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The difficulty of balancing the competing time demands of teaching and research are familiar to all CUR members. Like many of us, I try to make my time do double duty by attempting to integrate teaching in my upper level Molecular Genetics class with my research interests in DNA repair mechanisms in the yeast *Saccharomyces cerevisiae*. Since I have complete control over these labs, I have written my own lab manual each year so that the students do projects that are important to my research while also allowing them to learn important techniques in the field. In the past I found that integrating class labs with my research interests took a tremendous amount of effort because I had to substantially rewrite my lab manual every year in order to keep the projects in the class labs current with my research needs. To reduce this burden, I have adopted what I call the module evolution approach. In this approach, the labs are arranged as a series of modules, each introducing an important technique. The description of the technique we are performing and the general structure of the labs remains the same each year, but the particular problem we are using the technique to solve can change each year, thus the modules may evolve with each iteration of the manual.

The Southern blot lab illustrates the way the module evolution approach works to reduce my writing burden while still introducing students to this technique and allowing them to participate in my research. In my research lab we produce many yeast strains in which we delete particular genes important for DNA repair. I have my Molecular Genetics students confirm the gene deletions by Southern blot. Each year the general outline of the lab remains the same:

Day 1: Make genomic DNA from wild-type and putative mutant strains and cut with restriction endonuclease.

Day 2: Separate DNA fragments by agarose gel and blot to filter.

Day 3: Hybridize and wash blot, image results by colorimetric detection method.

Each year the skeleton of this lab is the same, the only thing that changes is the particular gene we examine. The students must use bioinformatics techniques to pull the sequence of the gene from a database and predict the fragments that we will see on the Southern blot from the wild-type and mutant strains, then decide whether their results indicate that we have the mutant strain or not.

The module evolution method works if there are techniques routinely performed in your research lab. Currently, I have a four- to five-lab module on producing a recombinant plasmid, a one- to two-lab sequence using the polymerase chain reaction (PCR), the Southern blot module, and one- to three labs focusing on bioinformatics. All of these techniques are things we need to do often in the research lab, and it is always easy for me to think of a plasmid I need made, a PCR amplification I need done, or a Southern blot to be performed. I simply update the part of the lab module that describes the particular gene or plasmid we are working with and I am ready for the new semester.

I make sure that the students know that they are doing a piece of my actual research, and I take pains to let them know the entire scope of the project into which their lab projects fit. Student response to being part of my research has been very positive. I have noticed that students are much more careful about their experimental technique when they realize that their results really mean something. (And they do mean something; the 2001 class is acknowledged in a recent publication from my lab for confirming the identity of the mutant strains used in the experiments described in the paper (McInnis et. al., 2002).) My student evaluations have frequently mentioned the lab experience as a highlight of the class, and more than one has indicated that these were the most interesting labs they had ever done because they were real research. Thus, I consider the module evolution approach a successful way to integrate students into my own research, while reducing the burden of my lab manual preparation each year.

Reference

McInnis, M., O'Neill, G., Fossum, K., and M.S. Reagan. (2002). Epistatic Analysis of the roles of the *RAD27* and POL4 gene products in DNA base excision repair in *S. cerevisiae*. *DNA Repair* 1: 311-315.