MOLECULAR VISUALIZATION AS A DISCOVERY TOOL FOR INTRODUCTORY BIOLOGY
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OVERVIEW

Introductory Biology is often the first opportunity for students to think about the unseen world of molecular 'machinery' that underlies all life. The object of this project was to develop a set of web-based exercises that allow students to visualize this molecular machinery as concrete, three-dimensional objects with shapes and chemical properties that account for biological function. The exercise used publicly available databases of 3D atomic coordinates at the National Center for Biotechnology Information (NIH) and Eric Martz's visualization program, CHIME (MDL, Inc). CHIME allowed students to visualize 3D information using rotation, perspective and virtual lighting. It allowed them to selectively visualize and color different parts of a complex structure. Students used these tools to perform virtual 'dissections' of protein, much the same way that they would in an anatomy lab. The exercise challenged them to make and test hypotheses about the relationship of genetic information to protein structure and biological function.

OUTCOMES

- Material that cannot be demonstrated in a typical 'wet-lab' exercise was translated into a 'hands-on', student-driven learning experience
- Students were able to visualize and understand inherently 3D structural concepts using virtual reality tools
- Using real data allowed for discovery of often unexpected results, challenging students to develop a more sophisticated understanding of concepts
- Students were able to use the software at home and extend the exploration beyond the lab exercise using free, web-based resources
- The learning experience was fun, given the video-game feel of the molecular visualization program

SPONSORS

- Howard Hughes Medical Institute
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TECHNOLOGY USED

- Chime