw evidence from literary or informational texts to support analysis, reflection, and research.

CCSS.ELA-LITERACY.CCRA.SL.1
Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

CCSS.ELA-LITERACY.CCRA.SL.2
Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

CCSS.ELA-LITERACY.CCRA.SL.4
Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

Suggested Standards: STEM (Science, Technology, Engineering, Math)

Throughout this lesson students are encouraged to understand the primacy of **observation**, and the need to attend closely to **patterns and relationship**s, and to be able to envision **the impact of actions**.

- Patterns and relationships
- Precision and depth in observation
- Inference and probability
- Ratios and proportional relationships

Suggested Connections: NGSS/Environment

Students are encouraged to make connections between the health of natural systems and the health of human beings and human communities. In addition, phenomena and change may be observable at one scale and not another, or may require a different way of inquiry and attention to detect and understand.

- Health of human lives and health of natural systems
- Flow of energy and matter at the scale of the entire planet
- Exchange of matter between natural systems and human societies affects long-term functioning of both
- Phenomena that can be observed at one scale may not be noticed/observable at another scale
- Systems interact with other systems
- Stability might be disturbed either by sudden events or gradual changes that accumulate over time

Suggested Connections: Social Justice

The integration of perspectives and voices in this lesson is intended to encourage greater appreciation for the depth of **one's own identity**, and **respectful curiosity about others' lived experience**.

Diversity. Students will respectfully express curiosity about the history and lived experiences of others and will exchange ideas and beliefs in an open-minded way.

Action. Students will recognize their own responsibility to stand up to… injustice.

Suggested Connections: Social Emotional Learning Competencies

Components of this lesson are meant to support students' sense of **confidence and agency**, as well as their social-awareness and sense for relationships; as well as how much relationships need tending, both with **respect** to our relationship with the natural world and each other.

- Self-awareness (confidence, self-efficacy)
- Social-awareness (perspective-taking, appreciating diversity, respect for others)
- Social skills (communication, relationship building)
- Responsible decision-making (evaluating, reflecting)

Suggested Connections: UN Sustainability Goals

(*Click the images to go to pages on the UN's website that detail the goals and intentions behind each.)