

SCIENCE EDUCATION FOR NEW CIVIC ENGAGEMENTS AND RESPONSIBILITIES

REPORT ON ACTIVITIES AND IMPACTS

FEBRUARY – OCTOBER 2012

This report details the achievements, symposia, and resources developed by the SENCER program from February – October 2012. Abstracts on issues of *Science Education and Civic Engagement: An International Journal*, the 2012 model selection, and work planned by newly elected SENCER Leadership Fellows during this time period are provided, as are posters and sessions selected for presentation at SENCER and external meetings. In this report, readers will also find information on project participants, recipients of awards and honors, and evaluation of campus projects as well as the assessment of the impacts of SENCER activities at the national level.

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I. Publications

A. 2012 SENCER Model: Science Outreach – Public Understanding of Science

The most recent addition to the SENCER Model Series is "Science Outreach - Public Understanding of Science," developed by Hannah Alexander, Adjunct Associate Professor, Division of Biological Sciences, University of Missouri.

This course is distinctive within the model series as it has been developed to serve both graduate and undergraduate students who are focusing on STEM disciplines. Its goal is to teach future scientists to communicate science in a manner understandable to the public at large, and to develop the students' awareness of the critical civic need for science outreach. As such, it meets SENCER's goal to "connect scientific knowledge to public decision-making, policy development, and the effective 'work' of citizenship."

The course has a significant interdisciplinary character, which is fostered through the student's choice of topics to address, their interaction with faculty mentors from different disciplines, and the fact that any given class consists of students from different departments. More importantly, in order to communicate how basic science results in tangible improvements to our daily lives, the students are charged with exploring their particular topic from the vantage point of many different science disciplines. For example, we owe our ability to undergo corrective eye surgery to physicists who study lenses and lasers, anatomists, neurobiologists, and physicians who study the eye and the eye/brain interaction, and so on. By bringing these topics to the public, the students increase the understanding of the nature of, and need for, basic science. Moreover, the course helps students develop a capacity for civic engagement, and encourages them to assume a responsibility that we believe all scientists should share: to explain to the public the importance of science in our society. In the past several years, students generated 35 different presentations, and have given over 110 presentations to adult audiences in the community.

The course has been offered to graduate students at the University of Missouri and to upper-level undergraduates at Westminster College in Fulton Missouri. The class is registered in several departments (e.g. Biological Science, Animal Sciences, Physics, Science Education). It counts as an elective in the program "Minor in College Science Teaching," and counts towards a graduate certificate of Science Outreach at the University.

The full text of the model is available on the SENCER at http://serc.carleton.edu/sencer/science_outreach/index.html.

B. Science Education and Civic Engagement: The Next Level

SENCER has been invited by the American Chemical Society to prepare a book to expand on *Science Education and Civic Engagement: The SENCER Approach*, which was also published by ACS in 2010. *Science Education and Civic Engagement: The Next Level* will feature a collection of chapters addressing larger scale and program-wide adaptations of the SENCER approach, as well as program level assessments. The book, edited by Dr. Richard Sheardy of Texas Woman's University and SENCER PI David Burns, will be published later in 2012. The expected final table of contents is below:

- *Meeting the Challenges of Large Scale Educational Reform: SENCER and the Problem of "Knowledge Inequality"*
Wm. David Burns, National Center for Science and Civic Engagement
- *UNC Asheville's Integrative Liberal Studies Program: Using SENCER to Influence Major Curriculum Change*
Keith Krumpke and Edward Katz, University of North Carolina Asheville

- *Incorporating an Environmental Research Project Across Three STEM Courses: A Collaboration Between Ecology, Organic Chemistry, and Analytical Chemistry Students*
Douglas E. Latch, W. Lindsay Whitlow, and Peter J. Alaimo, Seattle University
- *The Changing Tides: The Opportunity Provided by Campus Curricular Change to Embed SENCER*
DonnaJean A. Fredeen, Southern Connecticut State University
- *How to Build A Transdisciplinary Certificate Program*
Richard D. Sheardy, Texas Woman's University
- *Unclear Nuclear*
Cathy Middlecamp, University of Wisconsin
- *Connecting Head, Hand, and Heart: SENCER and Becoming a Chemist*
Matthew A. Fisher, St. Vincent College
- *Bringing SENCER's Civic Engagement Strengths to Large Research Universities*
Garon Smith, University of Montana
- *Stop, Look, Listen: Changing the Way Future Teachers Think about Science and Teaching*,
Carolyn M. Viviano¹, Maria R. Alderete¹, Meredith McCarthy² & Matthew Morrissey³
Loyola Marymount University¹, Heal the Bay², Environmental Charter High School³
- *Formal/Informal Science Learning through Civic Engagement: Both Sides of the Education Equation.*
Alan Friedman, Consultant for Museum Development and Science Communication, New York, NY, and Ellen Mappen, National Center for Science and Civic Engagement
- *Communicating Your Science in Common Language: Creating Effective Dual Posters*
Cynthia Maguire, Le Shepard, Nicole Wallis, Texas Woman's University
- *Scaling Up Dissemination: From Models to Materials*
Eliza Reilly, Franklin and Marshall College
- *Influences on Faculty Practice: The SENCER Approach*
Danielle Kraus Tarka and Janice Ballou, National Center for Science and Civic Engagement
- *Using the SENCER –SALG to Reveal Student Learning in a Large-scale Environmental Science Course for Non-majors*
Trace Jordan, New York University
- *From SALG to GLISTEN: Scaling Up Assessment of Student Learning?*
Stephen Carroll, Santa Clara University and Glenn Odenbrett, National Center for Science and Civic Engagement

C. Science Education and Civic Engagement: An International Journal - Winter 2012

To access the full text of the Winter 2012 *Science Education and Civic Engagement: An International Journal* issue, please go to <http://seceij.net/seceij/winter12/index.html>.

