Litter and Fuels and Earth, Oh My!

Learning Objectives:
- Understand the energy cycle and make connection to how energy drives the modern day life style
- Learn the common sources of energy and their environmental impact
- Identify polluting factors and how to manage and prevent environmental damage

Key Vocabulary:
- Energy
- Fuel
- Renewable resource
- Nonrenewable resource
- Fossil fuels
- Greenhouse Gas
- Atmosphere
- Litter

INTRODUCTION (15 MIN. OPEN DISCUSSION)

Name some tasks that you do daily that involves using some sort of modern day invention.

Sample answers
- Turning on the sink to brush your teeth
  —modern plumbing, water delivered from a reserve, plastic toothbrush
- Showering
  —tons of fresh water from reserves
- Opening and closing the fridge
  —electricity to keep the AC in fridge extra cold
- Cooking food on the stove/oven
  —gas stove uses methane to light, electric uses power outlets
- Using the toaster
- Driving
  —have to put gas in it every few days, comes from oil
- Charging your phone

All of these things require ENERGY to work. Our lives revolve around the cycle of energy.

Where does the energy for these appliances/devices come from? *Fuel.*
Note: the likely answer will be electricity, ask where electricity comes from

Sample answers
- Coal
- Solar panels
- Wind turbines
- Oil (makes plastics, polyethylene, gas, etc.)
- Natural gas
- Hydroelectric
- Geothermal
- Nuclear

15-20 min Background Info.

Many of these fuel sources do not belong in the same category. **Two primary kinds of resources makes up our total reservoir of fuel.**
Non-renewable and renewable resources.

Most of our energy comes from burning non-renewable resources, mainly fossil fuels such as natural gas, oil, and coal. Using these resources emits greenhouse gases into the atmosphere that retain heat and in turn, warm the planet.

Which source of greenhouse gases is the most prevalent?
Electricity (29%), Transportation (27%), Industry/Manufacturing (21%), Commercial/Residential Activity (12%), and *Agriculture (9%)* are the major sources of greenhouse gas emissions.

Carbon dioxide, water vapor, methane, and nitrous oxide are amongst the most abundant greenhouse gases released into our atmosphere, which in time, thin its layers and allows more harmful solar rays to enter the Earth.

List the layers of the atmosphere and briefly describe their functions.
[Mini-Activity] Have students act out each layer.
Troposphere — the first layer, weather occurs here
Stratosphere — houses the ozone layer, which basically acts as the Earth's sunscreen
Mesosphere — comets and other space material burn up here
Thermosphere— space shuttle orbits here
Exosphere — thin merger between our atmosphere and space

But! The Earth has whole ecosystems that take in CO2 and convert it into O2, or oxygen, and pump it out into the atmosphere for us to breathe. According to NASA, forests and other land vegetation currently remove up to **30 percent** of human carbon dioxide emissions from the atmosphere during photosynthesis.

What if something were to affect how these ecosystems grew and functioned? *In comes litter!*

How does litter affect our environment? Litter may not seem like a huge problem when you think of one person doing it, but think of how many people litter daily. Ever seen a garbage truck on the highway with its trunk improperly covered, letting a trail of trash escape as it makes its way to the landfill?

Land litter smothers plants and leaks nasty byproducts into our soil that directly affects us and the rest of the organisms that share our ecosystem. Litter can start fires, harm the microflora of soil, and harm animals that can ingest it. It can also contaminate groundwater, aka our drinking water. Litter can clog storm water drains, leading to flash flooding on our roadways. Contaminated water increases the chance of algal blooms that asphyxiate fish and other marine creatures.

Polluting Biodomes

Materials:	Procedure:
64 oz. Jar	1. Lay the jar horizontally on a flat surface. Place a layer of gravel at the bottom and fill about 1/5 of the way with soil. Repeat this 2 other times with the other 2 jars.
150 Watt Lamp	2. Layer the first jar with plants, plant of few other ones in the second jar, and leave the third jar barren.
Assorted Small Plants	3. Fill in the remaining space of the second jar with the assorted litter and cover the soil of the third jar with the remaining litter.
Thermometer	4. Place a lamp at the base of each jar, covering the sides of the last jar with aluminum foil. Place a thermometer in the soil of each jar.
Soil	5. Tie a funnel around the opening of the jar so that it hangs off the side of your surface, with the stem leading to a smaller jar on the floor.
Varied Litter	6. Water each jar mildly and allow half an hour for the water to drain out. Observe any difference, take the pH of the water collected, and read the temperature in each thermometer.
Aluminum Foil	
Funnel	
Litmus Paper	

Reinforcement. Take the 30 minutes of waiting as an opportunity for students to share their hypothesis and back up their statements using the appropriate background information. Refer the students to current issues in Miami's community, tying all the concepts to problems occurring on the local level.

Wrap-Up! After the students have written down their observations and completed a concluding discussion about the results, review the learning objective by asking the students what new information they have learned and reviewing the key vocabulary words.