Two Virtual Labs to Study Genetic Inheritance in the Fruit Fly
DOI: http://dx.doi.org/10.1128/jmbe.v14i1.580

Comparative review of: Drosophila, an online lab simulation, by Virtual Courseware for Inquiry-based Science Education, http://www.sciencecourseware.org/vcise/drosophila/; and Virtual Genetics Laboratory II, an online lab simulation by the University of Massachusetts, Boston, http://vgl.umb.edu/.

Labs demonstrating Mendelian genetics are illuminating for students but pose potential complications. Typical hands-on, in-person experimental models involve plants (which grow slowly) or fruit flies (which require strict time-frames for particular steps – something nearly impossible for high school or a commuter undergraduate campus). The advent of virtual labs allows students to struggle through mating strategies in order to draw conclusions about modes of inheritance (by simulating actual matings)
without having to organize their real-life schedules around isolating *Drosophila* virgins.

The first virtual fruit fly lab road-tested was the Virtual Genetics Lab II version 3.2.0 (VGLII3.2.0) produced by a team at the University of Massachusetts, Boston. The program has pre-set “problems” which are individual crosses of parental fruit flies. Students must do subsequent additional crosses and analyze offspring to deduce the mode of inheritance. The problems can be worked on in a “practice” mode where the mode of inheritance can be revealed with a simple click, and there are replicas of these problems without this feature so students are forced to solve for the mode of inheritance through their own trial and error. However both practice and non-practice versions are available to anyone who downloads the software, making it difficult to use this as an assessment tool for distance learners or as homework. It would, however, be easy to delete practice versions on classroom computers to make this an excellent in-class activity. Progeny from one or more matings can be viewed in a summary chart that can be easily manipulated to show or hide sex, phenotype, etc., for fast, quantitative analysis. While a good tool overall, there are some drawbacks to the program. It requires download of an executable file as well as an appropriate Java environment; and with different versions for various operating systems, this could cause “hiccups” for distance learners. Additionally, some of the walk-throughs were written for a previous version of the program and have not yet been updated to reflect attributes of the new system. Finally, assessment is extremely limited since there are no quizzes or opportunities to record substantive conclusions at any point – such exercises would have to be developed separately by the instructor.

The second resource investigated was from Virtual Courseware for Inquiry-based Science Education (VCISE). VCISE allows a user to review applicability to K–12 science standards by state, showing that the learning objectives of the program will integrate easily into a course curriculum. Unlike the VGLII3.2.0, this interface operates entirely online (no downloads) and visually simulates all steps of an actual mating lab. One must put flies in mating jars, place and retrieve the jars from incubators, anesthetize the flies, sort them under a microscope, etc. Mimicking these actual steps (as opposed to simply receiving numerical data as in VGLII3.2.0) adds a completely different feel to the exercise. Whereas both programs allow one to keep track of mating results, VCISE allows the participant to save information about each step in a virtual lab notebook, again simulating a genuine lab operation. Finally, this program helps students build a lab report: students follow prompts to build a report online with quantitative analysis along with qualitative answers and images from their notebook. One of the best features of this software is that with minimal preparation, an instructor can set up a class code whereby students can save their work and build a report which can be monitored and graded online.

In summary, while both programs allow a student-directed approach whereby students choose fly matings and interpret the mode of inheritance based on offspring, the VCISE program is more ideally structured to visually engage students and facilitate instructor assessment of student learning.

**Robin Herlands Cresiski**
Nevada State College, Henderson, NV
E-mail: robin.herlands@nsc.edu