“But You Needed Me:” Reflections on the Premises, Purposes, Lessons Learned, and Ethos of SENCER, Part 2

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

This paper is based on the opening plenary address at the 10th annual SENCER Summer Institute delivered by SENCER's co-founder, the paper's author. SENCER (Science Education for New Civic Engagements and Responsibilities), supported by the National Science Foundation, works to improve learning and strengthen civic engagement in undergraduate courses that teach through complex, capacious, unsolved civic issues to canonical knowledge and practice in Stem and other fields. Part one appeared in the last issue.

Laboratories in a Democracy: Science and Hard Public Policy

Joseph Karlesky, Department of Government, Franklin & Marshall College

Abstract: Scientists in the trenches of their work know that doing inventive and worthwhile research taxes mind, body, and spirit. Supporting funds always seem to be scarce, false starts are distressingly common, pressure to publish can be unrelenting, experiments can resist sure replication, colleagues may be uncooperative, and flashes of understanding can be frustratingly elusive. Despite the frustrations, however, hard work and persistence, brilliant insight, and sometimes a bit of serendipitous luck can produce findings that literally change the world. But why is it so hard for government to produce related public policy, particularly when the findings of science have so much to offer? Why is debate over climate change, nuclear waste disposal, evolution, vaccination, embryonic stem cell research, and environmental strategies so durable? Why do governments have such difficulty deciding on public questions, especially when answers informed by science seem so obvious to so many?

Reshaping How Educators View Student STEM Learning: Assessment of the SENCER Experiences

Janice Ballou, Independent Consultant

Abstract: There are innumerable government-commissioned reports documenting the need for improved STEM (science, technology, engineering and mathematics) education. These are exemplified by *Rising above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (2007) and the *National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering and Mathematics Education System* (2007). In 2010 the National Science Board report *Preparing the Next Generation of STEM Innovators: Identifying and Developing Our Nation's Human Capital* emphasized the urgency of the issue: "to ensure the long-term prosperity of our Nation, we must renew our collective commitment to excellence in education and the development of scientific talent."

Bio-Math Mapping: Water Quality Analysis of the Hudson River and Gowanus Canal, A SENCER-Based Summer Project

Urmi Ghosh-Dastidar and Liana Tsenova, New York City College of Technology

Abstract: The Summer 2010 Bio-Math Mapping project, based on SENCER (Science Education for New Civic Engagements and Responsibilities) ideals, provided nine undergraduate students from New York City College of Technology of the City University of New York with the opportunity to study and perform interdisciplinary research, combining mathematics with epidemiology, microbiology and environmental studies. It met the SENCER ideal to *connect science and civic engagement by teaching through complex, contested current and unresolved public issues to basic science*.

Advancing Science Instruction on a Rural Campus

Orianna Carter, Ohio University

Abstract: To be an effective educator, one should embrace openness to learning. Thus, it is fortunate for me to teach in a discipline where I must constantly keep abreast of new knowledge and advances in technology. Outstanding teachers and mentors, who motivated me through their passion for the study of life, with its myriad levels, nurtured my own enthusiasm for biology: from the miniscule to the magnificent ecosystems. As an educator, my primary motivation is to evoke similar feelings in my students, science majors and non-majors alike, while caring for their intellectual and emotional growth.

Development of the Environmental Forum: An Integrative Approach

Michael Berger, Simmons College; Jack Duggan, Wentworth Institute of Technology; and Ellen Faszewski, Wheelock College

Abstract: In 2003, with the help of the Science Education for New Civic Engagements and Responsibilities (SENCER) dissemination project, faculty members from the Colleges of the Fenway (COF) consortium created a cornerstone course as part of a newly developed Bachelor of Science Degree in Environmental Science. Environmental Forum, created to provide a common identity for all environmental science students at the COF institutions, brings together students, faculty and practicing professionals to discuss current issues, career planning, and civic engagement as well as to participate in service learning activities throughout the COF and greater Boston communities. An initial assessment of student learning outcomes was previously reported (Faszewski and Duggan, 2007).

Preparing Students for a Transdisciplinary Approach to Solving a Complex Program: Traffic Issues in Los Angeles

Nageswar Rao Chekuri, Woodbury University; Zelda Gilbert, Woodbury University; Ken Johnson, City of Burbank, Public Works Department; Anil Kantak, Jet Propulsion Laboratory; Marty Tippens, Department of Mathematics and Natural Sciences, Woodbury University

Abstract: In addition to preparing students in disciplinary areas, universities must train them to become independent thinkers and to be capable of taking part in complex and collective activities outside their disciplines. Furthermore, students should be trained to extract knowledge from scientific practices and procedures, and integrate that knowledge with their disciplinary-specific knowledge to solve real-world complex issues. The training should consist of important mental activities such as analyzing the data to understand inter- and intra-connections; abstracting methods and techniques through analysis and synthesis; mentally organizing such procedures and techniques; and applying those to solve complex environmental and community issues.

