**ComGen: The community college genomics research initiative mini-graduate school experience**

M. Gita Bangera1, Chris Shelley1, Jim Ellinger1, Lynne Sage1, Robin Jeffers1, and Andrea Gargas2

1Bellevue College, Bellevue WA; 2Symbiology LLC, Middleton WI

**Background**

Education needs to adapt to cope with the avalanche of new information that teachers and learners have to deal with and the rapid rate at which it is generated. Teaching all the content will soon become impossible. The emphasis needs to be on guiding students to be self-directed learners comfortable in a changing environment, with confidence to deal with ambiguity and to make decisions with incomplete information.

Bellevue College’s ComGen is an innovative program that teaches the skills of self-directed learning, critical thinking and analysis in a mini-graduate school experience for community college students.

ComGen’s students partner with USDA/ARS Root Disease and Biological Control Research Unit to sequence the genomic library of the patented biological control bacterium Pseudomonas (fluorescent) strain L5.1-96 and interact with graduate students, post-docs and world-renowned scientists.

**Teaching Methods**

**Self-directed learning**
- Prerequisite only a basic biology course
- Socratic method with almost no lectures
- Students collaborate on learning concepts and techniques
- Connect new protocols to underlying theories

**Original Research**
- Authentic problems
- Unknown answers
- Lab notebook as documentation
- New discoveries

**Journal Club**
- Pairs or small groups of students analyze current primary research articles for presentation to the class

**Internships**
- Extend course knowledge
- Generate collaborative data with the world-renowned scientists

**Research Presentations**
- Design and production of posters
- Presentation and defense of project at USDA Minisymposium

**Scientific Meetings/Conferences**
- Practice optimizing the conference experience
  - Plant Growth Promoting Rhizobacteria Intl, April 2009
  - USDA ARS/WSU Minisymposium June 2009
  - American Association of Colleges and Universities Nov. 2008
  - Botanical and Mycological Societies of America, July 2009
  - American Phytopathological Society August 2009

**Assessment**

**Student-Learning Assessment Tools**

- Take-home exams
- Oral Exams
- Student Portfolios
- Drawing Protocols
- Lab notebook
- Poster

**Student-Impact Assessment Tools**

- CURE: Pre- and Post-surveys
- With permission from Dr. David Lopatto of Grinnell College, designer of the original CURE (Classroom Undergraduate Research Experience) survey and Dr. Sarah Elgin of Washington University, who produced a genomics-oriented version, we developed our new survey incorporating elements of each.

**Challenges: Responses**

**Student recruitment:** Email, social networking sites, course transfer agreements with local universities

**Assessment of student learning:** Refine portfolios requirements

**Training instructors:** Focus on up-and-coming graduate students and post-docs

**Discussion**

Students progress from knowledge consumers to knowledge creators through transformative hands-on research experiences. Students are emerging as self-directed learners as evidenced by the number of hours spent in the lab outside of class time and on weekends, and by continuing the Journal Club during summer on their own. After refining this course over the past year, we are developing curriculum modules adaptable for teaching undergraduates and also training graduate students and postdocs — the teachers of the future.

Our goal is transformation of not just the classroom, but also the teaching experience.