Proceedings of the Symposium on Life Science Education

North Carolina Biotechnology Center
Hamner Conference Center, Congressional Room
15 T.W. Alexander Drive
Research Triangle Park, NC 27709-3547 USA

May 26th, 2009, 9am-5pm

Organizing Committee
Steffen Heber, chair
Benjamin Wheeler, co-chair
Zhao-Bang Zeng, co-chair
Department of Computer Science and Bioinformatics Research Center
North Carolina State University
Welcome to the Symposium on Life Science Education! Our goal is to provide a forum to meet, discuss and exchange ideas on teaching and technology in Life Science Education. Please get to know your fellow participants and enjoy our speakers.

-- The Symposium Organizers

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North Carolina Biotechnology Center, Hamner Conference Center, Congressional Room
Tuesday, May 26th, 2009 9am - 5pm

9:00 Welcome

9:05 Vincent J. Carey
Teaching the analysis of genome-scale data using R and Bioconductor: Software, documents, and experiments

9:50 Steffen Heber and Leif Saul
Bioinformatics in Motion: Animations for teaching Bioinformatics

10:20 Coffee Break

10:45 Bruce Nash
CSHL: Tools to Teach Biology in the Genome Age

11:30 Lunch and Poster Session

2:00 Cheryl A. Kerfeld
The Joint Genome Institute’s Microbial Genome Annotation Program for Undergraduates

2:45 Coffee Break

3:00 A. Malcolm Campbell
The Full Spectrum of Online Tools: From Synthetic Biology Research to Introductory Biology

3:45 Tom Miller and David Howard
NCSU DELTA: Educational Technology in Distance Education

4:15 Concluding Remarks

4:20 Social and Open Discussion
Graduate Teaching Assistants’ Instructional Framing of the Social and Ethical Implications of Genetically-Modified Crops

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Graduate teaching assistants (GTAs) are gaining an increasing responsibility for the delivery of science content to undergraduate biology students. Subsequently, understanding this group of science educators’ perspectives and practices in regards to science teaching and learning is important. This poster describes a research study that closely followed six GTAs who taught an introductory biology laboratory lesson on biotechnology (specifically genetically-modified crops) and its societal and ethical implications (SEI). Data sources included instructional observations and post-lesson semi-structured interviews. Qualitative analyses revealed that there was a disconnect between GTA perspectives about SEI and their teaching practice. While GTAs limited their instructional design and presentation to three frames (analytic, perspectives and biases, and individual reflection), the post-interviews revealed that their understanding of the importance of SEI to science instruction was much richer. Challenges for assisting GTAs in bridging the gap between perspectives and practices are discussed.

Expertiza: Collaborative Learning, Peer Review, and Social Networking

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Expertiza is a collaborative-learning environment that can be used in any class. It helps extend collaborative active learning to out-of-classroom activities and distance education. As part of their homework in a class, students do projects that help update or improve the course. For example, they might research new developments related to a specific lecture in the course and write a hyperlinked summary. They might devise an active-learning exercise that could be used during a class session. Or they might make up questions that could be used on future home-
work or tests. All of these have been produced successively with Experitza; we will summarize the results.

The Expertiza application supports individual or team submissions. For team projects, any team member can submit on behalf of the team. Submissions can be in the form of files, URLs, or wiki pages. Individual students can be assigned to review teams. Authors can give feedback to reviewers during the review period. There can be multiple rounds of review, allowing teams to update their submissions in accordance with the feedback that they have received from their reviewers. After the assignment is over, students fill out a questionnaire on their teammates contributions. All feedback in Expertiza is based on rubrics.

Currently, we are adding several social-networking features to Expertiza. Students will be able selectively to make their peer-review ratings visible to other class members and other Expertiza users. We hypothesize that by being able to share their achievements with the class, as well as attempt useful microtasks for extra credit, students will become more engaged with the class material and their fellow students. In addition, the course will be improved by the contributions that students will be motivated to create.

**iBLEND: AN INTEGRATIVE BIOMATH-EMATICAL LEARNING ENHANCEMENT NETWORK FOR DIVERSITY**

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Dept. of Mathematics²

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North Carolina Agricultural and Technical State University (NCATSU) is a historically minority-serving land-grant institution which has achieved high-research activity status. The University wishes to leverage this achievement by providing an institutional program that recruits and supports undergraduate biomathematical research and training experiences.

