

*The National Center
for Science and Civic Engagement
Washington Symposium
&
SENCER
Capitol Hill Poster Session*

March 30-31, 2009

Welcome

Welcome to the 2009 National Center for Science and Civic Engagement Washington Symposium and SENCER Capitol Hill Poster Session. The Washington Symposium and Capitol Hill Poster Session is an annual event designed to provide members of the SENCER community with campus based initiatives the opportunity to share their work and consider more advanced applications. SENCER (Science Education for New Civic Engagements and Responsibilities) is a faculty development and science, technology, engineering, and mathematics reform initiative supported by the National Science Foundation. It is the signature program of the National Center for Science and Civic Engagement, which is affiliated with Harrisburg University of Science and Technology.

This year, the symposium focuses on the importance of the citizen scientist in our society, and how educators at colleges and universities, as well as members of governmental and non-governmental organizations, can foster science literacy in all students. The educators, administrators, and students invited to present their work at the symposium and on Capitol Hill bring with them a diverse set of strategies to interest students in the STEM disciplines, improve student skills, and spur life-long learning.

We would like to thank many people for their generous support of this year's Symposium and Poster Session:

Congressman Tim Holden for sponsoring the Capitol Hill Poster Session and for his participation. We would also like to thank his staff, especially Jason Knecht, for their assistance throughout the planning process.

Congressman Rush Holt, for his participation in the Capitol Hill Poster Session, and his staff.

Congresswoman Tammy Baldwin, for her past and continued support for all SENCER activities, including the Washington Symposium and Capitol Hill Poster Session.

The Dean for Undergraduate Studies, the Vice President for Research, and the College of Chemical and Life Sciences at the University of Maryland for their sponsorship of all symposium activities. We are also grateful to Ann Smith, instructor in Cell Biology and Molecular Genetics, and Cynthia Shaw of the Center for Teaching Excellence for the time and effort spent coordinating symposium activities on the University of Maryland campus in the months leading up to this event.



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Contents

| | |
|--|----|
| Welcome | 2 |
| Schedule of Events..... | 4 |
| Biosketches of Speakers and Moderators | 7 |
| Poster Abstracts | 12 |
| Roster of Invited Participants & Guests..... | 35 |

Schedule of Events

March 30, 2009

University of Maryland Stamp Student Union

8:00 – 9:00 a.m.
Banneker

Symposium Registration and Breakfast Buffet

9:00 – 10:15 a.m.
Charles Carroll

Welcome and Keynote Address

Dr. Mel Bernstein, Vice President of Research
Dr. Donna B. Hamilton, Associate Provost for Academic Affairs and Dean for Undergraduate Studies
Danielle Kraus, Associate Director, National Center for Science and Civic Engagement

Keynote: Garon Smith, University of Montana

10:20 – 11:20
Jimenez

Concurrent Sessions

The cycle of learning: How to engage students in the research process and then bring them back to the classroom: ad inifinitum

Gary Booth, Janet Lee, Analiesa Leonhardt, Jessica Rosenvall, Laura Jimenez, and Michelle Frandsen, Brigham Young University

This session will demonstrate how mentored research can be used to engage students into the investigative aspects of peer research. At Brigham Young University, we call this the cycle of learning; where the students work with a faculty member, collect information, and then bring it back to the classroom to inspire the next generation of student learners. We believe this motivates our students to engage in a lifelong learning process.

Charles Carroll

Understanding our world through quantitative literacy

Cindy Kaus, Metropolitan State University
Karen Saxe, Macalester College
Dorothy Sulock, University of North Carolina at Asheville

Professor Karen Saxe will present her work on quantitative approaches to problems in democracy and Professor Dorothy Sulock will present her work on reality math. In addition, we will discuss the issues of sustaining courses with civic engagement components in mathematics departments.

11:30 – 12:00

Discussion groups

12:00 – 1:15 p.m.
Banneker

Lunch

1:15 – 2:15 p.m.

Charles Carroll

Concurrent Sessions

Teaching on the edge: How Marquee courses offer a model for core education

Robert M. Briber, Jordan A. Goodman, David J. Hawthorne, Robert D. Hudson, Alan J. Kaufman, Wesley G. Lawson, Ann C. Smith, and Donna B. Hamilton, University of Maryland

The Marquee courses are taught by research faculty to large enrollments of students and are aimed at non-science majors. They differ from traditional science courses in their focus on how science addresses contemporary world problems to which we don't already know the answer.

Jimenez

Acquiring a broader perspective by confronting the potable water crisis in Haiti

Helen Qammar and Brittany Skelly, University of Akron

Engineering students must acquire effective teaming skills and be aware of the impact of engineering on society. SENCER pedagogy was used as the foundation for their semester-long design project. In the fall of 2008, 150 chemical engineering undergraduate students in 16 teams, each consisting of freshmen through seniors, were asked to recommend a plausible solution to the ongoing potable water crisis in rural or urban Haiti.

2:15 – 2:30 p.m.

Banneker

Afternoon break

Coffee and cookies provided

2:30 – 3:50

Charles Carroll

Citizen Science and SENCER: A Panel Discussion

Welcome: Dr. Donna L. Wiseman, University of Maryland Dean of Education

Moderator: Richard Duschl, Pennsylvania State University

Panelists:

Stacey Rudolph, National Oceanic & Atmospheric Administration

Sarah Schoedinger, National Oceanic & Atmospheric Administration

Kathleen Schwille, National Geographic Society

Tim Watkins, National Geographic Society

3:55 – 4:55 p.m.

Jimenez

Concurrent Sessions

National Geographic Society

Kathleen Schwille and Tim Watkins

Charles Carroll

National Oceanic and Atmospheric Administration

Stacey Rudolph and Sarah Schoedinger

5:00 – 6:00 p.m.

Biosciences Research Building

Reception

Welcome: Dr. David M. Mosser, College of Chemical and Life Sciences and Director, Maryland Pathogen Research Institute

Wm. David Burns, Executive Director, National Center for Science and Civic Engagement

A shuttle bus will run from the Stamp Student Center to the Inn and Conference Center every 20 minutes from 5:30 – 6:45 p.m.

March 31, 2009
Capitol Hill

8:30-11:30 **Meetings with congressional delegations**
Individually scheduled

11:30-12:00 **Poster set-up for invited participants**
Rayburn House Office
Building B-339/B-340

12:00 – 2:30 p.m. **Capitol Hill Poster Session & Reception**
Rayburn House Office Wm. David Burns, National Center for Science and Civic Engagement
Building B-339/B-340 The Honorable Tim Holden
Karen Kashmanian Oates, National Science Foundation
The Honorable Rush Holt

A light buffet lunch will be served.

2:30 p.m. **Symposium adjourns**

Biosketches of Speakers and Moderators

The Honorable Tim Holden

Congressman Holden is a native of St. Clair, Pennsylvania. Public service has played an integral role in Tim's family history. His father, Joseph "Sox" Holden was a four term County Commissioner. His great grandfather, John Siney, was founder of the Miners Benevolent Association, which evolved into the United Mine Workers.

After attending St. Mary's Elementary School and St. Clair Area High School, he received an athletic scholarship to Fork Union Military Academy, completing one year of college prep. Tim earned a football scholarship to the University of Richmond but an unfortunate bout with tuberculosis cut short his college career. After recuperating, Tim completed his education at Bloomsburg University, earning a Bachelor of Arts degree in sociology.

In 1980 Tim earned his license as an insurance broker and real estate agent, enabling him to gain experience in the family business. Tim went on to work as a probation officer and then sergeant-at-arms for the Pennsylvania House of Representatives. Tim was Sheriff of Schuylkill County from 1985 to 1992. Tim began his ninth term as a Member of Congress in January 2009. The Seventeenth District is comprised of Schuylkill, Dauphin and Lebanon Counties, as well as part of Perry and Berks Counties.

Tim has been a member of the Agriculture Committee since 1993, and was recently appointed Vice Chairman of the House Agriculture committee in the 110th Congress. He was also selected to serve as the Chairman of the Agriculture Committee's Subcommittee on Conservation, Credit, Energy, and Research, and continues to serve on the Livestock, Dairy, and Poultry Subcommittee. In the 105th Congress, Tim was appointed to the Transportation and Infrastructure Committee. Tim serves on the Transportation Subcommittees on Highways and Transit and Aviation.