Learning Public Health Through Civic Issues

Kathleen FitzPatrick, Merrimack College

Abstract: In 2008, Merrimack College adopted a four credit per course curricular model. At this time, major curricula were completely redesigned. Our Department recognized that since many of our students intend to pursue careers in health care, knowledge of population medicine and health care system organization and function was critical. This content was not included in the major program previously. The Association of American Colleges and Universities (AACU, 2007) recommends that education in public health is essential for all undergraduates, in preparing an engaged citizenry for civic responsibility. Public health, a highly interdisciplinary and applied field, offered an opportunity to design an entirely new course using the NSF Science Education for New Civic Engagements and Responsibilities (SENCER) principles of science education through engagement with complex, unresolved civic issues.

D. Science Education and Civic Engagement: An International Journal – Summer 2012

To access the full text of the Science Education and Civic Engagement: An International Journal summer 2012 issue, please visit <http://seceij.net/seceij/summer12/index.html>.

Using Emerging Technologies to Facilitate Science Learning and Civic Engagement

David Patrick James Green, Florida Gulf Coast University

Abstract: An urbanized world with an exponentially-growing human population that has surpassed 7 billion inhabitants creates challenges for educating today's general education non-science majors about environmental issues, largely due to their lack of connections with the natural world and their common reluctance for science. Additionally, today's learner expects a different learning environment and has new tools available that can be used to enhance the academic experience, both in and out of the classroom (McGee and Diaz 2007).

Full Immersion: The Chesapeake Bay Watershed as an Environment for Learning Science in a Civic Context

Suzanne Donnelly, Alix Dowling Fink, Mark Fink, M. Leigh Lunsford, Melissa C. Rhoten, and Kelsey N. Scheitlin, Longwood University

Abstract: The Chesapeake Bay, North America's largest estuary system, is a case study in the connections between science and civic engagement, the power of science to provide key insights into challenging issues, and the limitations of science to effect change in contested civic spheres. The Bay's watershed, which encompasses more than 64,000 square miles and parts of six states in the Eastern U.S., is home to more than seventeen million people whose activities within the watershed affect the quality of water in the Bay and therefore the biota that live there (Lippson and Lippson 2006).

The Practice of Reflection in an Integrated Pair: Math and the Environment

Marina Dedlovskaya, and Patricia Sokolski, LaGuardia Community College CUNY

Abstract: As teachers of Introduction to Algebra (MAT095) and Critical Thinking (HUP102) at LaGuardia Community College, we are well aware of our students' need to improve critical thinking and quantitative reasoning skills. With the goal of improving these skills, we paired our courses into a single learning community with a focus on the environment.

Engaging Within Time Limits: An Integrated Approach for Elementary Science

Vance High and James Rye, West Virginia University

Abstract: With the continued restraints on elementary level science instruction due to accreditation and assessment requirements, science curricula needs to be flexible while still emphasizing high quality 21st Century learning (Center for Educational Policy, 2008). Such curricula needs to accommodate instruction from other disciplines and target skills, principles, and standards that are shared with science; inquiry and related process skills should be high priority (Henderson, Hatheway, Gardiner, & Zarlengo, 2006; National Council of Teachers of English, 1996; National Council on Teachers of Mathematics, 2000; National Research Council [NRC], 1996).

How Well Do You Know Your Closest Neighbors? Activity for Promoting Active Learning in Biology Classes

Abour H. Cherif, DeVry University; Farahnaz Movahedzadeh, Harold Washington College; Linda Michel, DeVry University Online; and Nancy B. Marthakis, Purdue University North Central

Abstract: A number of organizations including the Association for Prevention Teaching and Research (APTR), the Council of College of Arts and Sciences (CCAS), the Association of Schools of Public Health, and the Association of American Colleges and Universities have affirmed that "an understanding of [individual and] public health is a critical component of good citizenship and a prerequisite for taking responsibility for building healthy societies" (AAC&U 2011). It is important because humans live with disease-causing microorganisms all around them.

II. Community Recognition

A. Leadership Fellow Elections

The National Fellowship Board concluded the review of a strong group of applications for election to the SENCER Leadership Fellows Program in late May 2012. Nine faculty members and administrators have been selected to join the Fellows, serving 18-month terms completing projects of their choosing to advance STEM education and teaching. Included here are summaries of each Fellow's intention for their work:

Erin Argyilan

Associate Professor of Geosciences, Indiana University Northwest

Erin became involved with SENCER through her role as cluster coordinator for the northwest Indiana and northeast Illinois region in the GLISTEN program. She has since adapted three courses (*Global Environmental Change, Field Methods, Principles of Hydrogeology*) to the SENCER model and integrated SENCER-based components in to an introductory course in Earth Science.

As a Fellow, Erin plans to promote SENCER on her campus by giving seminars through the Center for Innovation and Scholarship in Teaching and Learning and presenting on the courses that have resulted from combining the GLISTEN and SENCER models. She will also serve as a resource for the integration of SALG as an assessment tool for the university and give seminars at other institutions in the region that have expressed interest in her cluster's work including community colleges and 4-year institutions in Illinois and Northwest Indiana. She will work with other GLISTEN clusters to synthesize a list of key issues that students would be exposed to in GLISTEN-SENCER courses, and aims to increase development and adoption of GLISTEN-SENCER courses on campuses throughout the Great Lakes by presenting at scientific conferences. Erin will mentor fellow faculty members in implementing these approaches and will connect with future STEM teachers through IUN's teacher preparation program.

