Report for 2006 ACS Teaching with Technology Fellowship
Title: Interactive Web-Based Medicinal Chemistry Exercises
Awardee: Erland Stevens**,** Department of Chemistry, Davidson College

Background

The developed medicinal chemistry exercises provide a means for students to learn pharmacokinetic and pharmacodynamic principles in a convenient fashion. Pharmacokinetics and pharmacodynamics consist of ideas and relationships that are best illustrated through graphical relationships. Unfortunately, dynamic interaction with graphical information is difficult or impossible with textbooks alone. The medicinal chemistry exercises allow a student to immediately see the graphical effect of changing an equation parameter. In most cases, multiple examples may be viewed at once for side-by-side comparisons. While the ideas presented in the exercises are often not overly challenging, they are frequently not intuitive. The medicinal chemistry exercises will hopefully make the underlying ideas of the field more accessible.

An initial group of three exercises were written and then were followed by five more exercises which were funded by a 2005 ACS Teaching with Technology Fellowship. Five addition exercises were written with the current funding to give a total of twelve.

Pedagogy

While the exercises are intended to demonstrate selected concepts in medicinal chemistry, they are not suitable as a stand-alone tutorial. The brief introductory text for each exercise is only meant to reinforce ideas that have already been more thoroughly covered in the corresponding lecture and textbook.

In theory, the use of related exercises could be employed to emphasize any graphical concept for which the relationships can be expressed mathematically. Beyond the science applications, fields that might benefit from similar exercises may include economics and accounting. Additional treatments are likely obvious to those more closely associated with other fields.

Technical Information

Development of the medicinal chemistry exercises was partially funded with an Associated Colleges of the South-Mellon Technology Fellowship. The exercises themselves utilize Java applets, called Physlets, that have been written by Professors Wolfgang Christian and Mario Belloni of the Davidson College Physics Department. The Physlets primarily provide the graphical output in the exercises. Interaction between each exercise web page and the Java Physlet is accomplished with scripts written in JavaScript. Specific information on implementing Physlets in web pages with JavaScript may be found in *Physlets: Teaching Physics with Interactive Curricular Material* by Christian and Belloni (Prentice-Hall, 2001). The full HTML and JavaScript source code for all exercises is available by selecting “View Source” from the “View” browser menu.

All the HTML and JavaScript included in these exercises was written expressly for this ACS project.

Assessment Methods

The effectiveness of the exercises has been evaluated based on feedback from students who were enrolled in Medicinal Chemistry (CHE 309) at Davidson College in Fall 2005. The student feedback was generally positive, especially for the introductory text for each exercise. Feedback has been made available through the exercise website. (http://www.chm.davidson.edu/erstevens/applet_feedback.pdf)

Additional feedback will not be solicited until Medicinal Chemistry is taught again at Davidson – likely in Fall 2007.

Future Work

A few additional exercises may be written, but most of the obvious topics have already been covered. Ultimately, I hope to write a medicinal chemistry textbook. These exercises in modified form (likely needing a different Java applet to perform the graphics) will be the basis for included CD-ROM media for the book.

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