New England SENCER Center for Innovation

Fall 2014 Meeting

October 18, 2014

Massachusetts College of Liberal Arts, Feigenbaum Center for Science and Innovation, Rm 121
North Adams, MA

Meeting Schedule (as of 10/15/2014)

8:30 – 9:15	Registration (Coffee and light breakfast served) (CSI 1st floor Atrium)
9:15 – 9:30	Welcome from Dr. Monica Joslin, Dean of Academic Affairs, MCLA
9:30 – 10:30	Keynote Address: Brian Fitzgerald, BHEF (Business-Higher Education Forum) "Big Data for Big Problems: Democratizing STEM Skills"
10:30 – 10:45	Coffee Break (CSI 1st floor Atrium)
10:45 – 12:00	Panel Discussion: "How do our students experience data analytics?" Andres Colubri, Harvard University and Randy Paffenroth, WPI
12:00 – 1:00	Lunch and Poster Session (CSI 2nd floor Atrium) *Abstracts on next page*
1:00 – 2:00	Dr. Rob Sanford and Dr. Tara Mann, "SENCER: The Nuts and Bolts"
2:00 – 2:30	Sharon Basset et al., Massachusetts Campus Compact
2:30 – 2:45	Coffee Break (CSI 1st floor Atrium)
2:45 – 4:00	Contributed talks (2 concurrent sessions)

Session A: Community Action (CSI 121) Moderated by Liz Hartung, MCLA

- Susan Mooney et al., Stonehill College, *Service learning in STEM: Opportunities, Challenges and Student Perspectives*
- Olivia Carducci, East Stroudsburg University, *Mathematical Modeling and Service Learning*
- Joseph Staples et al, University of Southern Maine, *Undergraduate Research as a Tool for Civic Engagement*

Session B: Problem Solving Strategies (CSI 124) Moderated by Carolyn Dehner, MCLA

- Anindita Ghosh, Suffolk Community College,
  Effective Problem Solving In Classes & Beyond
- Shamsnaz Virani and Iris Burnam, *Innovative Curriculum for Engineering in High School*

Posters 12:00 – 1:00 p.m., CSI 2nd Floor Atrium

- Eugene Galperin, East Stroudsberg University, *A Redesigned College Algebra Course*

  We discuss some of the challenges faced by instructors, who teach general education courses in college algebra, and propose ways of addressing these challenges. Our approach emphasizes promoting environmental awareness and better preparation for future careers. We focus on redesigning the course structure and on incorporation of certain types of carefully designed materials and projects.

- Bronwyn H. Bleakley, Rachel Hirst, Allen J. Moore & Edmund Brodie III, Stonehill College, *Community-based faculty development for early-stage under-represented faculty*

  Despite recent advances in the representation of people traditionally under-represented in science in undergraduate and graduate programs, disparities in participation continue to emerge and compound through post-doctoral and early faculty years. Two significant factors that broadly affect the success of faculty in meeting tenure and promotion requirements, irrespective of gender (or ethnicity or disability status) are: 1) the degree to which new faculty are provided training for duties that often fall well outside the scope of the typical graduate professional preparation and 2) the availability of opportunities to develop close community ties that support scholarly productivity. For many institutions, including small "teaching-centered" colleges, the single most important factor in tenure decisions is publication rate. Even when early-stage faculty can access professional development resources, they may not have the opportunity to practice their training in meaningful ways before being required to put it into practice in their daily lives. We sought to support the development of a robust and diverse science pipeline by providing early-stage faculty from groups typically under-represented in biology with professional development training in writing productivity and the opportunity to put theory into immediate practice through a simultaneous writing retreat. Participants responded strongly to learning and practicing daily writing, employing strategies for accountability, and developing strong community ties in support of their productivity. A longitudinal follow-up study is ongoing. Our results suggest that, much like students, faculty need practice and low-stakes frequent accountability to develop as professionals. Our results also provide a list of concrete strategies that early-stage scientists may employ in support of their own professional development.

- Samuel Monroe Duboise and Karen Moulton, University of Southern Maine, *NanoDiscovery Labs at USM: Building Vertically Integrated STEM Learning Communities engaging Transdisciplinary Challenges at Convergent STEM Frontiers*

  Collaboration of STEM faculty and students at institutions of higher education with K-12 educators and students is critical for transformations needed across levels of STEM education. For a decade NanoDiscovery Labs programs (http://nanodiscoverylabs.org/) have integrated biosciences research and education for University of Southern Maine (USM) students while connecting to K-12 STEM education through pre-college classroom outreach and teacher professional development programs. These experiences are now being extended toward developing new course-based research experiences for vertically integrated learning communities that will include learners at all levels with particular emphasis upon developing highly capable and confident K:12 STEM teachers who can inspire and prepare students for a higher education learning environment building career development upon early and continuing research experiences, active learning, and growing self-identification as effective problem-solvers. The learning ecosystems being created will integrate

science and engineering practices, crosscutting concepts, and disciplinary core ideas (dimensions of the Next Generation Science Standards which are related to core concepts and competencies central to undergraduate student biological literacy).