S. Monroe Duboise

Associate Professor, University of Southern Maine

Monroe has been involved with SENCER since 2003, when he and colleagues implemented a series of seminar courses on the human body for the USM Honors Program. Additional work has emphasized interactions with K-12 teachers and their students and has brought classroom molecular biology based studies of microbial and viral biodiversity into high school classrooms in rural Maine. Through NSF funding, an electron microscopy core facility has been established at USM for use both in research and in science education outreach projects for K-12 teachers and students. A NIH Science Education Partnership Award has allowed supported increased teacher professional development and science education outreach activities focusing on biodiversity, microbial and viral ecology, molecular biology, and ecological aspects of infectious diseases. Monroe and his colleagues have collaborated with faculty from the University of Nairobi investigating microbial extremophiles and their viruses in soda lakes of the Great Rift Valley. Currently the genomics aspects of this research has led to applications in vaccine and nanomedicine development which we will incorporate into our educational programs at USM and in teacher professional development and classroom outreach.

During his fellowship, Monroe will promote existing elements such as Saturday morning courses and lab workshops for K-12 teachers, some of which are connected with courses such as the infectious disease epidemiology course taken by bioscience and public health graduate students. Monroe will address the transformation process in bioscience education at the University of Southern Maine by working with colleagues to develop at least one new SENCER course on campus, possibly with emphasis on involving pre-service teachers as well as other science students. A major professional focus for Monroe is the success of a vaccine development project that involves synthetic biology directed toward nanotechnology and nanomedicine applications. This research emphasis, combined with educational goals, has rich

possibilities for engaging students and a team of colleagues in a new course built on SENCER principles that will go far in meeting the challenges put forth in the Vision and Change call to action.

Richard Dunning

Instructor, Normandale Community College

Richard has undertaken a sabbatical project to develop student activities around Mississippi River related issues as a way to help students better engage in the class and in key local environmental issues. Over the previous decade he has developed and taught Environmental Geology, a course that relates the science of geology in relation to key environmental issues. Over the past four years, Rick has been the PI for an S-STEM scholarship program, work that has connected him to students from a wider range of scientific disciplines and has helped him appreciate some of the concerns they are dealing with.

As a Fellow, Rick proposes a Scientific Communication and Engagement in Civic Discourse, a project that explores how science is described, used, and misused in public media and in civic conversation. He plans to develop ways to use these portrayals of science to help students think critically about science and better understand the dynamics of the scientific method and the nature of scientific communication. If, collectively, we are interested in the engagement of science in civic responsibility, then the ways that science is communicated to the public and communicated about in public represent an important part of that engagement. Rick's perspective is that we will have better scientists if we encourage science students to look closely at this public discourse about science and begin to think about their own work as scientists in the context of larger civic engagement.

Linda Fuselier

Associate Professor, Minnesota State University, Moorhead

Linda has been involved with SENCER for approximately four years, after first learning of SENCER through a colleague while working on a project that centered around collaboration and women in science. She and her colleague used work from SENCER, particularly the report on the program's effectiveness, to promote SENCER as a tool for increasing participation of underrepresented groups in STEM fields. Since then, she has attended a regional conference and organized a campus visit by Marion Field Fass to train faculty and administrators in the SENCER approach. Linda has incorporated the basic ideas of SENCER courses into her classes with the intention of eventually converting a non-majors biology course fully.

As a Fellow, Linda will continue to facilitate a learning group including faculty from economics, biology, philosophy, physics, and womens and gender studies in their grant-funded project to design SENCER-based course modules for biology and physics courses. The group is working on a SENCER course designed around Red River Valley floods and a SENCER-based module on ultrasound techniques for an introductory Physics course, both of which will be implemented in the next year. Linda will be involved in developing an environmental science course and curriculum next year for which she will be working with faculty from institutions that do not use SENCER and have no experience with SENCER pedagogy. She plans to use this opportunity to engage with and mentor other faculty and to develop a SENCER course.

Gary Halada

Associate Professor, Stony Brook University

Gary and his colleagues from the four engineering departments have established an annual Socially Responsible Engineering Design Award as a result of their SENCER involvement. The award is presented each year to a student team from each program whose capstone design project and report best consider the potential impacts of their project on the community and society in general. In particular, the award has focused student attention and creativity on addressing and providing solutions to pressing problems in socio-economically disadvantaged communities in the US as well as globally. Gary and his colleagues have also developed an annual one day symposium on the "Ethical, Legal and Societal Impact

of Nanotechnology," an event that includes outside experts in areas from value sensitive design to bioethics.

As a Fellow, Gary will continue to advocate for the incorporation of values and ethics in undergraduate study and research in nanotechnology and other emerging technologies. He currently teaches a very popular ethics-related course (Learning from Engineering Disaster) to students from over 20 majors, as well as an enrichment course on how both reading and writing science fiction can help us understand the societal concerns which impact the development, use(or misuse) and regulation of emerging technologies such as nanotechnology and synthetic biology. Gary will further disseminate the educational models he has developed and their results in terms of how students can incorporate value-based decision making into their STEM learning. As co-P.I. on a project to evaluate electronic portfolios for enhancing engineering education and assessment, he plans to use the electronic portfolio model to continue building SENCER-related learning experiences into existing coursework. Also, as one of the leaders of a seven campus regional consortium focused on developing a new multi-institutional, multidisciplinary undergraduate program in energy education, the Leadership Fellow position will allow Gary to immediately incorporate and broaden the impact of SENCER-influenced coursework not only through his efforts in curriculum development and through recruitment of faculty throughout the region.

