STEM.edu

Is it time to rework how genetics is taught?

August 21, 2012 | Author:Summer Allen, Graduate and Postdoc, Brown University

A few weeks ago a college friend of mine (and geneticist) alerted me to a PLoS Biology commentary by bacterial geneticist Rosemary Redfield (of arsenic life fame) entitled *"Why do we have to learn this stuff?" – A new genetics for 21st Century Students.* I'm not a geneticist, but to my eyes this piece is both refreshing and thought-provoking and definitely worth a read for any science professor or aspiring professor.

Redfield's discussion focuses on how she and her colleagues sought to redesign their department's introductory genetics course because they found that while students could solve genetics problems in homework assignments and tests (e.g. filling in a Punnett square), they did not truly understand basic genetics concepts (like what allele dominance actually means). She says that this is due, in part, to professors (and textbooks) who are too tied to the historical framework of genetics.

For example, most genetics courses begin with Mendel and his peas and explore how phenotypes are passed on through generations—all the while keeping students in the dark as to what determines the differences in appearance between pea plants (just as Mendel was). Other topics are presented in the order they were discovered, which—as Redfield points out—is a very tempting way to teach science both because students can follow the logic (a question led to a finding which naturally led to the next question and so forth) and because they can get a feel for the scientific method. However, Redfield and her colleagues discovered that, while noble, this approach didn't work well and actually confused students. So the group designed a new course with two independent blocks (block 1: genotype determines phenotype; block 2: inheritance) that pretty much inverts the standard curriculum.

You may think that this is where the story ends, but it isn't. While teaching the revamped course Redfield introduced a short "Genetics in the News" segment to spice up each class session. Preparing these sections (with help from Google) made Redfield realize that the content and not just the structure of introductory genetics needs overhauling.

She argues that "the canon is past its sell-by date" and that because genetics now permeates everyday life, professors need to acknowledge that students both have an inherent interest in modern topics such as personal genomics (and the accompanying ethical issues) and need to learn about these topics for a host of reasons that differ from past generations—from prepping for medical careers to just being more informed citizens. Within the article is a suggested 21st century syllabus that includes many of the classical topics (including Mendel) as well as some new ones (such as genome-wide association studies and the genetics of cancer) but also leaves out some old standbys (like haploid genetics and classical bacterial genetics).

I find Redfield's commentary refreshing because it demonstrates backward curriculum design in action. This type of course development requires asking what we want students to know and why, and then designing course material around that (rather than simply following the flow of a textbook or what has been done before). Completely redoing a course like this takes a lot of time and is especially difficult without existing supporting materials but shows real reflection and dedication to students.

What Redfield is suggesting is a true paradigm shift—away from a focus on history and traditional problem sets and toward engaging students by integrating genetics into the 21st century world—and will likely elicit scorn from some old-school professors. I hope Redfield and others attempt to teach a course with the new curriculum and write a follow up commentary. I would be curious to see whether this curriculum makes learning genetics easier for students (and longer lasting) and what (if anything) is lost by changing the curriculum so drastically.

1 comment

January 13, 2013 - 6:18pm
This revamping would really be helpful. I work for a federal natural resources agency and I am amazed how little managers know about genetics as it relates to conservation. I obtained a Ph.D. in plant breeding and genetics and this training has been very useful to me as a natural resources manager.