The Honorable Rush Holt

Congressman Hold earned his B.A. in physics from Carleton College in Minnesota and completed his Master's and Ph.D. at NYU. He has held positions as a teacher, Congressional Science Fellow, and arms control expert at the U.S. State Department where he monitored the nuclear programs of countries such as Iraq, Iran, North Korea, and the former Soviet Union. From 1989 until he launched his 1998 congressional campaign, Holt was Assistant Director of the Princeton Plasma Physics Laboratory, the largest research facility of Princeton University and the largest center for research in alternative energy in New Jersey. He has conducted extensive research on alternative energy and has his own patent for a solar energy device. Holt was also a five-time winner of the game show "Jeopardy."

An active Member of Congress and a strong voice for his constituents, Rep. Holt serves on the Committee on Education and Labor, the Committee on Natural Resources, and the House Permanent Select Committee on Intelligence. Holt is the only scientist and only Member from the New Jersey delegation to sit on the Intelligence Committee. Holt is also the Chairman of the Select Intelligence Oversight Panel. Created at the start of the 110th Congress in January 2007, the Panel is working to

strengthen oversight of the intelligence community by ensuring that policymakers receive accurate assessments, civil liberties are safeguarded, and the intelligence community is protecting Americans.

Holt was honored to serve on the National Commission on Mathematics and Science Teaching for the 21st Century chaired by former Senator and astronaut John Glenn. He is co-chair of the Research and Development Caucus, and sits on Congressional caucuses concerning Children's Environmental Health, Renewable Energy, Sustainable Development, Alzheimer's, Diabetes, Biomedical Research, Internet, Community College, Farmland Protection, Human Rights, and a Women's Right to Choose. Rep. Holt is also a member of the New Democrat Coalition.

Rep. Holt has won several significant victories in Washington. He helped secure more than \$700 million in new federal funding for science and technology research. He passed an amendment to the Land and Water Conservation Fund providing millions in funding for protecting open space and he was instrumental in adding the lower Delaware River to the National Wild and Scenic River program. He started and facilitates the Einstein's Alley initiative, which seeks to expand and maintain the area's job base by attracting and supporting innovative companies. He also has made hundreds of school visits and held dozens of town meetings and forums on topics such as the War in Iraq, Social Security, Alternative Energy, Economic Growth, Prescription Drugs, Student Aid, Privacy, Long-Term Care, and Sprawl.

Wm. David Burns

Wm. David Burns is the founder and principal investigator of SENCER, the National Science Foundation-supported faculty development and science, technology, engineering, and mathematics reform initiative. Burns is also executive director of the National Center for Science and Civic Engagement and professor of general studies at the Harrisburg University of Science and Technology. Prior to establishing the National Center, Burns served as senior policy director for the Association of American Colleges and Universities. During his nine years with AAC&U, he established the CDC-sponsored Program for Health and Higher Education and created the Sumner Symposia dedicated to exploring the power that students have to improve the health of colleges and communities. Prior to joining AAC&U, Burns served in the administration of Rutgers University for more than twenty years.

He is the principal author and editor of *Learning for Our Common Health* and, among other publications, the article, "Knowledge to Make Our Democracy." Among Burns' community activities he serves as a member of the Franklin Township School Board and is a member of the Governor's Committee on Juvenile Justice and Delinquency Prevention (New Jersey). In 1994, Burns was appointed adjunct assistant professor, Department of Environmental and Community Medicine, Robert Wood Johnson Medical School, University of Medicine and Dentistry of New Jersey, Piscataway, New Jersey. In December 2008, the American Society for Cell Biology honored Burns and SENCER co-founder Karen Oates with the Bruce Alberts Award in recognition of the impact of the SENCER project on science, technology, engineering, and mathematics education.

Richard A. Duschl

Richard Duschl is the Waterbury Chair Professor of Secondary Education at the Pennsylvania State University. Richard earned his doctorate in 1983 from the University of Maryland, College Park. Prior to joining Penn State, Richard held the chair of science education at King's College London and served on the faculties of Rutgers, Vanderbilt and the University of Pittsburgh. He recently served as chair of the National Research Council research synthesis report *Taking Science to School: Learning and Teaching Science in Grades K-8* (National Academies Press, 2007). With Richard Grandy, he co-edited *Teaching Scientific Inquiry: Implications for Research and Implementation* (SensePublishers, 2008). His research focuses on establishing epistemic learning environments and on the role of students' inquiry and argumentation processes. Richard has twice received the JRST Award (1989; 2003) for the outstanding research article published in the *Journal of Research in Science Teaching*. He also served for more than a decade as editor of the research journal *Science Education* and editor for TC Press "Ways of Knowing in Science and Math" book series.

Cindy Kaus

Cindy Kaus is an associate professor at Metropolitan State University. Her interests include teaching mathematics/statistics through issues of social justice and its impact on students who are typically underrepresented in the STEM disciplines, computational electromagnetics, and increasing the participation of underrepresented groups, specifically women and minorities, in the STEM disciplines. She serves as co-director of the program Mpower: Empowering Urban Girls through Mathematics, which includes a summer camp and academic year activities for middle school girls. During her academic career, she has received awards for her excellence in teaching and for her advocacy and service to women. Cindy received her doctorate in mathematics from the University of Arizona and her master's and bachelor's degrees in electrical engineering from Arizona State University. Cindy serves as the SENCER Visiting Mathematician during the 2008-2009 academic year.

Danielle Kraus

Danielle Kraus earned her bachelors of arts degrees in economics and French from the Pennsylvania State University. She is the associate director for the National Center for Science and Civic Engagement and the Center's signature program, SENCER. Danielle manages the day-to-day operations of the national office and coordinates SENCER and the Center's national events, such as the annual Summer Institute and Washington Symposium. She also edits the biweekly e-News, researches new program opportunities, and works on strategic planning.

Karen Kashmanian Oates

Karen Oates currently serves as the deputy for the Division of Undergraduate Education at the National Science Foundation. Prior to joining NSF in the summer of 2007, she served as the founding Provost for Harrisburg University of Science and Technology and co-Principal Investigator on the SENCER grant. She received her bachelor's in biology from Rochester Institute of Technology and her doctorate in biochemistry for George Washington University. After completing her doctorate, Karen spent several years at the National Institutes for Health/National Cancer Institute as a visiting research fellow, working on the proliferate active effects and characterization of thymic hormones. She has published numerous research papers and received numerous grants and awards. In 1985, she joined the faculty of George Mason University, and in 1995 she became associate dean for the College of Integrative Studies (New Century College) at George Mason

University. In 1997, Karen became involved with the Program for Health and Higher Education. As senior science fellow at AAC&U (1997-2004), she worked towards integrating the sciences into a variety of AAC&U projects. Nationally, Karen conducts faculty development workshops on a variety of topics including assessment strategies, integrating service learning in the curriculum, community- and discovery-based undergraduate research, using research to inform curricular design and pedagogies associated with learning communities.

Stacey Rudolph

Stacey Rudolph serves as Grants Specialist for the National Oceanic and Atmospheric Administration (NOAA) Office of Education. Her role includes the management of NOAA Environmental Literacy Grants including grant development, application review process, and grantee selection and management. Additional responsibilities include support for the Bay Watershed Education and Training (B-WET) Program, liaison for NOAA's Office of Education to external education organizations, strategic planning for the Agency as member of the Visual Communications Team, and presentations at national and regional education conferences. Stacey is also the current Washington, D.C. representative for the National Earth Science Teachers Association (NESTA) and is an active member of the Coalition for Earth Science Education.

Prior to working at NOAA, Stacey worked for the National Science Teachers Association (NSTA) as the SciGuides Program Manager. She also worked for the National Aeronautics and Space Administration (NASA)'s Office of Education and Science Mission Directorate as Program Support Specialist for the NASA Sharp program and Education Products Manager for NASA's Office of Education. She also served as Senior Science Education Specialist at the Institute for Global Environmental Strategies (IGES) where she developed, reviewed, produced, distributed and trained educators on the use of NASA's science education materials. Stacey is a former high school science teacher and has conducted paleoclimatology research at Lamont Dougherty Earth Observatory. She has a B.S. in Geology from the State University of New York at Oswego and an M.A.T. from the University of South Carolina at Columbia.

Sarah Schoedinger

Sarah Schoedinger is a senior program manager for NOAA's Office of Education where she manages several of the office's grants programs, oversees a professional development program for NOAA's educators, and serves as a liaison to organizations with missions and programs complementary to NOAA's. Sarah is a past president of the National Marine Educators Association (NMEA). Since 2004 Sarah has been one of the leaders of campaign to increase ocean literacy, beginning with the workshop to define ocean literacy and identify the essential principles and fundamental concepts for grades K-12 to the promotion of these concepts at the national level. Prior to coming to NOAA, Sarah was the Education Director of the Consortium for Oceanographic Research and Education (CORE). She is a graduate of St. John's College in Annapolis and holds a Master of Science degree in marine studies from the University of Delaware.