Robert Holm

Assistant Director, Sponsored Programs Education, Auburn University

Bob has been actively involved with SENCER since 2006. While at Butler University, he was a member of a team that received the Bennett award and was one of the founding co-directors of the SCI-Central Plains. He also taught SENCER-oriented courses in water quality and environmental biology and helped faculty design a number of SENCER-oriented courses. With his recent move to Auburn University, Bob plans to continue to lead SENCER initiatives by introducing the approach to his new colleagues, many of whom are interested in experiential learning. Exchanging ideas with other fellows will also allow him to bring the information gained from this cadre of experienced individuals to the Auburn campus.

Gerald Kobylski

Academy Professor, United States Military Academy

Jerry has become a leader in the SENCER community after coordinating team participation by the United States Military Academy (USMA) in the SENCER Summer Institute. For six years, he has directed a freshman calculus course at USMA that on average involves 1,000 students and 20 instructors per year. He is currently leading an interdisciplinary effort that which will include seven different courses in the fall of 2012 (and possibly an additional 10 in 2013), all of which will involve several thousand cadets. Jerry and his colleagues initiated a SALG based survey for nearly 14% of the entire student population to create a baseline. He has already presented on these efforts and the team's process at the Washington Symposium and Capitol Hill Poster Session and at a SCI-Midatlantic meeting in March 2012 at Monmouth University. In addition to leading the interdisciplinary effort, as a Fellow Jerry will continue to support regional efforts and consult with institutions or faculty interested in learning more about USMA's work in interdisciplinary collaboration.

Cynthia Maguire

Senior Lecturer, Texas Woman's University

Cynthia has been involved with SENCER since 2008, both individually and as a part of the Texas Woman's University (TWU) team. Her scholarship of teaching and learning research has focused on increasing success in a below-college-level science course. Cynthia has also made great strides in the development and piloting of a dual poster project at TWU to increase student understanding of the civic consequences of their work. This project requires students to create a public version of their research posters that so that an educated, but not expert in the field, is able to easily understand the implications of the research and work.

As a Fellow, Cynthia plans to organize at least one SCI-Southwest workshop annually on various topics of interest. She will also further develop the dual poster concept and attended an International Institute for SoTL Scholars and Mentors (IISSAM) workshop for that purpose in May. The dual poster pilot study results have indicated students who develop a public version of their technical poster are significantly more capable of understanding and communicating the importance of their work. Cynthia has been heavily involved in TWU's Science Society and Sustainability certificate program, teaching both the foundation and capstone courses. The program is designed to teach sustainability issues from many perspectives and culminates in a civic project to improve the sustainability of the local community. It is her intention to continue this work and build a strong interdisciplinary program within the College of Arts and Sciences.

Farahnaz Movahedzadeh

Assistant Professor, Harold Washington College

Farah has been an active participant in the SENCER community for several years, and has presented the results of her work through poster presentations and journal articles. As a Fellow, Farah will continue to promote SENCER principles in her classes, department, and the college at large through presentations and by encouraging SENCER curriculum and activities. She is planning not only to expand the existing projects that her students are currently working on, but also to start new ones including the use of Project-Based-Learning to promote SENCER principles and students engagement. Farah intends to collaborate with faculty from the biology department and other departments in this regards. She will also connect with other Chicago-based Fellows to collaborate with them in SENCER projects that will benefit regional activities and growth.

Farah plans to continue to develop and publish about strategies that promote student involvements in SENCER courses early in their academic careers (especially among women and minority students). She will continue in conducting scholarly research and publish the learning activities and teaching strategies that promote SENCER principles in and out-side the classrooms. She will continue to encourage her students to come up with creative ideas and alternative strategies and solutions for SENCER activities that help them not only to learn, but also to present and publish their work.

B. William E. Bennett Awards for Extraordinary Contributions to Citizen Science

The 2012 recipients of the William E. Bennett Award for Extraordinary Contributions to Citizen Science are exemplary for their leadership and consistent good work. Dr. Marion Field Fass, Beloit College, was selected for the individual award, and faculty members from Roosevelt University received the team honor. The awards were announced during the 2012 Capitol Hill Poster Session in the Rayburn Building on March 13, during which Dr. Robert Seiser represented the Roosevelt University team during the presentation of the team award. The individual Bennett award was presented to Dr. Marion Field Fass during the 2012 SENCER Summer Institute at Santa Clara University.

We have been fortunate to have Dr. Marion Field Fass involved in the SENCER community since the program's inception. She has served as a Leadership Fellow, co-director of the SENCER Center for Innovation-Midwest, and has authored the model course Slow Food. In addition to her national work, Marion has been a critical innovator at Beloit College, where she is professor of biology and chair of the Health and Society program. As noted in the nominating letter sent by many of her colleagues, Marion's "influence is evident throughout [Beloit's] departmental, programmatic, and campus-wide curriculum." She has offered courses that connect to larger, global issues, and was a leader in the development of the College's Health and Society program, an interdisciplinary program that connects students to real-world public health issues at every level of society. She aims to deepen students' understanding of the material they study and understand the larger implications of their work.

