Lesson plan Introduction to magnets using *Faraday's Electromagnet Lab* 1
50 minute class .

Some of the tabs of Faraday Lab have been subdivided into smaller simulations to help users focus on fewer learning goals. The original simulation still exists, but you could use *Magnet and Compass* and *Magnets and Electromagnets* to meet these learning goals.

Learning Goals: *Students will be able to*

1. Predict the direction of the magnet field for different locations around a bar magnet and electromagnet.
2. Compare and contrast bar magnets and electromagnets
3. Identify the characteristics of electromagnets that are variable and what effects each variable has on the magnetic field's strength and direction.
4. Relate magnetic field strength to distance quantitatively and qualitatively
5. Compare and contrast the fields of gravity and magnets qualitatively

Background: This year, I decided to try changing the traditional order for electricity and magnetism. Normally, we study static electricity before magnetism. We started with a having the students do a lab about magnets from *Tutorials in IntroductoryPhysics*[1] . This lab has little instructor direction and comes late in the year, after we have developed the skills for investigation, lab design, writing and reasoning.

Faraday's Electromagnet Lab Introduction:
I will not demonstrate the sim. We will be using the *Bar Magnet* and *Electromagnet* tabs for this activity and the other tabs later. I think we'll get through most of the first 3 steps on the first day and I'll mention the step 5 is homework to be done before we meet again.

Lesson: I will review that a compass points along the direction of a magnetic field. The activity is planned for my honors physics students to take about 90 minutes.

Next day: I will project *Magnet and Compass* and discuss the poles of the Earth. Notice that when you flip poles the earth map turns upside down as well.
I have included clicker questions too.

1 McDermott, Shaffer and the Physics Education Group, Department of Physics, University of Washington. Prentice Hall 2002, p103