Kathleen Schwillie

Kathleen Schwillie is the director of program development for National Geographic's Education Programs Division. She manages professional development and materials development projects for K-12 teachers and informal educators focused on geography, science, and social studies learning, field work, and use of media in educational settings. She manages the FieldScope project, which

engages students as citizen scientists in collecting, sharing and analyzing data utilizing web-based GIS software. She has worked with teachers of all grade levels across the country on improving their teaching and their students' learning. Before coming to the National Geographic Society, Kathleen researched professional development programs for science teachers to increase student learning and change teachers' classroom behavior. Kathleen is a certified science teacher, and taught high school chemistry in rural Tanzania with the Peace Corps. Kathleen has a bachelor's degree in chemistry education and a master's degree in learning sciences, both from Northwestern University.

Garon Smith

Garon Smith is a professor of chemistry at the University of Montana. He received a B.A. in environmental biology from the University of Colorado at Boulder and his Ph.D. in applied chemistry from the Colorado School of Mines. He has been a SENCER Senior Associate since a 2004 sabbatical spent at the SENCER national headquarters and is a SENCER Leadership Fellow. In this capacity he works to help schools SENCERize courses by linking societal issues with specific disciplinary principles; and promote SENCER poster sessions within the NCUR organization for which students prepare two versions of their project – one for technical specialists in their disciplinary field and one for a more general public audience.

Garon has applied SENCER to his Introductory Chemistry Course for 700 students and to the development of learning communities on environmental planning for both freshman and science majors. He has also built a consortium of high schools and two-year tribal colleges throughout western Montana and Northern Idaho to perform air quality sampling and relate it to public health statistics on asthma and cardiovascular disease. Garon's research involves environmental applications of mass spectrometry, 3-D fluorescence spectroscopy and artificial neural networks.

His professional activities include serving as chair of his local Boards of Health, Air Pollution Control, and Water Quality; the Boards' liaison to the Air Quality Advisory Council; the Missoula Transportation Planning Coordinating Committee. He serves on the Board of Governors for the National Conference on Undergraduate Research and will be a repeat host for the NCUR organization's 2010 conference in Missoula. Garon has received a number of awards for his teaching and service, most recently, the 2008 University of Montana's Student Affairs Award and the 2006 Montana Faculty Service Award.

Tim Watkins

Tim Watkins is a program officer at National Geographic Society, where he oversees the Society's international small grants programs in life sciences field research and conservation. His professional interests are at the interface of biological research and education, particularly in ecology, evolution, and organismal biology. He earned a B.A. in biology at Vassar College and a Ph.D. in ecology and evolution at the University of California, Irvine. While at UCI he also developed and managed the campus-wide TA development programs and promoted excellence in teaching on the campus of a research university. He conducted postdoctoral research at Dartmouth College, then joined the faculty at Macalester College, where he pursued research on amphibian populations and novel approaches to active learning in the science classroom, laboratory, and field. Following several years of research and teaching in academia, he joined National Geographic in 2006. In addition to overseeing the grants program there, he is one of the leaders of the Society's BioBlitz program and is collaboratively building NGS's involvement in citizen science and education.

Poster Abstracts

Capitol Hill Poster Session

Brigham Young University

Comparative analysis of two non-majors biology courses in student assessment of learning gains (SALG) and attitudes of students in science

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| Jessica Rosenvall | <i>Student, Plant and Wildlife Sciences</i> |
| Laura Jimenez | <i>Student, Instructional Psychology</i> |
| Richard Sudweeks | <i>Professor, Instructional Psychology</i> |
| Bruce Schaalie | <i>Professor, Statistics</i> |
| Gary M. Booth | <i>Professor, Plant and Wildlife Sciences</i> |

In recent years many have noted a decline in interest among students in all areas of science even as there is a rising need for citizen awareness of scientific issues. Publications such as *Rising Above the Gathering Storm* highlight the severity of the situation and the concern of educators, scientists, and leaders of our nation because of the vast range of national and international scientific and biological issues the United States faces. Thus, educators are trying new methods of to connect and engage students with the world of science. Many studies show that the use of service-learning and other methods that connect learning to issues affecting students' lives and communities increases interest in the sciences. There is also evidence that students often view science as a group of separated, isolated concepts, and that the activities that help students make connections between concepts learned and the real world improve learning and diminish frustration.

In a comparative study, two non-majors biology classes were analyzed to determine if enriched activities improved attitudes and learning of the sciences. These enriched activities included service-learning projects and outside guest lectures, which aided in connecting science to the students' communities and lives, and concept mapping that helped students connect the variety of points learned. The control class received normal university instruction with no enriched activities while the treatment class participated in all three enriched activities. All students took a pre- and post-biology exam, as well as a pre- and post- student assessment of learning gains (SALG) survey to study attitude changes. The data set shows no significant differences between the control and treatment classes; however the SALG data clearly shows that both classes improved in understanding and attitudes toward science by the end of the semester. This preliminary data may suggest that the teacher may matter more than the pedagogy.

Psychometric properties of student concept map scores calculated using a scoring rubric based on four concept-map proposition attributes

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| Laura Jimenez | <i>Instructional Psychology</i> |
| Richard Sudweeks | <i>Professor, Instructional Psychology</i> |
| Jessica Rosenvall | <i>Student, Plant and Wildlife Sciences</i> |
| Gary M. Booth | <i>Professor, Plant and Wildlife Sciences</i> |

Dissatisfaction with traditional forms of assessment has led many educators to seek alternative ways to assess student conceptual understanding. Many traditional assessments include multiple choice items that can be reliably scored but often test recall or recognition of facts without regard to how students organize concepts within a larger framework (Ruiz-Primo & Shavelson, 1996).

Assessments that do measure student conceptual organization, such as essays or interviews, are generally time consuming to administer and to evaluate (Brussow, 2004). Concept maps may provide a more efficient way of assessing at students conceptual understanding, but using such ways for assessment purposes necessitates rater-mediated judgments of students' maps which raises concern about the reliability and validity of the resulting ratings. This study evaluated the reliability of an innovative concept map scoring rubric. Findings show that variability in student performance accounted for 79% of the total variance, rater effect contributes 1% and the person-by-rater interaction 5%. Twenty five percent of the variance was unexplained. A reliability of 0.82 can be obtained by averaging the ratings of two raters on two different rating occasions. Using only one rater in one occasion would yield a reliability of 0.69. Using two raters on one occasion would produce greater improvement in reliability than using a single rater on two occasions.

The Red Rock Wilderness Act: A novel approach for inspiring students to civic engagement

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| Analiesa Leonhardt | <i>Postgraduate, Department of Biology</i> |
| Gary M. Booth | <i>Professor, Plant and Wildlife Sciences</i> |

The Brigham Young University Environmental Science Program has a new course, Environmental Policy and Laws, which deals with the major acts and executive orders that impact natural resources. The Red Rock Wilderness Act of 2007 (S.1170) (HR. 1919), while it did not receive approval from the Senate and House in 2007, is currently being lobbied for reconsideration in 2009. Discussion of this act in class clearly reveals that undergraduate and graduate students have a tremendous interest in protecting the designated 9.4 million acres of Red Rock Canyon for future generations. However, these 36 students also admitted that they knew little about the act prior to classroom discussion (only 1 of 36 students knew enough to write a statement). These data support the growing concern that knowledge of major environmentally-related civic issues is limited in undergraduates and even graduates majoring in science. This SENCERized course attempts to remediate this educational defect by informing and inspiring students to take civic action with the skills and knowledge they gain from the classroom. The primary author of this poster (Analiesa Leonhardt) spent two weeks lobbying for this important environmental legislation, and thus brought first-hand experience about the lobbying process to the classroom.

The cycle of learning in a case study involving Pygmy Rabbits: Classroom instruction, field work, and back to the classroom teaching

Janet Lee *Research Faculty, Plant and Wildlife Sciences*

Randy Larsen *Assistant Professor, Plant and Wildlife Sciences*

Gary M. Booth *Professor, Plant and Wildlife Sciences*

If there is one thing that can be learned from the college experience, it is that the most valuable knowledge students can receive comes not from the classroom, but from field research. This is a study of an undergraduate who became involved in researching pygmy rabbits, a small leporid endemic to the sagebrush-steppe habitat of the Intermountain West. This intriguing species, along with the guidance of several professors, prompted this student to continue her research and attend graduate school to obtain a master's degree. As a graduate student she was given the opportunity to give guest lectures to undergraduate students concerning her research, which she readily accepted and found to be an awarding experience. The presentations not only spread awareness of the pygmy rabbit, but gave her an opportunity to inspire undergraduate students to become involved in field research and advanced degrees. We suggest that this cycle of learning—classroom learning, field research and returning to the classroom again to share these outside experiences—engages students and motivates them to be innovative and lifelong learners by sharing their learning with others.