Roosevelt University faculty members first participated in a SENCER Summer Institute in 2005, and since then have adopted the SENCER ideals across the STEM curricula. The efforts at Roosevelt have focused primarily on core courses in chemistry, biology, and math, and all faculty who have been involved started with SENCER prior to their tenure processes. Members of the team have since achieved tenure, published, received additional grant funds to support their work, and taken on leadership roles. SENCER involvement has been "a primary means of pre-tenure faculty development" for RU and has provided faculty "a way to unite teaching and scholarship toward professional goals." The Roosevelt University team includes Dr. Kristen Leckrone (chemistry), Dr. David Szpunar (chemistry), Dr. Melanie Pivarski (math), Dr. Barbara Gonzalez (math), Dr. Robert Seiser (biology), Dr. Kelly Wentz-Hunter (biology), Dr. Jie Yu (math), and Dr. Byoung-Sug Kim (education).

III. National Symposia

A. 2012 Washington Symposium and Capitol Hill Poster Session

Since its inception in 2006, the NCSCE Washington Symposium and Capitol Hill Poster Session has served as an opportunity for alumni to connect with colleagues and congressional representatives to share their accomplishments. The annual Symposium provides an opportunity for members of the SENCER, GLISTEN, and SENCER-ISE communities to present work to colleagues and Congress and to engage in discussions on how to continue to improve STEM education for all students.

In addition to meetings with congressional representatives and members of their staffs, the March 2012 program included a welcome reception at the Koshland Science Museum, a poster session on Capitol Hill, presentations on campus work, and discussions on areas of future growth. Keynote addresses were given by the hosts of [Talk of the Nation: Science Friday](#), and the program showcased examples of SENCER campus work that bring to life best practices recommended by seminal reports of the National Academies.

1. Program and Speakers

Sunday, March 11: Events Held at the Koshland Science Museum

Great Lakes Innovative Stewardship through Education Network (GLISTEN) Meeting

Glenn Odenbrett, NCSCE

Registration & Reception at the Koshland Science Museum

As a new partner for the National Center for Science and Civic Engagement with the SENCER-ISE initiative, the Koshland Science Museum hosted opening evening events, allowing all participants to explore the wonderful resources and exhibitions the facility offers.

Welcome from the National Center for Science and Civic Engagement

Mr. Wm. David Burns, NCSCE

Welcome from the Koshland Science Museum

Dr. Patrice Legro, Koshland Science Museum

Monday, March 12: Events Held in the Rayburn House Office Building, Capitol Hill

Welcome

Mr. Wm. David Burns, NCSCE

Reports Matter and How

Dr. Martin Storksdieck, Director, Board on Science Education

Reports such as Taking Science to School, How People Learn, and others have shaped best practices in education. What does it take for reports to resonate as policy and on-the-ground implementations?

Connecting Formal & Informal Science Education: The SENCER-ISE Initiative

Dr. Ellen Mappen, NCSCE

Ms. Amanda Moodie, NCSCE

Dr. Thomas Wood, George Mason University

The SENCER-ISE conference was funded by the National Science Foundation in 2010 to bring together formal and informal science educators to discuss collaborations.

Encouraging Faculty Collaboration: Energy Security Across the Curriculum

Col. Gerald Kobylski and Col. Joseph Shannon, United States Military Academy

The Core Interdisciplinary Team at the United States Military Academy has developed an institution-wide academic program to inject energy related topics into 16 core courses spanning multiple disciplines beginning in the fall semester of 2012. Cadets will receive an initial exposure to energy security topics, the theme of the interdisciplinary effort, and a variety of challenges within courses like chemistry, math, psychology, English and information technology.

Keynote: Making Science the Talk of the Nation Science is Sexy

Mr. Ira Flatow, Science Friday

Kids and young adults are rediscovering science. The popular media and social networking sites are now featuring science and technology topics that gaining new attention. Ira Flatow, host of Science Friday on NPR, highlights those changes and why science is now sexy.

Making Science Visible

Ms. Flora Lichtman, Science Friday

Flora translates the tone of the show into a different product--video. She will discuss some of the techniques used and guiding principles for communicating science, how she got this job in the first place, and the options young people have for working in science.

Demonstrating Best Practices: Nuclear/Unclear

Dr. Catherine Middlecamp, University of Wisconsin Madison

Dr. Jay Labov, National Research Council

This plenary will consider applying pressing civic issues, in this case nuclear energy and radioactivity, to course content - and how to do this knowing what we do about how people learn.

Engaging Students in STEM: Examples of SENCER and GLISTEN Campus Initiatives

Ms. Sabrina Brown, Indiana State University

Dr. Heide Hlawaty, Metropolitan College of New York

Mr. William Mokry, Northland College

This session will highlight some of the many successful campus adaptations of the SENCER and GLISTEN approaches.

Tuesday, March 13: Events Held on Capitol Hill

Morning: Congressional Meetings, Individually scheduled

Capitol Hill Poster Session and Lunch Reception

Rayburn House Office Building Foyer

We welcome you to learn more about SENCER and GLISTEN campus projects by visiting with the educators and students working on these initiatives.

Vision and Change: How Each of Us Can Contribute to Improving STEM Education

Dr. Muriel Poston, National Science Foundation

“Every schoolboy (and girl) knows” how a bill becomes a law, but how do ideas and responses to civic challenges become policies and programs, and how do laws get translated into programs designed to achieve democratically-driven aims? Muriel Poston, a senior leader in the Education Directorate at the National Science Foundation and a professor of biology, will offer answers to these questions by sharing insights gleaned from her experience in many roles - as student, faculty member, dean, NSF official, biologist and citizen. Dr. Poston will help us see that there are important roles for each of us as we work to achieve our visions for improved science education and a stronger democracy.

