The Concord Consortium (Interactive simulations; Concord Consortium; https://concord.org/stem-resources/subject/biology)

A world of digital simulations awaits the sixth to twelfth grade life science instructor. The Concord Consortium hosts a variety of high-quality interactive simulations that can help students in middle and high school classrooms reach greater levels of understanding. The digital models include variables that students change using point-and-click tools. These changes lead to different model outcomes that create the perfect environment to prod students into thinking critically about why outcomes differ.

The range of topics spans everything from hydrogen bonding to ecosystems, including intermolecular attractions, protein folding, phase change, meiosis, heredity, transcription, cellular respiration, and population modeling, among many others. The interactive models do not sit in content silos. Much overlap exists, and the team at Concord represents this overlap by hyperlinking related modules. In addition, to guide teachers in determining which of these resources may make sense for their lesson, a clear list of relevant national standards and benchmarks is provided alongside each simulation.

So what does one of these interactive models look like? The 3D exploration of bound antibody and antigen, for example, depicts a three-dimensional protein structure in green surrounding in lock-and-key format an antibody depicted in white. Users can toggle between viewing the atoms that make up these molecules as ball-and-stick models or space-filled atoms. They can also choose to digitally remove one half of the antibody surrounding the antigen, zoom into the active site, and take a close look at the molecular structure holding the antigen in place, rotating the complex to better understand the interactions. This is one of the simpler simulations, but even the more involved ones are user-friendly and relatively self-explanatory.

The digital resources at Concord.org, like most media, have some drawbacks. They all require an Internet connection. Many run exclusively in your browser, though several kinds of browsers are supported. Many will also run on a tablet. Some require Java and must be downloaded and launched in a separate environment. Although all likely have a place in the life science classroom, the standards connected to each module may be outdated; some adhere to the Next Generation Science Standards, but some only to the 2008 American Association for the Advancement of Science benchmarks. Finally, perhaps the most cumbersome obstacle teachers will face is the time required to become familiar with each simulation. Moreover, lesson plans do not accompany the models, which would facilitate teacher adoption of these resources.

Despite the potential drawbacks, the simulations are well made. Other than the model relating diffusion to the spread of perfume in a room (this is actually convection!), they are scientifically accurate. Teachers can search for what they need using a variety of helpful filters and star ratings. The proper implementation of these simulations will certainly help students develop deep conceptual understanding with regard to the various abstract concepts taught in life science—primarily high school biology—classrooms.

Remy Dou
ABT Department Editor
University of Maryland
rdou@umd.edu

REMY DOU taught high school life science for eight years before serving as an Albert Einstein Distinguished Educator Fellow at the National Science Foundation. He is currently a postdoctoral research associate at the University of Maryland. For column queries: rdou@umd.edu

The American Biology Teacher, Vol. 79, No 5, page. 426, ISSN 0002-7685, electronic ISSN 1938-4211. DOI: https://doi.org/10.1525/abt.2017.79.5.426.