Champlain College

Weaving science into the fabric of higher education

Cynthia Brandenburg *Assistant Professor, Core Division*

Craig McKeon *Student, Graphic Design & Digital Media*

How does a trained lab scientist shift gears and think about “the rest of the world?” One way is to leave the comfort of teaching within one's area of expertise and enter the often confusing, sometimes intimidating, and ever challenging world of interdisciplinary education. Champlain College is in the midst of redesigning its general education curriculum by creating a required four-year core sequence that will prepare our professionally-oriented students to think critically and engage in complex issues upon graduation. While the standard requirement for a lab science remains, the curriculum also emphasizes embedding multiple disciplinary perspectives, including scientific ones, throughout the entire sequence. All students are exposed to neuroscience, environmental issues, the revolutionary ideas of Galileo and Darwin, the role of science in the culture wars of contemporary America, and the implications of science and technology for our global future. Students who are never formally trained in the sciences become scientifically literate, appreciating the importance of scientific perspectives when tackling broad issues. Assessment data reflecting core curriculum outcomes are being gathered through an electronic portfolio system. This approach results in a more fully engaged citizenry that recognizes science as woven into the fabric of everyday life.

Christopher Newport University

Using faculty development to create an engaged research-rich learning environment for students across the liberal arts and sciences

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| Andrew J. Velkey | <i>Associate Professor, Psychology</i> |
| Bobbie Bartels | <i>Professor, Mathematics & Associate Dean, Liberal Learning</i> |
| Mihaela Dobrescu | <i>Assistant Professor, Psychology</i> |
| Lisa Webb | <i>Assistant Professor, Biology</i> |
| Michael Meyer | <i>Assistant Professor, Biology</i> |
| Raouf Selim | <i>Associate Professor, Physics</i> |
| Rob Atkinson | <i>Professor, Biology</i> |

In 2005, Christopher Newport University joined the Project Kaleidoscope Leadership Initiative to foster faculty development in creating research-rich learning environments. This science, technology, engineering, and mathematics (STEM) initiative led to a substantial expansion of the undergraduate research opportunities across the university; the number of departments, faculty, and students participating in these research collaboratives has more than doubled. As part of our strategy to institutionalize undergraduate research, a team from CNU attended the 2008 SENCER Summer Institute and has begun programming activities for faculty development aimed at infusing the SENCER ideals into this emerging research-rich environment. In January 2009, twenty CNU faculty and administrators from a variety of STEM and other disciplines participated in a day-long workshop featuring a SENCER presenter (Dr. Edward Katz of the University of North Carolina at Asheville) as well as a focused discussion on using the PKAL Planning Process for developing personal action plans. Implications of these findings will be discussed in terms of planning for future faculty development workshops as well as the exploration of scaling up the program for a regional workshop in the future.

City College of New York

“Who does science and why?” Answering this question on multiple campuses through close analysis of papers coupled with email interviews of authors—the C.R.E.A.T.E. approach

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| Sally G. Hoskins | <i>Professor, Biology</i> |
| Leslie M. Stevens | <i>Assistant Professor, Section of Molecular Cell and Developmental Biology, University of Texas-Austin</i> |

Many students initially interested in majoring in the science disciplines do not gain a real sense of the excitement of long-term lab research projects from their coursework, and give up on their dreams of science careers as a result. One contributing factor is the overwhelming amount of textbook information students are expected to learn. With National Science Foundation support, we have piloted and expanded an alternative approach focused on depth rather than breadth and based on

journal articles, the real language of science. Our approach, C.R.E.A.T.E. (Consider, Read, Elucidate hypotheses, Analyze data, and Think of the next Experiment) also puts students directly in contact with researchers through email interviews where students' own questions about 'the research life' are answered.

Pilot studies at CCNY, in classes that were 2/3 minority students, showed the approach succeeded at enhancing students' critical thinking and content understanding while at the same time increasing their enthusiasm for researchers and research careers. Recent expansion of the CREATE method to additional campuses ranging from Ivy league (Columbia) to community colleges (Queensborough Community College) indicate that this method is successful with students from quite varied academic and social backgrounds.

Eugene Lang College, The New School for Liberal Arts

Stem Cells in the City: Making Biology Relevant Through Local Community Projects

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| Charnell Covert | <i>Student, Literature Studies/African American Studies</i> |
| Katayoun Chamany | <i>Associate Professor, Biology</i> |
| Nona Griffin | <i>Student, Interdisciplinary Science & Integrative Design</i> |
| Daylon James | <i>New York Stem Cell Foundation – Druckenmiller Fellow, Weill Medical College of Cornell University</i> |

As part of a civic engagement component of *The Science and Politics of Stem Cells* course, undergraduate students collaborate and design education and outreach materials for a local community partner, The New York Stem Cell Foundation (NYSCF), and disseminate the work of the NY State Ethics and Funding Committees for Stem Cell Research. Students propose projects based on their disciplinary expertise and interests, while NYSCF selects post-doctoral fellows whose work could be enhanced through these projects. As one example, Daylon James's work on the generation of endothelial cells (cells that make up blood vessels) from human embryonic stem cells will be showcased in student projects that highlight the scientific, ethical, and political dimensions of developing a novel protocol to produce these cells. The course projects will promote education and awareness on three levels: undergraduates gain firsthand knowledge of biomedical research through course content and interaction with NYSCF fellows; NYSCF postdoctoral fellows acquire experience communicating and teaching science to a general audience through student interactions and a public seminar series; and the general public and university campus has the opportunity to engage with researchers through the public series, online forums, poster sessions, and other student generated products.

The New York Stem Cell Foundation: Community partners in civic engagement

Daylon James

*New York Stem Cell Foundation – Druckenmiller Fellow,
Weill Medical College of Cornell University*

Daylon James’s work on the regenerative power of human embryonic stem cells (hESCs) to address cardiovascular disease is a real-world example that highlights the relevance of scientific research for students coming from a wide range of academic disciplines. Diseases of the cardiovascular system are the leading cause of death in the developed world. Human embryonic stem cells can theoretically give rise to a limitless supply of the cells and tissues lost to cardiovascular disease and/or injury. Through James’s research, methods to efficiently generate unlimited amounts of endothelium (the cells that make up blood vessels) have been developed and are testing the ability of these cells to restore healthy circulation to tissues in which blood flow is limited or lost. The research is supported by the New York Stem Cell Foundation, underscoring the political and economic dimensions of hESC research which are deeply connected to the overarching themes presented in The Science and Politics of Stem Cell Research course. James will be working with students in this course to raise awareness about hESC research on the Lang campus and in the larger community of New York City through radio interviews, web-linked videos, and other outreach materials.

Florida Gulf Coast University

Preparing citizen scientists via science research opportunities in Southwest Florida

Nora Egan Demers

*Associate Professor Biological Science and
Interdisciplinary Studies*

Edwin Everham

Associate Professor, Marine and Ecological Sciences

Michael Savarese

*Professor, Marine & Ecological Sciences & Interim
Director of the Whitaker Center for STEM Education*

Joseph Kakareka

Associate Professor, Mathematics and Physical Sciences

Ai Ning Loh

Associate Professor, Marine & Ecological Sciences

Anne Hartley

Assistant Professor, Marine & Ecological Sciences

Brian Bovard

Assistant Professor, Marine & Ecological Sciences

John Cassani

Deputy Director, Lee County Hyacinth Control

Brenda Brooks

Corkscrew Regional Ecosystem Watershed Land Trust

Mike Owen

Fakahatchee Strand Preserve State Park

In a world in which the majority of the American public gets its scientific information from “media sound bites,” the Whitaker Center at Florida Gulf Coast University is involving local citizens in the scientific process to improve their understanding of science concepts and the critical role science plays in modern society.

University-sponsored initiatives in cooperation with other community organizations in which local residents and students participate include a monthly frog monitoring program, the monitoring of critical ecological processes at local parks, conservation areas and on the University campus, and a Summer Research Opportunities program that engages middle school students in developing and completing research projects such as developing and evaluating ecosystem carbon budgets and analyzing coastal geomorphology. In classroom settings at the University, students become proficient in finding and evaluating resources, and understanding the role of scientific data in decision- and policy making. For example, in an interdisciplinary global climate change course, students develop their own strategies to compare opposing theories. After learning the science, students evaluate potential impacts, adaptations and the ethics of mitigation strategies. In another course, students learn how to become more civically engaged as well as how to critically evaluate sources as they develop an understanding of the science and technology associated with current issues.

