Crafting an In-house Lab Manual for Community College Geology Students

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I am creating an in-house lab manual for historical geology at Frederick Community College (FCC). The manual needs to be tailored to non-geology and non-science majors, be affordable, and capitalize on the samples and equipment available at FCC. At this point we are still using a published lab manual that costs $125 and is a poor fit for our students and available supplies.

I've cobbled together about half of the labs by selecting simple, hands on geoscience activities from a variety of sources (the SERC website chief among them) and modified them to best fit students with little to no background in science. My students have the chance to run a trial, collect data, analyze it, make hypothesis, and then modify their experiment. They learn the scientific method and see for themselves how geologists develop and use tools such as radiometric dating, dimensionless speed analysis, and fossil succession to make hypotheses about the age of the earth, speed of dinosaurs, and extinction events over time.

I've modified the math component of my labs to suit my math-phobic and math-gifted students. Problems range from simple velocity calculations and metric conversions to more challenging questions about confidence levels in age estimates from radiometric dating. I have also eliminated a lot of the detailed memorization that would be expected for geology majors. For example, students learn a limited number of rocks and fossils but spend more time using them to determine past sedimentary environments, climate, and extinction events.

The strongest part of my work is kinesthetic learning of the scientific process. Students who would otherwise sleep through a lecture on evolution are alert and invested in creating their own experiment, such as testing the survival rates of birds with different beak shapes. They love choosing new tools for beaks (open access to the lab supplies) and better imitations of food sources (from a bag of candy).

The biggest challenge, however, has been that many students expect cookbook labs with fill-in the blank answers. It takes them several weeks to get used to labs that incorporate some independent thought, and some never get used to it. I would like to achieve a balance of objective questions as well as provide a jumping off point where more advanced students can apply the skill being taught in the lab assignment, examine its drawbacks, and suggest ways to refine.

The other big hurdle I face in creating an in-house lab manual is funding to cover the amount of time I dedicate to the project as an adjunct, and for the supplies that would be required for the labs. I still want to create at least 5 more labs that incorporate current and local historical geology topics such as global warming, ocean acidification, and natural gas fracking. Supplies for these labs would be actual ocean sediment cores, foraminifera species that can be used as climate proxies, as well as more sedimentary structure and vertebrate samples.