

Lesson plan *Faraday's #2 using Faraday Law (Flash) and Electromagnet Lab(Java):*  
Induction (college version)

Learning Goals:

Students will be able to:

- Identify equipment and conditions that produce induction
- Compare and contrast how both a light bulb and voltmeter can be used to show characteristics of the induced current
- Predict how the current will change when the conditions are varied.
- Explain practical applications of Faraday's Law
- Explain what is the cause of the induction

Background:

This is based on my activity for honors high school students, but has some additional questions that I think college students could do, but has not been tested. I added the last 2 learning goals to the college version. The following is the Background that I included in my HS lesson: We will have studied electricity and had an introduction to magnets. About three weeks before, we will have done the activity called Introduction to Magnets that I wrote using *Faraday's Electromagnet Lab*. There will be a class discussion about their current understanding. I will define induction and demonstrate induction in common ways using an overhead meter and also a light bulb as indicators. They will be using the *Pickup Coil*, *Transformer* and *Generator* tabs of the sim. When I did this activity last year, the Flash version was not online. Many students did not do well on the essay question and I think there were too many concepts introduced at once and I had a sub that day. So this lesson incorporates changes: This lesson starts with the Flash version after the demos (the sub did not do the demos last year). I also wrote myself the following note: I have been thinking about how I might get the students to reason about what is the underlying cause of induction. I think I will have a class discussion on the next day after the activity. I will project the sim as an aid. Using the Flash sim with the "Show Field lines" may help solve the issue.

Demo equipment: magnet, variety of coils, power supply, overhead galvanometer, little demo light bulb, generator model

*Sim* Introduction:

1. *Faraday Law*: Show that the magnet can be moved to the left of the coil.
2. *Faraday's Electromagnet Lab* I will demonstrate turning off the *Show Field*, *Compass*, *Field meter* and *Electrons* so the window looks like real lab equipment and relate the window to the demo equipment that I used.

Lesson:

After the discussion and demos, have the students use the lab sheet for guidance..  
The activity is planned for my honors physics students to take about 50 minutes.

Post Lesson: Clicker questions and Class discussion: Have *Faraday's Electromagnet Lab* and *Faraday Law* ready to project.

Review the learning goals if the clicker questions demonstrate the need. I think it will be important to talk about how field interactions.