Virtual Laboratory Meets Case-Based Instruction
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Case It! is an NSF sponsored project developed by Mark Bergland and colleagues at the University of Wisconsin–River Falls. Its aim is to bring active, case-based learning of complex molecular biological techniques and subjects into introductory science classes by freely providing a software simulation environment and supporting instructional resources to educators. Case It! was recently awarded an AAAS Science Prize for Inquiry-based Instruction, which recognizes excellent active learning education modules.

Fully developed cases are provided in web-accessible and downloadable formats and cover a wide range of topics, including human genetic disease, cancer, infectious disease, phylogenetics, and more. Some case scenarios are enhanced by videos of individuals with a particular disease or disorder and/or links to other resources for additional information. Students perform simulations of wet lab techniques necessary to work through the cases. Techniques include PCR, ELISA, western blots, restriction digests, sequence searching and alignments, preparation of phylogenetic trees, SNP and expression microarrays, and more.

Case It! v6.06 is made more powerful by integrating the Mega5 bioinformatics software, which allows analysis of cases through sequence alignment and building phylogenetic trees. Some cases include bioinformatics components, such as comparing strains of HIV or *Staphylococcus aureus* to determine origin and relatedness. In some cases, protein and DNA sequences can be directly entered into BLAST for analysis and other sequences analyzed for mutations.

The Case It! website has an extensive support system for instructors including written and video tutorials, publications related to student learning, and lists of upcoming training workshops. The website now includes capability for users to participate in discussion forums providing feedback to developers, and to exchange ideas for implementation of cases in different settings. Discussion forums provide a mechanism for student discussion of cases during implementation. RSS feeds are available. Links to the Science Case Network and external resources are provided along with the instructor’s version of the case manual.

Case It! is modular and instructors can use what is necessary to accomplish specific learning goals. We have used Case it! in an allied health Introductory Microbiology course where students explore different infectious diseases. It allows us to focus on basic biology of the disease, techniques used in diagnosis, interpretation of data, etc. We also use student role playing to emphasize the different perspectives of the people described in the cases. Role playing could easily be performed online or in the discussion forums on the Case It! website. Case It! also allows students and instructors to write their own cases and introduce unique data sets.

Case It! provides an avenue for integrating genomics into course material as a supplement to discussions on the application of genomic techniques used for studying diseases. It could also be used to introduce complex methodology as part of pre-lab exercises, for example, in SNP expression analysis in a cancer case. The simulations could serve as alternatives to wet labs as a way to study disease agents that cannot be used in the laboratory.

Instructors considering Case It! should be aware that the interface for the simulation software is good but not always intuitive. Instructors and students will need to spend time learning how to use the system. However, students may access written guidelines (that walk them through specific tasks), on-screen help, and web-based tutorials. Live demonstration of the software during a class session can be provided on institution-based computers to allow students to experiment with the program to complete work on assigned cases.
Case It! is a tool that can assist in engaging and challenging students in vitally important STEM education. Anyone using case studies to teach core concepts through active problem solving, as well as those interested in introducing case studies into their teaching repertoire, will want to try Case It! as a tool to engage and challenge students.

Aaron A. Best  
Hope College, Holland, MI  
Email: best@hope.edu

Deborah V. Harbour  
College of Southern Nevada, Las Vegas, NV  
Email: deborah.harbour@csn.edu