## Teaching Notes

### By *Sarah Cadieux*

*cadies@rpi.edu*

**Course Information**

Institution: Rensselaer Polytechnic Institute

Department: Earth and Environmental Science

Course Name: Geology 1: Earth’s Interior

Level: **Lower/**Upper Undergraduate

Course type: Lab/Lecture/**Both** : Lecture and lab are two separate courses. Students do not need to take both, but 99% do.

Students:Majors/Non-majors (select one): **Both** (90% non-majors, but is required for majors)

Number of Students: 120

**Module Information**

Original Module Name: Spectral Seismology

Link to Original: https://serc.carleton.edu/eddie/enviro\_data/activities/spec\_seismo.html

Modified Module Name: Seismology Lab

Files associated with modification: (ie. Class Worksheet, Summative Quiz, Lecture Powerpoint, etc) Lab assignment, Seismic Canvas CAS files

**Teaching Notes**

*(Think about what you would like to read about this activity if you came back to it in 2 years)*

* How did this module fit into your overall course curriculum (e.g., relationship to other content, relationship to course learning objectives)? *This module was student’s introduction to seismic waves and determining earthquake location. In the lecture component of the course, we discussed why earthquakes occur at plate tectonic environments and hazards and risks associated with earthquakes.*
* Did you use the entire EDDIE modules as presented? If not, which components did you use?

*Activity A of the module was used (Phone seismometer and introduction to Seismic Canvas). Activity B and C, students perform a Fast Fourier Transform, which was beyond the goal for my purposes.*

* What did you change about the module and why?

*This lab was the student’s first introduction to P and S waves. In order to introduce these, I added a slinky activity to model wave motion. After students learned how to use the Seismic Canvas program, I wanted them to use it to find the location of an Earthquake. To do this, they imported CAS files into Seismic Canvas from 3 locations that experienced seismic activity from the Aug 1, 1999 event in Tonopah, Nevada. Using seismic canvas to figure out arrival of P and S waves and time, the distance from epicenter is determined, and students make a circle with distance as radius in Google Earth to figure out the epicenter. This part of the module is modified from an IRIS activity. Two other activities looking at earthquake data on different websites was added to introduce students to the Global Seismogram Viewer and IRIS.*

* What was the prep like?
  + What did you do to prep ahead of module implementation?

*To prepare for the implementation of this module, I went through and did the Eddie Module as written for students first, and secondly with the instructor notes in front of me. Once I made the decision to modify and add other components, I searched IRIS for other similar activities to add in.*

* + How much time went into prep?

*At least 10-15 hours, if not more. Because I am not familiar with earthquake data, modifying this activity took more than others.*

* How did the activity go?
  + What went well and why?

*The slinky waves and iPhone seismometer parts went really well. Students were engaged with the material and enjoyed using lots of different online resources to learn about earthquake locations and seismograms.*

* + What went wrong and why?

*Some technical problems with SeismicCanvas—mostly figuring out what to do when you zoom in too far. In lab, we did the earthquake location using a physical map and not GoogleEarth, and many of the compasses were broken and difficult to use. Utilizing GoogleEarth will fix this.*

* What do you think students took away from the activity?

*As you move away from the epicenter, it takes longer for seismic waves to arrive, and the amplitude is generally less. However, different materials result in different amplitudes.*

* Where did students struggle the most?

*Determining the timing of wave arrivals and utilizing compasses.*

* Would you do this activity again?
  + If yes, what would you change in the future?
  + What suggestions would you give to a colleague before they used it in their teaching?

*Yes-in class the earthquake location was done on paper as opposed to in SeismicCanvas and using GoogleEarth. This revision has already been made in the document, and in the future SeismicCanvas will be utilized to determine the time between P and S wave arrivals for figuring out the epicenter.*

* Is there anything else you’d like to make note of?

*This was the only lab I did this semester where I had students afterwards say they enjoyed it. It was also the one that had the most digital use.*

*However, because laptops and iPhones were used in this lab extensively, I ran into the problem of having students take photos/screenshots of their answers and text them to students in the later labs (note-I teach 5 labs back-to-back in one day).*