



## *Science in Motion - Ursinus College*

<https://www.ursinus.edu/offices/science-in-motion/>

# Environmental Science Activities – High School

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### **Climate Change**

CO<sub>2</sub> levels: Students measure the air temperature inside a flask exposed to light, then introduce high levels of CO<sub>2</sub> and re-measure the air temperature while the flask is again exposed to light. (45 minutes, can be combined with one other study in this time period)

Albedo: Students compare the air temperature change inside a flask with black gravel and another flask with white/tan gravel while exposed to light. (30 minutes)

Water vapor: Students compare the air temperature change inside a flask exposed to light, then introduce high levels of water vapor and re-measure the air temperature while exposed to light. (30 minutes)

Cloud cover: Students compare the air temperature change inside a flask exposed to light with and without “cloud” cover (white covering on one of the flasks). (30 minutes)

Solar output: Students compare the air temperature change inside a flask exposed to two different light outputs. (30 minutes)

*All are Biology Mobile Educator*

### **Alternative Energy:**

Solar panels: Students compare the efficiency of solar panels exposed to light at different angles. (45 minutes)

Fuel cell cars: Students use solar panels to induce electrolysis of water and collect the hydrogen produced. The hydrogen is then used to run fuel cell cars. Students may also calculate the mpg for the fuel cell cars and compare that to traditional gasoline cars. (45-90 minutes; 1-2 class periods)

Synthesizing biofuels: Students synthesize biodiesel from vegetable oil (45-60 minutes)

Heat energy of fuels: Students calculate the heat/energy produced from burning various fuels. Discussion at the end can lead to the pros & cons of using biodiesel and/or ethanol in our automobiles. (45-90 minutes; 1-2 class periods)

Solar homes: Students study the effects of thermal mass in passively heating a solar home. (45-60 minutes)

*All are Chem/Phys Mobile Educator*

### **Earth's Layers Introduction or Review – using Spheros**

We have large maps of the layers of the Earth available. Students modify a provided Sphero program to add different facts about the layers of the Earth, then show off their knowledge when their Sphero drives around the layers of the Earth. Contact us for suggestions / help planning a unique lesson or review session!

*Chem/Phys Mobile Educator*

### **Earthquake Tower Challenge – K'nex**

Students design, build, and test out towers on an earthquake shake table. Tower minimum size criteria, budget constraints, and specific building capacity are all imposed to give a greater challenge.

*Chem/Phys Mobile Educator*

### **Ocean Acidification / Acid Rain**

Students examine the effects of adding acid to soft freshwater, hard freshwater, and ocean water. A follow-up activity is to see how acidic ocean water dissolves shells, which can lead into discussions about the oceanic food chain and coral reefs.

*Chem/Phys Mobile Educator*

### **Ocean Floor Mapping**

Students use Vernier Motion Sensors to determine the terrain of an “ocean floor”. Activity uses the property of echosounding, and students learn to read the information that comes back to the computer. The activity concludes with a challenge for the students to describe a hidden “ocean floor”.

*Chem/Phys Mobile Educator*

### **Review / Test prep activities**

We can design fun, unique review sessions for nearly any topic using our programmable Spheros. (No prior programming experience needed.) Ask us for suggestions for your next review session!

*Chem/Phys Mobile Educator OR Biology Mobile Educator*

### **Soil Analysis**

Comparison of potting soil to ground soil: students use probes to measure temperature, moisture, pH, conductivity/salinity, calcium, chloride, ammonium, and nitrate in potting soil and ground soil. An add-on is to compare plants grown in potting soil to those grown in ground soil. (45 minutes)

Soil temperature: Students measure the temperature changes in soil from differing depths, daytime, and nighttime. (45-60 minutes)

*Both are Chem/Phys Mobile Educator*

### **Spheros**

Spheros are paired with a Kindle Fire (provided) through the SpheroEdu app. Beginners can draw a path for the Sphero robot to follow, intermediate users can drag and drop blocks of code, and advanced users can write text programs using JavaScript. Provide your own activities, or use one of the SpheroEdu prepared modules aligned to NGSS, CCSS, and various state standards.

*Chem/Phys Mobile Educator OR Biology Mobile Educator*

### **Survival of a Sea Turtle – a Sphero activity**

## Environmental Science - HS

This activity models a sea turtle ecosystem and the challenges sea turtles face in surviving to reproductive age (predators, environmental factors, pollution). Students drive Spheros (programmable robots) and act as the various parts of this ecosystem. (This activity does not need any prior programming experience.)

*Biology Mobile Educator*

### **Stream ecology:**

Stream study (physical parameters): Students study and measure the flow rate, temperature, dissolved oxygen, pH, and turbidity of a stream. This lab requires a field trip to a local stream.

*Chem/Phys Mobile Educator*

Stream study (biology): Students use digital microscopes to observe live pond organisms. (90 minutes; 1-2 class periods; subject to season and organism availability)

*Biology Mobile Educator*

### **Water and Wastewater Treatment:**

We have three activities for this topic – to investigate factors that affect the cleaning of drinking water and “wastewater”, and a third has the students build their own “wastewater” treatment plan.

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**We are always working on new activities to bring to your classroom. If you have any curriculum for which you do not see an activity, please let us know! We may be able to design one for you.**