Franklin & Marshall College

Pregnancy outcomes in American women

Berwood Yost

Director, Floyd Institute for Public Policy and Center for Opinion Research

Jennifer Stuart

Special Studies Major, Minor in Women & Gender Studies

The United States is currently ranked 28th in the rate of infant mortality, the second lowest ranking in the developed world. This upper-division seminar for juniors and seniors examines the pressing civic problem of poor pregnancy outcomes in American women by using locally collected data and a multi-disciplinary approach. The course is team taught by a biologist, an economist, a political scientist, and a cultural historian of gender, with guest lecturers providing expert coverage of topics related to infant mortality and its prevention, such as medical practices, behavior, genetics, and environmental factors. The science topics addressed include the stages of human pregnancy, genetic testing, and the impact of pharmaceuticals, toxins, and nutrition on fetal development. Through readings, presentations and discussions students explore unanswered questions at the intersection of science and public policy. Students gain experience with the evaluation and use of evidence drawn from multiple sources, so that the construction and defense of arguments based on statistical data is emphasized. The course educates students about the value of approaching complex policy issues from a multi-disciplinary perspective.

George Mason University

Smithsonian-Mason Global Conservation Studies Program

| | |
|---------------------|---|
| Thomas Wood | <i>Director, Mason Center for Conservation Studies</i> |
| Francisco Dallmeier | <i>Head, Smithsonian Center for Conservation Education and Sustainability</i> |
| Steven Monfort | <i>Associate Director, Conservation and Science, National Zoological Park</i> |

George Mason University and the Smithsonian Institution have joined forces to form the Smithsonian-Mason Global Conservation Studies Program. This alliance offers undergraduate, graduate, and professional development programs in conservation studies based at the Conservation and Research Center in Front Royal, Virginia. The flagship program is the 16-credit undergraduate Smithsonian-Mason Semester in which students learn from leading conservation researchers in a facility that houses some of the world's most endangered species. This residential undergraduate experience offered jointly by Mason and the Smithsonian represents a unique opportunity for reforming faculty development in both institutions, ultimately leading to improved student learning. The alliance represents significant progress in responding to calls for science education reform from the National Science Foundation and National Academies of Science as articulated by SENCER. The Smithsonian and George Mason University are committed to construction of new resident, dining, classroom and laboratory facilities to facilitate program expansion.

Harold Washington College

Science education in composition: Engaging the age of AIDS

| | |
|-----------------------|--|
| Cydni M. Hinton | <i>Student, Biology/Psychology</i> |
| Dennis Lehman | <i>Professor Emeritus</i> |
| Donyel Hobbs Williams | <i>Assistant Professor & English Department Co-Chair</i> |

Prompting students to understand the complexities of the problems affecting our society is a necessary approach to civic engagement. In this course, a problem-based learning strategy that facilitates an awareness of HIV and AIDS from a legal, ethical, cultural, and psychological perspective is used. Students examine issues such as an individual's right to privacy versus the public's right to disclosure; the use of experimental drugs without consent; and engaging in at-risk behavior, despite potentially severe consequences. The impact of HIV and AIDS on individuals, families, and communities is analyzed through the lens of popular media-cinematic adaptations and a dramatic series-to engage composition students in both verbal and written critical dialogue.

James Madison University

How can science and service learning help low income, urban minority students prepare for college?

Oris Griffin

Director, JMU Professor in Residence Program

Cindy Klevickis

SENCER Fellow and Professor of Integrated Science and Technology at James Madison University and Professor in Residence at Huguenot High School in Richmond VA

The James Madison University Professor in Residence Program encourages minority and disadvantaged high school students across the state of Virginia to pursue studies at two- and four-year institutions of higher education. Senior JMU faculty are appointed as Professors in Residence at ten diverse high schools and middle schools throughout the state of Virginia, and work in partner schools at least one day each week. Each year, as part of this program, 20-30 students attend a Middle School Leadership Academy and other summer programs at JMU; 40-50 middle school students participate in after school programs; 20 freshmen and sophomores participate in service-learning activities; and 40-50 juniors and seniors take JMU dual enrollment classes at their high schools taught by JMU professors. We also work with students and parents tutoring in science, completing college applications, scheduling college tours and completing financial aid applications.

The mission of the professor-in residence program has always been to enhance the academic atmosphere in high-needs schools. Over the last five years, it has become evident that the focus needs to be on math and science because that is where the students fall behind. Faced with challenges in algebra II and chemistry, students are easily tempted to slip back from an advanced diploma to a standard diploma. Thus, science and math often make the difference that prevents the students from being accepted at competitive colleges and universities. This program has had a positive influence on the middle and high school students. Applications from one of the high schools to JMU went from zero students five years ago to 37 students this year. From that same school, student interest in bus tours of JMU went from barely filling half of a bus three years ago increased to three bus loads of 47 students each this year.

Lipscomb University

An integrated approach to general education in the sciences

| | |
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| Alan Bradshaw | <i>Associate Professor, Physics</i> |
| Autumn Marshall | <i>Associate Professor, Family and Consumer Sciences</i> |
| Linda Phipps | <i>Associate Professor, Chemistry</i> |
| Marcia Stewart | <i>Professor, Education</i> |

Historically, undergraduate liberal arts have emphasized studies in the natural sciences of biology, chemistry and physics. Increasingly, general education programs view science education in utilitarian terms, and some programs exhibit alarming reductions in the quality and quantity of science general education offered to undergraduates. Faculty at Lipscomb have developed an integrated science sequence for general education covering areas of biology, chemistry, physics, nutrition, environmental science and astronomy. They incorporate case studies with interactive learning techniques on topics that encourage civic awareness and engagement. For example, a case study involving food irradiation is used to encourage investigation of radioactivity, nuclear physics, food safety and nutrition and to examine societal and civic implications. In another case study, students tested water from a local river to determine levels of contaminants and the impact on local marine life. Other case studies are incorporated to provide a broad general science background appropriate for non-science majors and to encourage civic involvement informed by the team's experience at SENCER conferences. The 2008-2009 academic year represents the first implementation of the two-semester sequence. In both semesters, faculty found that the civic engagement dimension was well-received and seemed to serve the desired purposes of raising students' awareness of and interest in science applications by involving them in content-related service. But it is too early to make additional comment as to the relative pedagogical effectiveness of this approach vis a vis traditional disciplinary courses since: 1) they have yet to collect all of the comparative data; and, 2) analysis of the results is complicated by the addition of variables associated with team-teaching. Team members hope to have a clearer picture later this spring.

Macalester College

Quantitative approaches to problems in democracy

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| Karen Saxe | <i>Professor and Chair, Mathematics and Computer Science</i> |
| Owen Truesdell | <i>Student</i> |

This past fall, twenty-four students took a newly developed course at Macalester College on the mathematics behind some of the basic problems of elections and voting. The course is intended for future political leaders, and most students are majors in political science, or international studies. The central topics of the course are the apportionment problem, the redistricting problem, and a study of electoral systems used around the world. The apportionment section studies the well-known and fraught history of congressional reapportionment in this country, and also challenges faced by

countries that use proportional representation as a way to fill parliaments or other national assemblies. Measures of compactness of proposed districts give a way of identifying fragrant gerrymandering, and districting algorithms are developed to determine not only political districts, but also public school districts. The last section of the course covered, as an example, how single transferable voting (instant runoff voting if one seat to fill) works, and why it might be challenged in courts. Throughout the course, all is done in context, and pros and cons always debated. The hope is that with these new quantitative approaches in their arsenal, students can better assess arguments regarding the workings of democracies.

Massachusetts College of Liberal Arts

Program assessment of the science/technology core domain at MCLA

Adrienne Wootters

Associate Professor, Physics

In the past year, MCLA science faculty have begun the work of assessing their general education science program, known as the Science/Technology Core Domain. When the MCLA core curriculum was implemented in 2001, faculty members wrote a set of learning outcomes that would guide the creation and implementation of all science courses for non-science majors. In 2003, introductory courses for science majors were also required to meet those learning outcomes. In 2007, when faculty began the process of program review of the Science/Technology Core Domain, they realized that the learning outcomes were too broad and not easily assessable. Since then, faculty have written a new, expanded, assessable set of learning outcomes and implemented a three-year plan for assessment of those outcomes. The expanded outcomes are listed below.

For all courses:

- Students will demonstrate knowledge of natural science content
- Students can develop a testable hypothesis based on observations.
- Students can find media focusing on scientific topics.
- Students can evaluate the reliability of media sources.
- Students can evaluate and summarize information found in media sources.
- Students can interpret graphs.
- Students can communicate scientific findings orally and in writing.

