1. Sustainability topics would fit perfectly in a physics 204 course (calculus based electricity and magnetism). This course teaches the fundamentals of electricity. In doing so, we discuss semiconductors, induction, energy usage, etc. These topics specifically lead to a discussion of solar cells and wind turbines (induction). Renewable energies are essential as we move towards sustainability.
2. The assignment created would focus specifically on the topic of induction. We will explore how changing the magnetic flux (the field strength, the angle of the incident field or the loop area) through a coil produces electricity.
3. This method of producing electricity is a very simple method. It requires very few materials (1. wire to make the coils and 2. a magnet) and since the materials are very basic I believe this relates to social justice (the idea of everyone having the same opportunity). I would need to point this out when discussing the lab at the beginning of class.
4. This assignment can be used in the lab (and may be a very good replacement for the current induction lab).
5. GYC201 (2015FA_CTLF-M205-300-0000024: 2015FA CTLF-M205-300 SSP 202: Green Economy & Social Justice)
6. Jennene Fields, Electricity and Magnetism, PHY204
7. Induction Lab
8. Learning outcomes covered: Induction and Lenz's law
9. Outcomes of the assignment: they will develop design skills, data collecting and analysis, they will have hands-on experience with the topic of induction, and will have to critically think about renewable energy and sustainability.
10. Critical thinking will be in the form of designing, testing and modifying based on the collected data.
11. Electricity is used in our everyday lives. Looking at an alternative to plugging in and batteries would be very beneficial.
12. See second sheet
13. In order to receive credit for the lab, the students must demonstrate they understand how electricity is produced, the correct amount and they must answer the questions.

Lab #5: Induction Lab

Background: Light bulbs, calculators, cell phones, etc. all require electricity (usually in the form of batteries or plugging into the grid) for the device to operate. Each device is unique in the amount of voltage and current (power) required.

We recently learned about induction in class. The idea is that we can produce a renewable source of energy to power these devices.

By changing the field strength, the angle of the incident field or the loop area we can detect an induced emf. Remember…

$$\varepsilon = -N\frac{\Delta\phi_B}{\Delta t} = -N\frac{\Delta(BA\cos\theta)}{\Delta t}$$

Materials: Wire, Magnets, Digital Multimeter (DMM), clips, DataStudio

Procedure: Design a coil that produce 0.5V (+/-). You must use a wire that is 1m in length and a 1 milli-Tesla magnet. To test the voltage produced you may use the DMM to make sure you are within the required voltage range. Make as many modifications as you need to reach the required voltage.

Data Collection: Hook up your coil to the Pasco interface using the alligator clips. Click start to begin data collection. You may either move the magnet or the coil to produce the induced emf. (Make sure that you include several peaks from your data.)

Questions:

1. Do you think your design could be implemented in modern devices? (Think in terms of the size of modern devices and the output voltage required.)
2. Look up the definition of renewable/ sustainable energies. Would this electricity production fit that description?
3. Can you think of how this scenario relates to wind turbines?