Elementary Electromagnetism in Action!

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Cost of Proposed Activity: $194.60

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Abstract:

The SSU SPS chapter would like to go to a fourth grade class room in a local school to inspire and help educate students in the physical sciences, using a hands-on approach. We wish to show the primary school children the fun and exciting nature of magnetism. Finally we would like the children to take away an important lesson with them as well as get them motivated to try experiments at home, using lessons and materials given to them in class.

Proposed Idea:

In California, it is often easy for elementary school teachers to forget the importance of science under the pressures of statewide-standardized examinations (such as STAR testing) with heavier stress on mathematics and reading skills. Many times, science lessons are skipped in the classroom in order to spend more time on subjects like mathematics, reading, and writing; however, the teacher is often not to blame since there is truly not enough time in the day to accomplish, making thirty or so students proficient in all subjects. The SPS chapter members of Sonoma State University (SSU) have become aware of the plight of science in the local schools and believe it is important for students to be exposed to the sciences.

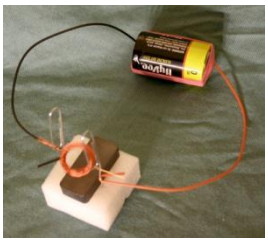
This provides an excellent opportunity for those in the SSU SPS to visit a classroom and inspire elementary students' curiosity with exposure to simple demonstrations and explanations of how things work. Most elementary students are inherently curious and simply need someone who can answer questions in a way that they can find relatable and understandable.

While the Full Option Science System® (FOSS®) has developed curriculum to teach students the California State Standards, the SPS chapter of SSU recognizes that some elementary school teachers feel unqualified or do not have enough school hours to teach the entirety of this curriculum. The SPS chapter at SSU would like to compliment the FOSS® curriculum by creating an interactive, experiential presentation of electricity and magnetism, demonstrating some of the many applications in our world such as how electric motors work and why green energy is important.

First, we would like to promote students' curiosity by giving them each a small magnet and briefly explain how a magnet has two 'poles', i.e., a north pole and a south pole. Students will then have an opportunity to touch their magnet to that of a classmate and tell us what they

observe. This will lead into a discussion of how opposites attract and similar poles repel. (The format of this introduction will vary depending on how much of a basic understanding the students have of magnets). We also wish to show students the result of splitting a magnet in two or more pieces, to have them understand that two opposite poles result naturally in no time.

After this, we will assist the students in building a simple electric motor consisting of two magnets with opposite poles facing each other producing a fairly uniform magnetic field in between, a coil of wire and a battery. Students will first unfold the paper clips leaving a loop that is vertical to hold the wire placing the paperclips into a Styrofoam square, or fold it and tape it to the desk. Then, spool whatever length of wire needed around the D battery to conform the wire into a loop. The wire loop will then be suspended by the paper clips. After using electric tape to attach wire to each end of the D battery and attach each wire to a paper clip (using leads or other safe means). Students will then place the magnet under the looped wire and give the looped wire a turn to provide the activation energy needed to get it turning independently. Students will be encouraged to experiment with how a different number of loops in their motor affect its speed. A figure has been provided below to better show the set up.

Figure 1: 

This simple electric motor will serve as an excellent way to help students understand how electricity and magnets can be used to make motors which power many of the things they see every day including cars, dishwashers, microwaves, etc. We will explain the simple motor, built by the students, in the simplest terms possible and compare it to the attractive and repulsive effects the students experienced in the beginning.

We will bring several other electricity and magnetism displays from the Department of Physics and Astronomy at SSU for the students to see. In addition to the displays already made, the SPS of SSU would like to build a superconducting levitation demonstration. This would consist of a superconductor, liquid nitrogen and a magnetic track. We will put the superconductor (barium yttrium copper oxide) in liquid nitrogen, then place it on our magnetic track made up of 10 magnets or so. In doing so we push the magnet around and it will move according to the direction of the laid out direction of the magnets. Explaining superconductivity to an 8 year old would be quite difficult, however, it is an interesting method to show them the interesting yet puzzling nature of magnetism that is often not seen by children of that age.

Finally at the end of the visit, we will encourage the fourth grade students to take their magnets home with them, to try out more magnetic experiments with outlined guidelines (with the supervision of adults of course).

Cost Breakdown:

Supplies Needed:	**Cost**:
30 bar magnets	$82.50
315ft of wire	$9.00
Paper clips	$2.00
D Batteries	$26.10
Magnets for levitation track	$30.00
Levitation Kit	$45.00

We have already begun to contact local elementary schools and intend on presenting to a local high-needs/low-income school, between February and April, to allow students exposure to science they might not otherwise have. We hope that this grant will inspire a local 4^{th} grade classroom and the creation of a levitation track will be an excellent tool in promoting Physics for years to come.