For laboratory courses:

- Students can design an experiment testing a hypothesis.
- Students can conduct and collect data from a scientific experiment.
- Students can generate graphs and tables from scientific data.
- Students can analyze data and relate findings to a hypothesis.
- Students can revise a hypothesis based on experimental findings.
- Students can communicate the results of a scientific experiment.

In the process of program assessment, participating faculty members submit and share syllabi and detail how they will assess the outcomes of that semester. They will save student examples of pertinent work, and assess their students' work on a 3-point rubric scale, which has been agreed on by the Domain faculty. Course syllabi, examples of students' work, and assessment results will be saved and catalogued in the form of a Domain e-portfolio.

Middle Tennessee State University

Contemporary Issues in Science: A new SENCER course

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|----------------------|---|
| Judith Iriarte-Gross | <i>Professor, Chemistry</i> |
| Kathy Patrick | <i>Undergraduate Student, Mathematics</i> |
| Martha Riherd Weller | <i>Professor, Physics and Astronomy</i> |

Middle Tennessee State University faculty are developing a new general education and multi-disciplinary course called *Contemporary Issues in Science*. The objective is to enable non-science majors to investigate science associated with current civic issues. Students participate in a case study in which they investigate a specific energy issue, similar to topics that arise in civic forums. Students practice their role as citizens by writing a letter to their state or federal representatives expressing and supporting their position on the issue using scientific evidence. Students also present their opinion in a "public forum" held during a class period. Other student activities include group problem-solving using instructor-designed computer modules and lab activities that illustrate energy-related concepts.

Faculty have posed the following research question: Will students' attitudes change about science using a SENCER approach in a general education physical science course? The Test of Scientific Related Attitudes (TOSRA) is used as a pre- and post- measure in our class and in a corresponding, yet traditionally taught general education science course. Initial results show that students in the SENCER course do not dislike science any more at the end than at the beginning of the course. Students in the tradition course, however, do have a stronger dislike of science at the end of their studies than at the beginning. We are also using the SENCER-Student Assessment of Learning Gains pre- and post-tests, where preliminary anecdotal evidence indicates more student interest in the course topics.

Montgomery College

A critical thinking exercise for STEM students: Development of procedures for an air quality experiment for non-science majors

| | |
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| Mesfin D. Adamassu | <i>Pre-Pharmacy</i> |
| Tobesta G. Adera | <i>Pre-Medicine</i> |
| Ralph L. Bain | <i>Professor, Chemistry</i> |
| Brian T. Barrett | <i>General Studies, Chemistry</i> |
| Linda Mona | <i>Department Co-Chair & Professor, Chemistry</i> |
| Nicolas A. Moyer | <i>General Studies, Chemistry</i> |

Montgomery College reports the results of a critical thinking exercise to develop a set of procedures for a chemistry laboratory experiment related to air quality, intended for use in an experiment for non-science students. The quality of air may be determined by measuring changes in the amount of airborne particles. In submarines and other confined spaces (e.g., the International Space Station), the size and type of smoke particles can help determine the location and nature of the fire. Lab procedures were developed using commercial detectors often found in homes and businesses. The detectors used are two types of smoke detectors, a carbon monoxide detector, and a dual purpose explosive gas (natural gas) detector.

Four science major students in a chemistry honors section participated in this project. The development of the project centered on the safe use of the detectors in the laboratory, a purpose statement for the experiment, compiling written procedures for a non-science student that could be completed in about 60 minutes from set-up to data collection and cleanup, and posing a critical thinking question as part of the experiment. Critical thinking skills involved in this exercise include evaluation, design, and the synthesis of information.

New Mexico Tech

Evolution of CSI:DNA

| | |
|---------------|-------------------------------------|
| Rebecca Reiss | <i>Associate Professor, Biology</i> |
| David Metcalf | <i>Computer Specialist</i> |

Mysteries are fashionable entertainment and television is crowded with crime scene investigation shows that combine this literary genre with advanced scientific procedures. The mixture of real science and mock drama makes *CSI:DNA* the most popular offering of the New Mexico Tech summer high-school mini-course program. *CSI:DNA* is made possible by a 1998 NSF instrumentation grant (NSF DUE Grant #9851150) that funded the purchase of a Prism 310 Genetic Analyzer, which is used for both DNA sequencing and forensics. The donation of expired reagents from law enforcement labs make it affordable for students learn about basic DNA structure by doing

genotyping experiments. This exercise was incorporated into the undergraduate genetics lab course in 1999. In 2003, a high-school teacher in the Masters of Science for Teachers program designed a course in which high-school students learn about forensic genetics, then apply this knowledge to a mock crime scene, and *CSI:DNA* was born. The web site <http://infohost.nmt.edu/~biology/CSIWeb/> was launched in 2007 to encourage the inclusion of forensic DNA activities in other classrooms. In 2008, the Applera foundation funded a proposal to develop a virtual *CSI:DNA* site that will use animated graphics and virtual reality programming to simulate forensic DNA analysis.

North Carolina Central University

Integration of laboratory and social science skills as a means for engaging STEM majors in research on an urban HBCU campus

| | |
|---------------------|--|
| Yolanda B. Anderson | <i>Chair, Department of Environmental, Earth, and Geospatial Sciences</i> |
| Sandra F. DeLauder | <i>Associate Dean, College of Science and Technology</i> |
| John J. Bang | <i>Associate Professor, Department of Environmental, Earth, and Geospatial Sciences</i> |
| Lauren Lawrence | <i>Graduate Student, (Master of Sciences, in Earth Sciences Degree Program</i> |
| Algernon Finley III | <i>Undergraduate Student, Environmental Science</i> |
| Karimah Bennett | <i>Undergraduate Student, Environmental Science</i> |
| Jerry Battle | <i>Undergraduate Student, B.S. Environmental Science, Second Degree Major, Chemistry</i> |

In 2001, North Carolina Central University and the National Exposure Research Laboratory of the United States Environmental Protection Agency entered into a cooperative agreement to assess environmental exposure and impact in low socioeconomic status communities of color. The project entitled “The Environmental Risk and Impact in Communities of Color and Economically Disadvantaged Communities of Color” (ERICC) was supported with five cycles of funding that resulted in a six-year project and budget period; ending in August 2007. A primary goal of the cooperative agreement was development of the research capacity within the Environmental Science Program enabling the department to address environmental justice issues through integration of laboratory techniques common in this discipline with aspects of the community based participatory research model (CBPR). The project allowed students to obtain experience in real world applications by participating in field sampling and the curriculum was modified to include modules developed through this project. Several student participants have completed undergraduate and graduate programs at NCCU and have matriculated into doctoral programs or careers utilizing skills obtained through the ERICC Project. Additional aspects of this project pertinent to the engagement of science, technology, engineering, and mathematics faculty and students will be discussed along with the implications for involvement in community based research.

Rutgers University

The SENCER Centers for Innovation – A focus on the Midatlantic region

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| Monica A. Devanas | <i>Director Faculty Development and Assessment Programs, Center for Teaching Advancement and Assessment Research</i> |
| Ellen Mappen | <i>Senior Fellow, National Center for Science and Civic Engagement</i> |
| Terry R. McGuire | <i>Professor and Undergraduate Vice Chair, Department of Genetics</i> |

The SENCER Centers for Innovation are formal regional organizations that provide support to local educators and programming throughout the year to complement national events. Rutgers University is the host institution for the SENCER Center for Innovation – Midatlantic. The SCIs are also focused on improving teaching and learning in the sciences and mathematics, in STEM disciplines, teacher preparation and K-12 curriculum.

SENCER programs engage students in science and mathematics by focusing coursework on real world problems. This method extends the impact of student learning across the curriculum to the broader community and society. The SCI-Midatlantic is designing a regional research project with components to engage students, teachers, community groups, colleges and researchers. The project will create a virtual water research institute where data can be shared, resources can be requested, presentations can be developed and connections with water research projects and laboratory can be created.

The SCI-Midatlantic hosted a formal symposium at Franklin & Marshall College on October 4, 2008. The theme was “Preparing Future Undergraduates: Taking Science to School;” examining collaborations for science and science teaching across all grade levels. An upcoming conference, planned for April 4, 2009 at Rutgers University will focus on “Building Connections with Water.”