Announcement of the 2012 William E. Bennett Awardees for Extraordinary Contributions to Citizen Science

Mr. Wm. David Burns, NCSCE

The Bennett award is given annually to both an individual and a team to recognize exemplary work in citizen science.

2. Invited Posters

Participants were required to submit applications with abstracts of posters for consideration for presentation during the Capitol Hill Poster Session. The full text abstracts of all posters selected for presentation on Capitol Hill, as well as biosketches for all Symposium speakers, are available at http://www.sencer.net/Symposia/pdfs/CapHill_program.pdf.

The Saginaw Bay Watershed GLISTEN Cluster’s Kawkawlin River Assessment Project

Jacob VanHouten, Delta College

Hannah Voss, Meaghan VanWert, Brent Hedquist, and David Karpovich, Saginaw Valley State University

River Academy: ECC Students “Streamline” Learning with Buffalo Niagara Riverkeeper

Lisa Matthies-Wiza and Rhiannon Starks, Erie Community College

Community Service Learning and Continuing Engagement in an Undergraduate Geology Course

Julia Nord, Thomas Wood, David Brooks, Christopher Johnson, and Lisa Schreffler, George Mason University

Population Dynamics and Habitat Restoration of Ambystomatidae Salamanders in Fauquier County Virginia

Thomas Wood, Douglas Messier, and Christine Kauffman, George Mason University

Michael Hayslett, Sweet Briar College

Exploring Students’ Attitudes and Insight toward the Changing Face of AIDS

Eric Egli, Brittany Vernon, Farahnaz Movahedzadeh, Elizabeth Greer, and Marcus Heldt, Harold Washington College

Creating A Virtual Sustainability Network Between University and Community Partners

Larry Tinnerman and Brian Zuel, Indiana State University

The Case of Minor League Sports for Small-sized Cities in the U.S.

Athanassios Strigas, Ryan Benner, and Logan Engle, Indiana State University

Promoting SENCER throughout the Indiana State University Community
Andrea Kelley and Jim Speer, Indiana State University

Urban Wind Energy Production: Prediction of Energy Production by Taking Advantage of the Urban Landscape
Sabrina Brown, Indiana State University

Creating Rubric 3.0: Implementation of the SENCER Model in Courses and Curricular Programs
Adriahhna Lehman and Carolyn Wallace, Indiana State University

Chemistry Outside of the Classroom: The Service Learning Approach
Jana C. Cram and Heather Dulaney, Ivy Tech Community College Northwest

Restoration Management
Heather Dulaney and Jana C. Cram, Ivy Tech Community College Northwest

Incorporating Physical Activity into Science Lessons to Improve Academic Performance in Low-Income Hispanic Girls
Kevin Finn, Merrimack College

Using the Mathematical Theory of Utility for Describing a Nuclear Crisis
Doru Tsaganea, Metropolitan College of New York

Starting to Think Critically about Critical Thinking at MCNY: What Do Our Students Tell Us?
Heide Hlawaty, Richard Grallo, and Doru Tsaganea, Metropolitan College of New York

Tennessee History and Science: An Innovative Learning Community to Improve Student Learning
Ashely Harvey, Judith Iriarte-Gross, and Mary Hoffschwelle, Middle Tennessee State University

Air Quality on the Bad River Reservation: A GLISTEN Collaboration between Northland College and the Bad River Tribe
William Mokry and Sharon Anthony, Northland College
Nathan Kilger, Bad River Tribe

An Integrating Framework for Multi-disciplinary Collaboration in Biodiversity, Astrobiology, and Nanoscience Research and STEM Education
S. Monroe Duboise, Karen Moulton, and Gail Fletcher, University of Southern Maine
Francis Mwaura University of Nairobi
Lynn Rothschild and Jefferson Gaynor, NASA Ames Research Center

Northeast Ohio GLISTEN Stewardship Liaisons: Citizen Scientists Improving Local Watersheds
Katherine Rumora and Dennis Taylor, Northeast Ohio Cluster

Baseline Data Analysis of the Thorgren Basin Retrofit
Caitlin Soley and Tom Goynes, Valparaiso University
Erin Argyilan and Nicole Grabos, Indiana University Northwest
Jennifer Nebe-Birchfield and Jennifer Wunsh, Save the Dunes Conservation Fund

Science Assistments: Assessing Students' Inquiry Skills in Real Time with the Goal of Scaffolding Students in Real Time

Janice Gobert, Worcester Polytechnic Institute

Quality of Life Improvements for the Oak Hill Community

Robert Krueger, Ben Davidson, Shawn Mahoney, David Patrick, and Tory Sidoti, Worcester Polytechnic Institute

Developing Promotional Materials for Rain Gardens

Jennifer deWinter, Praphapan Lasin, Alexandra Fontaine, Alfredo Porras, and Frank Oglesby, Worcester Polytechnic Institute

B. 2012 SENCER Summer Institute

The 2012 SENCER Summer Institute, held at Santa Clara University on August 2 -6, was a great success. Over 220 participants and facilitators from nearly 100 institutions gathered in California to collaborate with their peers, share ideas, and plan for the upcoming year. In addition to the 32 individual representatives, nearly 30 institutional teams and collaborators from new initiatives were in attendance. The newly-funded Strategic Synergies project brought twenty participants from nine states as a kick-off to their EPSCoR-Campus Compact-SENCER partnership. The Center's W.M. Keck Foundation-funded project, Science and Civic Engagement Western Network (SCEWestNet), was also well represented with participants from all seven nodal collaborators throughout the western region.

