AGU FALL MEETING

San Francisco | 15−19 December 2014

Using Low Cost Environmental Sensors in Geoscience Education

John Leeman[1], *Charles J Ammon*[2] *and Sridhar Anandakrishnan*[1], *(1)Pennsylvania State University Main Campus, University Park, PA, United States, (2)Pennsylvania State University Main Campus, Department of Geosciences, University Park, PA, United States*

Abstract:
Advances in process technology have drastically reduced the cost of manufacturing almost every type of sensor and micro-controller, putting low-to-mid grade sensor technology in the reach of educators and hobbyists. We demonstrate how a low cost magnetometer and an Arduino micro-controller can be used in education. Students can easily connect the sensor to the Arduino and collect three-component magnetic field data. Experiments can easily be turned into long-term monitoring projects by connecting sensors to the internet and providing an Internet-of-Things interface to store and to display the data in near-real time. Low-cost sensors are generally much noisier than their research grade counterparts, but can still provide an opportunity for students to learn about fundamental concepts such as signal quality, sampling, averaging, and filtering and to gain hands-on, concrete experience with observations. Sensors can be placed at different locations and compared both qualitatively and quantitatively. For example, with an inexpensive magnetometer, students can examine diurnal magnetic field variations and look for magnetic storms. Magnetic field orientation can be calculated and compared to the predicted geomagnetic field orientation at a given location. Data can be stored in simple text files to facilitate analysis with any convenient package. We illustrate the idea using Python notebooks, allowing students to explore the data interactively and to learn the basic principles of programming and reproducible research. Using an Arduino encourages students to interact with open-source data collection hardware and to experiment with ways to quickly, cheaply, and effectively measure the environment. Analysis of these data can lead to a deeper understanding of both geoscience and data processing.

Back to: Keeping Geology Alive: Interactive Demonstrations in the Earth Sciences (Pop-Ups)

<< Previous Abstract | Next Abstract >>

SEARCH KEYWORDS

SEARCH SESSIONS

SEARCH CONVENER/AUTHOR NAME

LOGIN