Salmonella—it’s what for dinner tonight: Communicating to the public about food contamination

| | |
|-----------------|--|
| Cara Cuite | <i>Research Project Manager</i> |
| William Hallman | <i>Director, Food Policy Institute</i> |
| Mary Nucci | <i>Research Analyst, Food Policy Institute</i> |

In June 2008, the public learned about the possible contamination of specific kinds of tomatoes with *Salmonella* from a warning advisory released by the FDA. It was not until the end of August that the FDA was able to provide an all-clear to the subsequent expanded warning to avoid Jalapeno and Serrano peppers. Over the three months of this investigation, various kinds of tomatoes from numerous growing regions were removed from the warning list, and the pepper warning was broadened from susceptible consumers (e.g., elderly, immuno-compromised, children) to all

consumers. Following on the heels of several wide-spread recalls of food and toys over the past few years, the FDA attempted to provide precision communications to an area of uncertainty based on epidemiological investigation in what became the largest food contamination outbreak in the last decade. Communicating food safety information is critical in this global economy. An analysis of newspaper and television coverage of the food advisories between June and August 2008 considers the effectiveness of communication in both extent of coverage and accuracy of content, and in light of the potential for widespread and devastating consequences of food contamination, both unintentional and intentional.

SUNY Old Westbury

Promoting scientific literacy and responsibility through community engagement in the first year program

| | |
|-----------------|--|
| Laura Anker | <i>Distinguished Service Professor and Director, First Year Experience and Community Engagement Programs</i> |
| Barbara Hillery | <i>Associate Professor and Chair, Chemistry and Physics</i> |
| Lauren Santiago | <i>Undergraduate Student</i> |
| Tonya Thomas | <i>Director, Community Engagement and Partnership Center</i> |
| Inez Zuska | <i>Undergraduate Student</i> |

General education at SUNY Old Westbury requires that all students take a laboratory science. For many, this has been difficult. Two problems predominate: students have already developed adverse attitudes towards the sciences, especially the physical sciences; and students view their science course as an onerous requirement involving arcane and useless data. To overcome these problems, we have developed curricula blending rigorous academic content with community engagement. Learning outcomes include the ability to integrate the content of their course with their placement experience, as well as an understanding of their role as active citizens. Summative assessment is based on formal essays.

Working with the Community Engagement and Partnership Center at Old Westbury, the First Year Program has created a unique model of college-community collaboration that addresses community needs while identifying civic engagement as a core value of an Old Westbury education. Partners must meet our mission-based commitment to fostering social equity, sustainability and/or environmental justice. The pilot for this program linked a freshmen seminar, *Energy and Long Island*, with our original community partner, Sustainable Long Island. Recently *Ocean Studies* has been linked with such partners as Atlantis Marine World and the Center for Science Teaching and Learning. By engaging students, both personally and intellectually, in science course work with embedded community engagement, faculty hope to further not only their scientific literacy but also their commitment to a sustainable future.

Texas Woman's University

Water conservation: What about graywater?

| | |
|-------------------------|--|
| Cynthia Maguire | <i>Lecturer II, Chemistry & Physics Department</i> |
| Danielle Miller | <i>Student, Communication Science</i> |
| Diana Newport | <i>Student, Interdisciplinary Studies</i> |
| Kelly Pearson | <i>Student, Interdisciplinary Studies</i> |
| Rachel Perry | <i>Student, Interdisciplinary Studies</i> |
| Martha Rose | <i>Student, Psychology</i> |
| Michelle Salas | <i>Student, Interdisciplinary Studies</i> |
| Lacey Shields Escalante | <i>Student, Government</i> |

This poster presents water conservation, creating awareness about water shortages Texans—and all Americans—are facing. It is locally significant as Texas's population is projected to double from 2000 to 2040. The current supply of drinking water won't keep up with this demand, therefore making changes today is vital to Texas's tomorrow. One part of the solution is to raise awareness about conservation. Students in this group surveyed others on campus to measure their awareness of conservation and related behaviors. Their poster gives the surprising results and informs readers about one little-known option: Graywater.

Where does TWU's food come from?

| | |
|------------------|--|
| Evie Bryant | <i>Student, Interdisciplinary Studies</i> |
| Patricia Kelly | <i>Student, Interdisciplinary Studies</i> |
| Susan Kendall | <i>Student, Interdisciplinary Studies</i> |
| Krystle Lee | <i>Student, Interdisciplinary Studies</i> |
| Cynthia Maguire | <i>Lecturer II, Chemistry & Physics Department</i> |
| Lindsey Martin | <i>Student, Physical Therapy</i> |
| Chastity Titus | <i>Student, General Studies</i> |
| Kristen Twerberg | <i>Student, Interdisciplinary Studies</i> |

Sustainable food is a newsworthy topic lately and one group of students was curious: How far does food travel to get to Texas Woman's University? Since greater distances involve added transportation costs and nutritive value declines over time, this is an indicator of how sustainable the meats and produce served at TWU may be, as well as food quality. This project seeks to inform the campus community about their daily food choices. Findings indicate most of our meat and produce travels from far parts of the United States to reach TWU.

University of Akron

Potable water in Haiti: Integrating the social sciences into a humanitarian engineering project

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|-----------------|---|
| Annabelle Foos | <i>Assistant Dean College of Arts and Science, Professor of Geology</i> |
| Helen Qammar | <i>Associate Professor, Chemical and Biomolecular Engineering</i> |
| Brittany Skelly | <i>Student, Chemical and Biomolecular Engineering</i> |

Civic and humanitarian issues allow students to become deeply involved with content they might otherwise shy away from. Last year faculty challenged 150 engineering students to develop a sustainable solution to the lack of potable water in Haitian households. Course assignments required these students, who may view social science as somewhat irrelevant to their career aspirations, to gain a fuller understanding of Haiti, how people live, and the societal obstacles to clean water.

The humanitarian issue yielded energetic discussions on socio-cultural, political, economic and education issues in all sixteen teams. *“This semester’s project was one of those eye-opening experiences, especially since I knew absolutely nothing about the situation in Haiti beforehand.”* Students reported a higher level of interest in getting the engineering solution right and viewed the humanitarian issue as the vehicle for more effectively teamwork, communication and project management skills. *“A sense of accomplishment ran through our team as we realized that we have the ability to drastically change lives for the better. I saw the great impact engineers have on not only our own society, but also the world.”* Non-science majors can be equally energized by scientific civic or humanitarian issues if seamlessly designed into their major courses.

University of Hawai’i at Manoa

ECON 496 – Students are hatching energy and greenhouse gas solutions for Hawai’i

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|---------------|---|
| Craig Coleman | <i>Research Assistant, Economics/Oceanography</i> |
| Denise Konan | <i>Professor, Economics</i> |
| Julia Morgan | <i>Student, Philosophy</i> |
| Mary Tiles | <i>Professor, Philosophy</i> |

Global climate change issues confronting the planet also create special challenges for the Hawaiian Islands. Solutions require an integration of scientific understanding, technological innovation, economic decision-making, and ethical considerations. In ECON 496, a writing-intensive, problem-based class, undergraduates are integrating science, ethics and economics to develop Hawai’i specific solutions to problems posed by global climate change. Students access substantial faculty expertise on environmental and energy economics, coastal erosion and sea level rise, oceanographic consequences of global warming and climate modeling. Hawai’i legislators, state agencies and community leaders agree to listen to the outcome of the student work.

A trans-disciplinary team of economists, engineers, philosophers and planners are developing data driven computational models of Hawai'i's economy, emission and environment. Students are engaged in consequential research, including measurement of greenhouse gas emissions both on the Manoa campus and across the state.

University of Maryland

Marquee courses in science and technology at the University of Maryland: Engaging non-science majors in learning science in context of current global issues

| | |
|-------------------------|---|
| Robert M. Briber | <i>Professor & Chair, Materials Science & Engineering</i> |
| Romel Del Rosario Gomez | <i>Professor, Electrical & Computer Engineering</i> |
| William W. Dorland | <i>Associate Professor, Physics</i> |
| James Farquhar | <i>Associate Professor, Geology</i> |
| Jordan A. Goodman | <i>Professor, Physics</i> |
| Donna B. Hamilton | <i>Associate Provost and Dean for Undergraduate Studies</i> |
| David J. Hawthorne | <i>Associate Professor, Entomology</i> |
| Robert D. Hudson | <i>Professor, Atmospheric & Oceanic Science</i> |
| Alan J. Kaufman | <i>Associate Professor, Geology</i> |
| Daniel Lathrop | <i>Professor, Physics</i> |
| Wesley G. Lawson | <i>Professor & Associate Chair, Electrical & Computer Engineering</i> |
| Steven L. Rolston | <i>Professor & Associate Chair, Physics</i> |
| Ann C. Smith | <i>Faculty Fellow, Center for Teaching Excellence</i> |

In the fall of 2007, the University of Maryland Office of Undergraduate Studies launched a program to create general education science courses for non-majors that encourage students to learn science through the lens of globally important problems. The six Marquee Courses in Science and Technology are taught by highly respected research faculty from biology, physics, geology, engineering, and atmospheric sciences and are designed for high enrollments. Courses target students' understanding of how science is used to address globally important problems to which we don't know the answer. Topics of the courses include the global energy crisis, engineering issues in medical technology, biodiversity, the origin of life, and weather. To date, 1,144 students have completed a Marquee course. Marquee faculty meet regularly, generate course learning goals, and experiment with pedagogies that engage large numbers of students in understanding science. They utilize problem-based learning, collaborative work, and invited speakers, including science journalists and policy experts, to engage students. Student learning is assessed by examining how students look at complex questions and identify the associated science in written responses to articles. This information drives curriculum development.

