

Open Labs in Biology: the writing workshop that became a science workshop

Manus Patten

Some background on the course and its goals:

Foundations in Biology II, an introduction to evolution and ecology, is a large-enrollment (~180-200 students), 5-credit course, co-taught by 3-4 members of the faculty and a team of undergraduate TAs. We have a lecture portion – where all the students sit in one big lecture hall and listen – and a lab portion – where students are divided into multiple sections of 24 students max. Each lab is led by a member of the faculty who is assisted by a team of three undergraduate TAs. Our students in Foundations in Biology II are mostly first-years and mostly science majors. One goal of this introductory course is to familiarize students with scientific papers. Our assumption is that our students read nothing but textbooks in their high-school science courses and have no real experience with the scientific literature, but we think our students should be comfortable reading from the primary scientific literature by the time they reach junior year and capable of contributing to the scientific literature by the time they graduate. This introductory course is the first step in that transition. The lab portion of the course gives our students a chance to perform experiments and analyses, generate data and results, and then write up their findings in a scientific paper. No part of that is easy for a student who just a year ago equated textbooks with science.

Through the years, we have tinkered with our approach. Below I describe a lab we do and a device, the “Open Lab,” that we’ve incorporated for teaching our students how to write (and how to think and how to do science all at the same time).

Some background on the lab and the accompanying assignment:

First, we have every pair of students set out four small traps to collect insects for one day. They survey the plants around the traps and later survey the insects that they trap, keeping score of how many species of plants and insects they find at each trap. Second, we pool all of the data from the course. We end up with ~350 data points that let us look for associations between the plants in a community and the insects in a community. (The underlying hypothesis is that a more diverse plant community will support a more diverse insect community and a greater abundance of insects.) All students are given the same data set and then asked to write a complete scientific paper. We advise them on a few things to look for in the data and offer pointers on what to cover in each of the usual sections (Abstract, Introduction, Methods, Results, Discussion) of the paper. Beyond that we don’t provide much of a skeleton to work from. At this point in the semester they have written two other scientific papers and received feedback on theme, and they’ve listened to us in lectures describe how scientific papers take shape.

The (honest) backstory for how we arrived at “Open Labs”:

Foundations in Biology II is a spring course, which means that every year we live in fear of a snow day. Labs are taught on Wednesday, Thursday, and Friday, and if a snow day lands on any of those days, the students who meet for lab on that day will fall a week behind, which for us would mean having to prep different labs for different students in subsequent weeks or trying to reschedule a three-hour lab for 24-48 students; these are both unattractive options. Add to this fear the surprise that greets us every year when we lay out the calendar for the labs: Easter. Some of our labs in the second half of the course spread over two or three weeks, and an Easter recess in the middle of that can throw a wrench in things, particularly if we’re growing organisms or collecting from the wild for our labs.

Two years ago, we had to drop one such multi-week lab because of Easter. We replaced it with a shorter one, leaving us one week short of programming. So, we decided to put a week of “Open Labs”

on the calendar. It was a placeholder. We didn't know at the time what an "Open Lab" would entail, but we knew that it completed our calendar and that we could always drop it if a snow day created any scheduling SNAFUs. Shortly after writing "Open Labs" in the calendar we noticed a challenging written assignment that was due right around when "Open Labs" were scheduled to meet, so we decided to use Open Labs to help our students with the assignment. We had for several years been saying that a week of writing-workshop labs would be a good idea, given how important that skill is in the sciences, given that it's often a weak spot for our students, and given the extent of the writing assignments we task our students with. But for various reasons we hadn't ever committed to building one into the schedule. Easter that year provided the necessary nudge. Knowing now how successful Open Labs would become I am grateful for the scheduling headache Easter caused us that year.

Open Labs:

Open Labs are very free form. We tell students that they can come to any lab during the week (Wednesday, Thursday, or Friday) – they're "open" in that sense – and the professors and the TAs will be there to read any part of a draft that the student likes (see the page from the lab manual, included below). There is no introductory lecture or explanation; we simply set down to work. I circulate from student to student for about three hours straight, reading paragraphs, editing, helping them to interpret their data, and weighing in on what the students have written and how they've written it. I usually dig in to a paragraph or two of a student's paper before moving to the next student. The TAs in the course do the same. There aren't enough of us to go around, and very often students in the class will spontaneously peer review or discuss one another's work. When you're in the lab room, an Open Lab sounds like science. One overhears discussions of how to interpret a pattern in the data, how to perform some analysis, how best to convey some result, and the tap-tap-tapping of the keyboard as all of these decisions get made and converted into written form.

The best part of the Open Labs for me is that I can meet students right where they are. If the draft I see looks like C work, I can tell them what it takes to bring it up to a B. If the draft I see looks like A work, I can point them to some references they should read to deepen their understanding of the topic. Lecturing about writing sometimes feels like stating the obvious into a void. (Do students benefit from hearing me say in a lecture that adverbs sink their writing? Will they change their habits?) I find it hard to know my target when I'm lecturing about writing, and I'd understand if students don't gain much from these lectures. I'll spend several hours prepping a lecture about writing and then one hour giving it, and at the end I always wonder if students would have been better off had I just invested that time in their work. Open Labs have convinced me that it's better to just meet them at their work.

One of the big surprises from Open Labs – and in hindsight it shouldn't have been surprising – is that it feels like the emphasis is on science and not on writing in the end. Sure, we address matters of composition and conventions for writing in the sciences as we circulate from student to student, and in those moments it feels like a writing workshop. But I spend most of my time helping students to hone their argument from the data, which I have found is the toughest part of this assignment for most of our students – the "science" part, not the "writing" part. After having run Open Labs for two years now, we are beginning to think they may be our best tool for teaching the scientific process and teaching our students how to think about science. What started out as a filler week when Easter landed at an inconvenient time has grown into two weeks of programming now. And we think these are two of the most important weeks of programming that we run.

Lab Exercise 12

Open Labs

There are no activities planned for this week. But the teaching staff (professors and TAs) will be available in the labs, which will be *open* during all of the usual lab times. We'll be there to guide you through your papers, and you should feel free to come by whenever labs are running – even at a different time from your usual lab if you'd like. These Arthropod Diversity Reports are a tall order, and we want to make sure you have ample opportunity for help and guidance. Let's use this time as a chance to firm up your understanding of diversity measures, statistics, arthropod biology, searching the literature, scientific writing, etc.

Labs meet at the following times:

Wednesday 12:20 - 5:30

Thursday 1:20 - 6:30

Friday 10:20 - 3:30