**Day 6**

**Title: Biofuel Production & the Cycle of Life**

Monday Week 2

**Length of Time:**

1 class period between 45-50 minutes

**Environment:**

The classroom desks will be in a half circle. Students will be working around the perimeter of the room going to stations.

**Standards:**

**Indiana State Biology I Standards**

\*B.3.1 Describe how some organisms capture the sun’s energy through the process of photosynthesis by converting carbon dioxide and water into high-energy compounds and releasing oxygen.  
  
\*B.3.2 Describe how most organisms can combine and recombine the elements contained in sugar molecules into a variety of biologically essential compounds by utilizing the energy from cellular respiration.  
  
\*B.3.4 Describe how matter cycles through an ecosystem by way of food chains and food webs and how organisms convert that matter into a variety of organic molecules to be used in part in their own cellular structures.  
  
\*B.3.5 Describe how energy from the sun flows through an ecosystem by way of food chains and food webs and how only a small portion of that energy is used by individual organisms while the majority is lost as heat.

\*B.4.1 Explain that the amount of life environments can support is limited by the available energy, water, oxygen and minerals and by the ability of ecosystems to recycle the remains of dead organisms.

\*B.4.2 Describe how human activities and natural phenomena can change the flow and of matter and energy in an ecosystem and how those changes impact other species

**Biofuels Standards**

Students will be able to diagram the processes involved in biofuel production.  
  
Students will be able to describe and evaluate the trade- offs of land use and discuss the need for conservation.

**21st Century Skills**

Critical thinking  
  
Communication  
  
Creativity  
  
Collaboration

**Objectives:**

Students will investigate the various biomass plants being used and for use in the future. Then, students will investigate how biomass is transformed into biofuel. Students will explore the materials and resources required to make biofuels. Finally, groups will decide if their chosen biofuel is the best use of their available community land.

Students will be able to describe the process of photosynthesis and how it contributes to the flow of energy in the biosphere.  
  
Students will be able to describe the process of cellular respiration and its importance in the production of energy for every organism.  
  
Students will be able to evaluate the carbon cycle lab in order to predict levels of carbon dioxide in the atmosphere.  
  
Students will be able to describe how the increasing use of fossil fuels.   
  
Students will be able to discuss the interdependence and dynamic equilibrium among organisms, energy, matter, water, oxygen and minerals in the earth’s biosphere, lithosphere, atmosphere and hydrosphere after completing the carbon cycle activity.  
  
Students will apply concepts taken from the carbon cycle activity to predict how future human activities will affect atmospheric carbon including the impact of biofuels.

Students will investigate the various biomass plants being used and possibly used, and then investigate how it is transformed into biofuel. Students will then look at the materials and resources required to make biofuels and decide if their biofuel is the best use of community land.

**Materials:**

Computers

Life cycle analysis handouts

White boards or large post its

Dry erase markers

**Opening:**

As students enter the classroom, the teacher can hand out half sheets of paper with the bell ringer question printed on it. When students sit down, they write down their answer to the question, “What would be the characteristics of a “good” plant for biofuel production?”

Another alternative is that the bell ringer can be written out on the dry erase board and the students can enter the classroom and write their response in their science journals.

**General Procedure**:

Students will do a KWL activity over biofuel production.

For the Life Cycle activity, students will pick their own groups of three to four members. Students go to an assigned station and identify the energy inputs and carbon inputs as well as the energy outputs and carbon outputs. The student learns the process involved for each conversion.

**Assessment:**

At the end of the class, students will do an exit ticket question/journal reflection and a Life Cycle analysis of a specific type of biofuel.

The exit ticket question is: “what information do you still need in order to make a recommendation about using community land to raise crops for biofuel productions?”

The teacher can choose to use the exit tickets to quickly check in with the students’ correct understanding of the content and, if needed, plan for any additional reinforcement activities or posthole materials for the next class session. Or, the teacher can grade the students’ science journal entry (response to the exit ticket/reflection question).

In the same manner, the teacher can either grade the students’ Life Cycle analysis of a specific type of biofuel or use the activity as a beginning for a discussion to wrap up the class content.