Challenging issues of infectious disease research engage science majors in learning science in the context of globally important problems

| | |
|---------------------|--|
| Volker Briken | <i>Assistant Professor, Cell Biology and Molecular Genetics</i> |
| Laura Cathcart | <i>Graduate Student, Science Education</i> |
| Michael Chase | <i>Associate, Biology, Montgomery College</i> |
| Najib El-Sayed | <i>Associate Professor, Cell Biology and Molecular Genetics</i> |
| Kenneth Frauwirth | <i>Assistant Professor, Cell Biology and Molecular Genetics</i> |
| Brenda Fredericksen | <i>Assistant Professor, Cell Biology and Molecular Genetics</i> |
| Lian-Yong Gao | <i>Assistant Professor, Cell Biology and Molecular Genetics</i> |
| Sam Joseph | <i>Professor, Cell Biology and Molecular Genetics</i> |
| Vincent Lee | <i>Assistant Professor, Cell Biology and Molecular Genetics</i> |
| Gili Marbach-Ad | <i>Assistant Professor & Director, Center for Teaching and Learning in College of Chemical and Life Sciences</i> |
| Kaci Thompson | <i>Director, Undergraduate Research and Internship Programs, College of Chemical and Life Sciences</i> |
| Kevin S. McIver | <i>Associate Professor, Cell Biology and Molecular Genetics</i> |
| David Mosser | <i>Professor, Cell Biology and Molecular Genetics</i> |
| Boots Quimby | <i>Lecturer, Cell Biology and Molecular Genetics</i> |
| Patty Shields | <i>Instructor, Cell Biology and Molecular Genetics</i> |
| Ann C. Smith | <i>Instructor, Cell Biology and Molecular Genetics</i> |
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| Daniel C. Stein | <i>Professor, Cell Biology and Molecular Genetics</i> |
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Research faculty of the Maryland Pathogen Research Institute and instructional faculty teaching eight science major courses (1000+ students each year) have created a teaching community to enhance their professional development as scientific educators and to reform the undergraduate curriculum in the area of host pathogen interactions (microbiology/immunology). Faculty use their research interests to provide authentic contexts to engage students in course content. Research focuses on infectious diseases such as tuberculosis, gonorrhea, and streptococcal flesh eating disease that are of immediate concern world wide. In the courses, students learn science as they grapple with challenging problems stemming from the topics studied in our research programs that have no obvious solutions such as vaccine development. They also study infectious disease treatment in the

face of increasing numbers of antibiotic resistant organisms. Faculty work collaboratively to find approaches to teach the fundamental concepts of how hosts and pathogens interact and that engage the students in critical thinking. Courses are enriched with active and research-oriented learning pedagogies that including discussions, case studies, problem-based labs, concept mapping, and use of personal response systems. A concept inventory assessment tool developed by faculty measures the meaningful learning of students, identifies student misconceptions, and drives curriculum development.

University of Massachusetts-Boston

Transformation of STEM education in environmental programs at UMass Boston through civic engagement and responsibility.

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The University of Massachusetts Boston is a public university in the greater Boston area with an enrollment of more than 12,000 undergraduates. UMB offers several environmental programs serving both undergraduate and graduate students and provides significant service to the university, greater Boston, and Massachusetts. Existing transformative science, technology, engineering, and mathematics education activities at the university include (1) coastal environment ecosystem stewardship students providing the UMB Master Plan Steering Committee for the Integrated Sciences Complex with green and sustainable planning options, (2) graduate students are involved in municipal and state coastal and ocean resource management planning, (3) the UMB Sustainability Club providing students with leadership and community building opportunities, and (4) the Environmental Studies Program capstone course, which incorporates hands-on environmental problem solving for upper level students. Future plans include the incorporation of additional SENCER activities that will engage students and support the development of skills needed to address scientific and environmental issues.

University of North Carolina at Asheville

Reality math

Dorothy Sulock *Department of Mathematics*

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"Reality Math" is a new approach to the general education mathematics course required for students majoring in liberal arts fields such as foreign languages, art, drama, history, literature, language, and philosophy at the college level. Instead of studying math topics which are not of interest to these students, students work on units about real-world subjects which are of interest to them. The content is current and Internet-based, organized in modules that may be completed independently or cooperatively. Each module is 8-10 pages long and contains 20-30 questions that unfold naturally.

Examples of Reality Math modules include *Ecological Footprint*, *Credit Cards*, *Exercise and Nutrition Labels*, and *World Oil*.

Many students are handicapped by their avoidance of numbers and math in their daily lives. Reality Math strengthens the abilities of these mathematically-deprived students to use numbers to help themselves in many arenas, from money management to health and nutrition. Students gain confidence in their ability to reason analytically, to read and understand tables, graphs, and to think using numbers, even very large numbers. They learn to overcome their confusion about measurement units from electricity to metric. Dealing with real-world problems in some depth strengthens reading skills, problem-solving skills, analytical thinking skills, and teamwork skills if working cooperatively, in addition to mathematical skills. The approach can be trickled down to high school, middle school, and even elementary school.

West Virginia University

An NSF Robert C. Noyce funded project to increase science and mathematics teachers in high needs West Virginia school districts

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Jane Caldwell Clinical *Assistant Professor, Biology*

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Teaching Excellence At College for High Achievement in West Virginia (TEACH-WV) recruits undergraduate majors in science, technology, engineering, and mathematics (STEM) at West Virginia University (WVU) to become secondary STEM teachers. *TEACH-WV* is a collaborative effort between WVU's Eberly College of Arts and Sciences and College of Human Resources and Education. This collaboration was initiated through WVU's participation in Science Education for New Civic Engagement and Responsibility (SENCER), which encouraged participating universities to include science/mathematics and education faculty on their SENCER teams. The aims of *TEACH-WV* include: (a) increasing retention of college students who traditionally leave STEM majors, (b) attracting freshmen-sophomores to secondary STEM teacher certification, (c) providing a continuum of mentoring services through collaborative advising from STEM content and education mentors, and (d) increasing the number of WVU graduates with 5-12 STEM education certification who gain employment in WV high needs school districts. Methods to be employed include utilizing contextualized science teaching methods, targeted recruitment and internship opportunities, and STEM and education department mentoring. Preservice teachers will assist their mentors in designing Science-Technology-Society-based materials to contextualize science concepts for introductory STEM classes. This interaction also will help to facilitate the vertical alignment of grades 5-12 and university level STEM teaching.

Roster of Invited Participants & Guests

This section includes contact information for all Washington Symposium and Capitol Hill Poster Session participants. Please note that not all authors listed with the poster abstracts in the previous section were able to attend the symposium in person.

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Harrisburg University of Science and Technology is the home of the National Center for Science and Civic Engagement. A private, not-for-profit teaching institution, the University offers an applied science and technology education for students who want a degree and a dedicated pathway to a career. Harrisburg University's focus is to educate career-minded individuals in the areas of science, technology, engineering, and math (STEM), giving them the tools to succeed while helping to shape their communities, locally and beyond. To that end, the University offers bachelor of science and master of science degree programs in the nationally critical STEM disciplines.

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The National Center for Science and Civic Engagement inspires, supports, and disseminates campus-based science education reform strategies that strengthen learning and build civic accountability among students in colleges and universities. The Center serves as a national resource for the improvement of undergraduate science education and provides a platform enabling faculty and administrators to broaden the impact of their innovations and reforms beyond their campuses. The Center is affiliated with Harrisburg University of Science and Technology, a private and not-for-profit technology focused institution.

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Science Education for New Civic Engagements and Responsibilities (SENCER) is the signature program of the National Center for Science and Civic Engagement. Initiated in 2001 under the National Science Foundation's Course, Curriculum, and Laboratory Improvement Program's national dissemination track, SENCER applies the science of learning to the learning of science, all to expand civic capacity. SENCER has established and supports an ever-growing community of faculty, students, academic leaders, and others to improve undergraduate science, technology, engineering and mathematics education by connecting learning to critical civic questions.

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