



The History of Bioenergy: A Timeline Puzzle

Objectives: Students will recognize the sources of bioenergy and be able to explain the evolution of bioenergy over time.

Oklahoma Academic Standards:

Science: 4.PS3.2; 4.ESS3.1; 5.ESS3.1 ; 5.PS3.1

Teacher Background:

Bioenergy is a form of renewable energy that comes from recently living organic materials known as biomass. Biomass can be derived from plant or algae based materials and includes things such as crop and food waste, forest residue, microalgae, and purposefully grown grasses and energy crops. Biomass provides us with biofuels, biopower, and bioproducts that are used for transportation, heat and electricity, and many industrial products such as plastics. Biomass has been used for over 100,000 years to generate energy (heat) for humans. Throughout history the use of biomass to create bioenergy has continued to evolve. Currently, the United States is looking to bioenergy to reduce dependency on foreign oil exports and fossil fuels, provide increased domestic clean energy, generate U.S. jobs, and revitalize rural communities. By completing this lesson, students will recognize the sources of bioenergy and how its use has changed over time.

Important Vocabulary:

Biomass: organic matter used as a fuel

Bioenergy: renewable energy produced by living organisms

Biofuel: a fuel derived directly from living matter

Biopower: technologies used to convert biomass fuels into electricity and heat

Bioproducts: everyday commodities made from biomass

Fossil Fuel: a natural fuel, such as coal or gas, formed in the geologic past from the remains of living organisms

Renewable Energy: energy from a source that is not depleted when used

Materials:

- [Bioenergy History Cards](#) (1 printed set per group of 3-4 students)
- [Bioenergy History Slides](#)

Optional Materials:

- Chromebooks, iPads, books, or preprinted articles about biomass
- Full of Beans: Henry Ford Grows a Car- book by Peggy Thomas

Bioenergy: *From Field to Fuel*

Lesson:

1. Prior to students arriving, print one set of [Bioenergy History Cards](#) for each group of 3-4. Cut the cards and fold on dotted line if you would like to provide them with hints. Otherwise, just cut out the images.
2. Ask students: What is energy? How do we get energy?
 - a. Accept all answers. They may recognize energy in the form of electricity or driving our cars. It could also be energy in their bodies from eating food. Guide students to realize that energy is power (physical or chemical) and that we get energy from other things.
3. Explain to students that bioenergy is a form of energy that comes from recently living organic materials. We call these materials biomass.
 - a. Point out that the prefix BIO means LIFE.
4. Ask students: What are some example of life or living things? Do you think they could be used to produce energy?
 - a. Accept all answers
5. Tell students that humans have used biomass to produce heat and light (energy) for thousands of years! Over time we have begun to utilize more biomass sources and use them for different forms of energy!
6. Pass out the Bioenergy History image cards to groups of 3-4.
7. Have students work together to put the cards in chronological order (based on historic record) of which biomass sources were used by humans from oldest to the most recent. Once complete, review the answers with them.
 - a. You may utilize the [Bioenergy History Slides](#) to help you. Feel free to make a copy and edit the information to meet the academic needs of your students.
 - b. You may end the lesson here with wrapping up what biomass is, how we use biomass to produce bioenergy, and telling them about the important role it plays in transportation, heat and electricity production, and its use for bioproducts (plastics, etc).

Extension Opportunities:

- To give a more specific example of biomass use in society read the book: Full of Beans: Henry Ford Grows a Car by, Peggy Thomas.
- Provide students with Chromebooks, iPads, pre-printed articles, or books about bioenergy and biomass sources. Have them research a biomass source and create a drawing or poster about how we use that source for energy.

Bioenergy: *From Field to Fuel*

Information Sources:

Algae Basics - history of algae as fuel. (n.d.). Retrieved July 1, 2022, from <http://allaboutalgae.com/history/>

Bioenergy Basics. Energy.gov. (n.d.). Retrieved July 1, 2022, from <https://www.energy.gov/eere/bioenergy/bioenergy-basics>

Biofuels: The promise of algae. BIO. (n.d.). Retrieved July 1, 2022, from <https://archive.bio.org/articles/biofuels-promise-algae>

Lecture 1: Early bioenergy history. College of Agricultural Sciences. (2018, September 27). Retrieved July 1, 2022, from <https://agsci.oregonstate.edu/bioenergy-education/lecture-1-early-bioenergy-history>

Seidel, K. (2021, August 9). *The history of biomass as a renewable energy source*. Cablevey® Conveyors. Retrieved July 1, 2022, from <https://cablevey.com/the-history-of-biomass-as-a-renewable-energy-source/>

Image Sources:

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