On an institutional level, the goal of the our work is to significantly increase the number of biology and math majors at NCATSU who gain higher competitive knowledge-based research and training experiences. From 2006 to current, our NSF Undergraduate Biomath (UBM) Group program has been highly
As the number of students continues to increase in the introductory biology majors courses, the lack of physical space and the large number of students (>240 students) in each lecture section become limiting factors for implementing active learning approaches in small collaborative groups. By using a synchronous virtual space (Elluminate Live(r)), students are given additional opportunities to engage with the course concepts in a setting that allows them to work actively and collaboratively.
in small groups. Students sign up for a “problem session” in
groups of no more than 24. When the students login, they enter
a virtual classroom setting with a white board and the ability to
text or voice chat with their peers or instructor. Students can
ask questions, share documents and websites with each other
and with the instructor. The instructor can invite them to write
on the white board, to add to material already there or to pres-
tent their own work. Students can enter “breakout rooms” where
they can assemble into smaller groups and tackle specific
problems or case studies. This environment also has the ability
for quizzes and polling students. In these online groups, stu-
dents work through case studies and problems which are then
coupled to assessments done in class via personal response
systems. In a pilot study of this approach, students who par-
ticipated in the virtual problem sessions were more successful
in learning the biology concepts in the course than those who
opted out of the program. Student success was measured
by survey responses as well as by examination scores in the
course.

DEVELOPMENT OF AN ONLINE
INTERDISCIPLINARY COURSE IN
AGRICULTURAL BIOTECHNOLOGY

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A three-hour interdisciplinary online course entitled “Agricultural
Biotechnology in Today’s Society” was developed to provide stu-
dents with a foundation in basic environmental, animal, and plant
biotechnology while integrating emerging and current trends and
issues in each of these areas. Course modules included those
on bioremediation, agricultural byproducts, biofuels, animal re-
productive and genetic technologies, genetic selection, plant
transformation and tissue culture, transgenic plant applications,
and biotechnology regulation and ethics. Instruction was deliv-
ered using multimedia tools and utilization of learning manage-
ment systems (Blackboard/Vista and Moodle) that allowed for
mass delivery through a collaborative effort from three faculty
members in the aforementioned disciplines.

Thirteen students completed a pilot offering of the course
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in summer 2008 and 22 students were enrolled in spring 2009. An optional synchronous on-campus lab was also developed and taught in spring 2009 to demonstrate lecture concepts. Two voluntary questionnaires were administered at the end of each offering using an online survey tool. The first questionnaire was a standard course evaluation on which students provided about the delivery of the integrated curriculum. The second questionnaire sought feedback regarding teaching methods used in each section to encourage the integration of science concepts and to improve the delivery of the science concepts in an agricultural context.

Efforts are currently underway to analyze survey data to assess the effectiveness of the integrated curriculum to teach science concepts, the attitudes of pre-service agricultural teachers and life science majors regarding the integration of science and agricultural concepts, and changes in student attitudes regarding agricultural biotechnology.

CULTIVATING THE FUTURE OF BIOINFORMATICS THROUGH THE GOOGLE SUMMER OF CODE™ PROGRAM

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Much of the most popular and important software in the life sciences is produced by highly interactive and geographically distributed communities of Free/Libre/Open Source Software (FLOSS) developers (e.g. Bioperl, R).

Unfortunately, there is little opportunity for life science students to receive training in the skills needed to contribute successfully to such projects. The National Evolutionary Synthesis Center has, since 2007, participated as a mentoring organization in the Google Summer of Code™. This program connects undergraduate and graduate students to a global community of mentors drawn from the ranks of senior FLOSS developers. Despite the demand for their skills, many of the mentors in this community often do not have the opportunity to teach these in traditional classroom settings.
The overarching goals of the Students Hot on the Sciences (S.H.O.T.S.) program in the Department of Biology at North Carolina Agricultural and Technical State University are to enhance science learning skills and increase the number of disadvantaged and minority high school students who are qualified and motivated to pursue science careers. Rising 11th and 12th grade underrepresented minority students throughout North Carolina participate in a multi-component year-round program, including a six week residential Summer Institute in Genome Science (SIGS). SIGS is designed to engage students in hands-on, problem-based learning to improve reading comprehension and test-taking skills and to increase student awareness of biomedical research. Therefore, we have successfully incorporated Case-It!, a web-based, case-based computer program, into the SGS curriculum to integrate Molecular Biology and Bioinformatics concepts through realistic infectious disease case studies and wet-lab experiences.
In addition to our sponsors, we would especially like to thank Nagiza Samatova, Dahlia Nielson, Theresa-Maria Rhyne, Leif Saul, Melissa Seate, Ann Hunt, Bill Schy, Sue Carson, and Kathleen Kennedy for their invaluable assistance in organizing the Symposium.

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