The Transformation and Use of Different Types of Energy Using Local Flora and Fauna in a Vietnam Village Setting

Submitted by: Tom Weir
Subject: Science>
Grade: 8
Time required: 5 - 7 Days

State of Michigan Science Benchmarks:

1.1.MS.1	Generate scientific questions about the world based on observation
1.1.MS.2	Design and conduct scientific investigations
1.1.MS.3	Use tools and equipment appropriate to scientific investigations
1.1.MS.4	Use Metric measurements devices to provide consistency in an investigation
1.1.MS.5	Use sources of information in support of scientific investigations
II.1.MS.3	Show how common themes of science and technology apply in real world context.
II.1.MS.4	Describe the advantages and risks of new technologies.
III.5.MS.2	Describe how all organisms acquire energy directly or indirectly from the sun
III.5.MS.5	Explain how humans use and benefit from plant and animal materials
III.6.MS.6	Describe ways in which humans alter the environment
IV.2.MS.2	Describe common chemical changes in terms of properties of reactants and Products
IV.3.MS.4	Describe common energy transformations in everyday situations

Materials Required:

1. A source of animal manure
2. A large heavy duty plastic bag
3. Tubing or garden hose

4. Bunsen burner and matches
5. map of Vietnam

Background:

Here I will expound upon the farming practices whereby manure from pigs is placed into a septic tank and the methane gas which is produced is stored and then utilized in the homes as a fuel to cook the daily meals. This methane gas reduces the need for wood to fuel the stoves thereby reducing deforestation. The waste from the septic tank is allowed to flow into a dugout pond where the excrement promotes the growth of two types of algae. Fish are placed into the pond wherein they feed and grow utilizing the algae. Upon maturity the larger fish are netted and sold at the market or are placed into the flooded rice fields. In the rice fields, the fish eat slugs, mosquito larva, and other rice plant parasites thereby reducing the need for pesticides to be sprayed onto the growing rice crop as well as reducing the vectors for Malaria and Denge Fever. Upon maturity of the rice, the fish are collected and returned to their breeding ponds or sold.

Activity:

This activity is done in conjunction with our High School Agriculture classes who raise pigs in a barn located between the High School and Middle School and therefore the pig manure is readily accessible. Manure is collected and placed into a large garbage bag and enough water is added to create a liquid mixture. Tubing is inserted into the open end of the bag and the opening is secured tightly around the tubing so that none of the methane gas can escape. At the other end of the tubing a Bunsen burner is connected. The methane gas will be used to fuel and sustain a flame in the Bunsen burner. The students will then roast marshmallows over the flame. Two primary objectives (benchmarks) will be accomplished by this activity. The first is that students will reinforce the concept that the sun is the ultimate source of energy for living things. The energy of the sun will be transformed into chemical energy as plants grow and then are fed to the pigs whereby the food again becomes chemical energy in the form of methane gas. The methane gas is burned to create heat and light energy (See benchmark IV.3.MS.4). Describe common energy transformations in everyday situations). The second primary objective is that students will develop an appreciation chemical and physical change as the methane is changed to heat and light as well as the roasting of the marshmallow over the open flame (See Benchmark IV.2.MS.2). Describe common chemical changes in terms of properties of reactants and products)

Assessment:

The students will create a formula which shows the reactants and products of the energy transformation (Methane + Oxygen + flame produces heat + light + Carbon Dioxide