STEM disciplines and programs preparing new generations of informed citizens and professionals for diverse STEM-related careers in the 21st century, are enriched and challenged by the confluence of interwoven scientific and complementary technological revolutions of the past century that prominently include the development of molecular biology, genomics, and information science which together promise to inform deeper understanding of the continuing evolutionary biology revolution that began in the 19th century. Transformational innovation arising from convergence of the physical sciences, life sciences and engineering is particularly expected at intersections of nanotechnology, biotechnology, synthetic biology, information technology, and cognitive sciences. The NanoDiscovery Labs education efforts are applying genomics and synthetic biology in projects that use evolutionarily ancient viral capsid structures as design platforms for nanobiotechnology problem-solving applied to transdisciplinary human challenges such as development and use of effective vaccines.

Session A: Community Action (CSI 121)

Moderated by Liz Hartung, MCLA

- Susan Mooney, Jessica Devereaux , and Corina Mier y Teran , Stonehill College, *Service learning in STEM: Opportunities, Challenges and Student Perspectives*

  Incorporating community-based learning (aka service learning) into environmental science curriculum provides direct experience that can help students better learn and remember scientific facts & theories. However, structuring that experience in ways that achieve the best outcomes for both the students and the community partners can be difficult. We will share two different efforts to collaborate with the urban community which our campus abuts. One curriculum focused science and ethics on climate change advocacy, the other focused science and environmental policy on urban storm water management redesign. Susan Mooney taught in both curricula; Jessica Devereaux was enrolled in the former while Corina Mier y Teran was enrolled in the later.

- Olivia Carducci, East Stroudsburg University, *Mathematical Modeling and Service Learning*

  Math 425: Introduction to Mathematical Modeling has always been a hands-on course with the students doing several group projects and presenting their results to the rest of the class. In 2008, I decided to add a service-learning project to the course. This talk will describe my experiences with service-learning projects in this course over the last seven years. It will include discussion of both why I continue to use service-learning and how I arrange for and manage the service-learning project.

- Joseph Staples, Robert Sanford, Travis Wagner, Karen Wilson, Samantha Langley-Turnbaugh, and Daniel Martinez, University of Southern Maine, *Undergraduate Research as a Tool for Civic Engagement*

  The Department of Environmental Science & Policy (ESP) at the University of Southern Maine uses an interdisciplinary and applied approach to educate students about environmental issues. In this talk, I will summarize a few ESP student projects that demonstrate opportunities for increased civic engagement. I will also summarize some of our recent citizen science efforts and highlight the ongoing collaboration with the U.S. Forest Service and the Hubbard Brook Research Foundation to establish a smart forest at USM's Gorham campus using Arduino based environmental sensors. Group discussion regarding class based research and community engagement is encouraged.

Session B: Problem Solving Strategies (CSI 124)

Moderated by Carolyn Dehner, MCLA

- Anindita Ghosh, Suffolk Community College, *Effective Problem Solving In Classes & Beyond*

  For most students, a science class, especially a physics class is daunting. They try hard, spend significant amounts of study time and yet do not seem to be able to "get" it. How can we as faculty help them? How do we guide them so they learn to solve problems effectively on their own? How do we help them learn to think analytically so they can apply these techniques in the classroom and beyond?

  In this presentation I will discuss some effective strategies that have evolved over many years of teaching at Suffolk County Community College. Through a combination of cognitive strategies and use of technological tools, I will outline concrete steps that help students
  - understand the problem
  - develop a plan for a solution
  - carry out that plan
  - reflect on the result

  Once mastered, these techniques will help students approach any and all problems in an analytical manner, thereby helping them to face the world beyond college more successfully.

- Shamsnaz Virani, WPI, and Iris Burnam, Da Vinci School of Arts and Science, *Innovative Curriculum for Engineering in High School*

  STEM education at the high school level is a classic problem of population and resources. The population is underserved due to limited and often uncoordinated resources. This is especially true in case engineering education in high school where engineering study typically equals technology classes or after school activities. However, one high school in Texas wanted engineering as a cornerstone of its curriculum. The Da Vinci School for Science and the Arts [grades 5-12] in El Paso, TX is dedicated to students acquiring knowledge + responsibility to repair the world which it believes will result in personal happiness and greater good. Within that code, the school wanted to develop an engineering program that would appeal to all students regardless of their preference for art or science. Appreciating the diversity of the students who would be required to study engineering in high school (all), a program was designed with a central focus on having an appealing humanitarian impact. Consequently, Da Vinci School developed its own, unique engineering curriculum framework with the collaboration of it teachers, community members, and parents under the leadership of System Engineering professor, Dr. Shamsnaz Virani. This talk will present the ICE-HS development and its results after three years of application