

Joseph M. Mahaffy, Department of Mathematical Sciences, San Diego State University, San Diego, CA, USA

Computer Labs for Calculus in the Life Sciences with WeBWorK

Calculus for the Life Sciences remains an important course for introducing quantitative biology to students in the life sciences. Most schools use classic Calculus tools with some examples drawn from biological examples. Our university has adapted a lecture/computer lab format, where the lectures use a modeling-based approach to learning the material and the computer labs use data-based examples to give hands-on modeling experience with real biological examples. Students are introduced to a biological problem, which requires some quantitative tool from Calculus to understand in more detail. A dynamical systems approach is used to better connect students to the biological relevance of the techniques. Examples are chosen from a variety of biological fields, which reinforces the importance of quantitative skills to all students and demonstrates the broad spectrum of applicability of Calculus. Several specific examples will be presented.

We have developed WeBWorK problems to manage our computer lab exercises (in addition to WeBWorK's use for lecture homework). WeBWorK is an open source, automated homework system supported by the MAA. The automated portion of the computer labs help develop greater accuracy in the students' work and provides immediate feedback to let them know if they are understanding the key concepts. The computer labs have been developed using Excel and some Maple for handling the data analysis. However, the numerical work could easily be handled by software like MatLab. The computer labs include a significant graphing component, primarily in Excel, and some writing. The 2-hour computer lab format of our course gives adequate time for students to learn both the mathematical modeling ideas present in the labs and to develop significant quantitative computer skills. Students acknowledge that the lab skills prove invaluable in their upper division biology classes. Especially because of the power of WeBWorK, we have been able to manage very large classes, which has been important in these times of declining resources to the university.