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Maine School Science Volunteers **Classroom Modules**

1. Buoyancy and Density.

This module was prepared for Lisbon middle school and was presented to about 6 classes in 2007. The module was presented by two volunteers working as a team and requires a full class period.

2. Battery chemistry and theory.

This module was prepared and presented by a team consisting of a chemist and a physicist. In the presentation the theory of the oxidation reduction reaction that produces the electrons was presented. Following this the class was divided into groups of 4 or 5 students and each group was given instructions and material for the construction of a battery. The battery design was an MSSV original and was chosen to be safe and to produce a large enough current to brightly illuminate an LED. This module requires every second of a class period. It would be better to give it two class periods. This module has been presented to about 10 classes in 3 different schools. All of the batteries worked.

3. How do you weigh the planets?

We were asked to prepare a program on how the weight of the planets in the solar system are determined. While the method is not too difficult for one who has a little knowledge of classical mechanics, the problem we were faced with was how to explain this to 7th graders. One of our volunteers spent some time figuring out how to explain this to the student and made a successful presentation to several classes. He would be willing to do this again for anyone who needs the program. It was complete in one class period.

4. General summary of what is known about the earth's magnetic field and field reversals.

In response to a teacher who wanted to give a science class more authoritative information about the earth's magnetic field and the historic and future changes (reversals) of that field we were asked to present a one-class period session on that subject. A volunteer, who also teaches classes in astrophysics at the university level here in Maine, put together this presentation, which is available to others whose students may be interested in this fascinating subject. The presentation requires a class session and allows lots of time for questions.

5. Small electric motors a student can build.

For several years one of our volunteers who is an electrical engineer has presented a program in which the students are divided into small teams, each of which builds a small motor which runs from a standard 1.5 Volt battery. To do this the volunteer pre-fabs some of the parts that the students would have trouble with. The motors each require about \$1.00 worth of materials (not including batteries or battery holders). We can supply the materials on a limited basis but it would be better if the school paid for this,



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particularly if they want to allow the students to keep the motors they have built. The program requires 2 or 3 class periods and so far all of the motors constructed have run. We would be happy to present this program to other schools which include electricity and magnetism in their science curriculum.

6. **Van deGraaff Generator.**

Many schools have one of these high voltage generators in their supply room. The generators are truly impressive. They are inherently safe for humans (not so safe for electronic devices) but the static discharge can be surprising if the students are not properly instructed. Every year we are requested to handle the demonstration of these things for teachers who are not comfortable with the generators and the high voltage effects they produce. One of our volunteers will come to a classroom that has or can borrow a Van deGraaff generator. We will carry out the demonstration so that everyone has fun and no one gets hurt. We will also explain how the generators work and explain why they produce the effects that are observed. Last year we did this for about 15 classes.

The generators are notoriously delicate and require occasional repair to keep them working. We know how to do this and will repair the generators as necessary as a part of a scheduled presentation. If your school owns one of these generators you should budget about \$20.00 for a replacement belt every year.

7. **Mechanics. Special subjects and entire program.**

MSSV has prepared a complete program on the subject of Mechanics. We have also written a series of notes that can be reproduced as needed. These notes form a mini textbook that can be distributed to all students for the cost of reproduction. The entire program is intended to guide the presentation of the subject for schools that wish to include it in their curriculum. MSSV volunteers who are trained in this subject are available to assist with any of all parts of this program.

The titles of the individual sections of the notes and hence the sections of the program are:

- A. Units of measure
- B. Vectors and Scalars and description of forces
- C. Newton's laws (all three)
- D. Momentum and conservation of momentum
- E. Gravity (Newton again)
- F. Energy potential energy and kinetic energy and conservation of energy
- G. Power
- H. Friction
- I. Efficiency.
- J. Density and buoyancy.



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K. There is also an introduction and teachers notes.

These notes are written at 7th and 8th grade level and have been used in a number of classes, so we think that most students of those grades can understand them.

On request we can convert any of the above topics into a stand-alone one-class presentation. This has already been done with the Density and Buoyancy module.

8. **Electricity & Magnetism. Special subjects and entire program.**

MSSV has prepared a complete program on the subject of Electricity & Magnetism. We have also written a series of notes that can be reproduced as needed. These notes form a mini textbook that can be distributed to all students for the cost of reproduction. The entire program is intended to guide the presentation of the subject for schools that wish to include it in their curriculum MSSV volunteers who are trained in this subject are available to assist with any or all parts of this program.

The titles of the individual sections of the notes and hence the sections of the program are:

- A. Static Electricity
- B. Magnetism
- C. Electrical Units
- D. Circuits & Schematics
- E. Simple Circuits
- D. Ohm's Law
- E. Power in Electric Circuits
- F. Batteries
- G. Current-carrying Conductors in Magnetic Fields (motors and generators)
- H. Electrical Safety
- I. Lightning Safety
- K. There is also an introduction and teachers notes.

These notes are written at 7th and 8th grade level and have been used in a number of classes, so we think that most students of those grades can understand them. The entire program has presented about 6 times in 2 schools. MSSV owns and maintain a great deal of the equipment used in these class programs.

On request we can convert any of the above topics into a stand-alone, one-class presentation.