Martin Storksdieck, director of the Board on Science Education, opened the 2012 SSI with an all-institute discussion, "Pressure from Below? How the New K-12 Science Education Standards Will Require a Very Different College Science Education Experience." The remaining days of the Institute were filled with concurrent sessions, facilitated work sessions, and workshops covering diverse implementations and approaches to improving student learning. Additional plenary sessions were offered daily by respected members of education community. Cathy Middlecamp, University of Wisconsin-Madison, and Jay Labov, National Research Council, began the second day of the Institute with their plenary, "Sustainability, Science and SENCER." Barbara Tewksbury from Hamilton College focused on "Real STEM Education—It's Not Just What You Know But What You Can Do With What You Know." Stephen Carroll, Santa Clara University and Christopher Lazzaro, The College Board presented "That's a Really Good Question: Designing Queries to Assess Learning," an all-institute session focused on assessment pedagogy.

A poster session, during which participants described results of prior work and their future plans to incorporate SENCER ideals at their institutions was held on August 4. The Institute concluded on August 6 following intensive workshops and closing remarks from Wm. David Burns. The 2012 SENCER Summer Institute agenda, presentations, photos, and more can now be found at <http://www.sencer.net/Symposia/summerinstitute2012.cfm>.

1. Plenaries, Concurrent Sessions, Work Sessions, and Workshops

Thursday, August 2, 2012

Opening Session

Welcome from Santa Clara University

Amy Shachter, Associate Provost, Santa Clara University

Plenary Address: “Pressure from Below? How the New K-12 Science Education Standards Will Require a Very Different College Science Education Experience”

Martin Storksdieck, Director, Board on Science Education, National Research Council

Aims for SSI 2012

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

Friday, August 3, 2012

All-Institute Session: William E. Bennett, presiding

Presentation of the William E. Bennett Awards for Extraordinary Contributions to Citizen Science to Dr. Marion Field Fass of Beloit College and to the Roosevelt University Team

William E. Bennett, National Center for Science and Civic Engagement

Plenary Presentation: Sustainability, Science and SENCER

Catherine Hurt Middlecamp, University of Wisconsin-Madison

Jay Labov, National Academies of Sciences and National Research Council

Work Sessions: Work sessions are 90-minute sessions organized to achieve the following aims:

- to provide newcomers with an introduction to basic elements of the SENCER approach,
- to provide alumni with opportunities to apply the SENCER approach to new challenges,
- to enable follow-up conversations with plenary speakers,
- to provide workshop-style training on active-learning pedagogies and appropriate assessment,
- to offer hands-on design and implementation planning opportunities, and
- to engage participants in thinking about new policy directions and their implications.

There are five options in each of four workshop session blocks. There are no repeat sessions, though there are multiple sessions that pursue a particular theme. We recommend that teams split up to assure broad exposure to the offerings in each work session block.

Designing a SENCER Course in About 90 Minutes

Ellen Goldey, Wofford College

Designing a SENCER Course for STEM Majors

Keith Krumpe, University of North Carolina-Asheville

Terry McGuire, Rutgers University

Matt Fisher, St. Vincent College

New Biology

Karen Oates, Worcester Polytechnic Institute

Jay Labov, National Research Council

Kevin Costa, University of California-Berkeley

Civic Engagement: Science and Democracy

Joe Karlesky and Eliza Reilly, Franklin and Marshall College

David Burns, National Center for Science and Civic Engagement

The New Science Standards and Changes in Advanced Placement: Meet the Next Generation of Your Students

Martin Storksdieck, National Research Council

Christopher Lazzaro, The College Board

Concurrent Sessions: Over the course of SSI 2012, there were three sets of concurrent sessions. Each session is scheduled for 60 minutes and contains a dozen program options. While we do not have designated “tracks”, we have arranged the sessions so that, in each one, there will be (1) a presentation by one of our William E. Bennett Awardees, (2) a session focused on mathematics and quantitative literacy, (3) a discussion of a SENCER model course, (4) an exploration or case study on institutionalizing the SENCER model in broader curricular applications, (5) a presentation or workshop on writing and communicating science, (6) a demonstration of a promising pedagogical and faculty development strategy, (7) a session that explores science, civic engagement and public policy connections, (8) a session focused on students, (9) a session on applying new technologies to learning and technology as a topic for learning, (10) the presentation of a particularly promising “emerging model” for faculty transformation, critical thinking, and a new application of the SENCER Ideals to art and design, and (11) in follow-up on the theme of sustainability as a civic and scientific challenge, a campus sustainability tour and a description of an institution’s new program to grant a sustainability certificate. There was also be sessions designed to help newcomer teams, strengthen community connections through research and partnerships, and apply the SENCER Ideals more robustly in the study of physics.

We’ve asked all session leaders to keep the sessions as interactive and lively as possible. As always, we conceive of our participants as partners in learning and encourage you to contribute your expertise to all the sessions you attend. There are many options for you to consider, 36 to be exact. Past experience has shown that teams that meet in advance to “map out” how they will take advantage of the range of opportunities within each concurrent session get the most from the Institute. They do this by dividing up their members among the most relevant sessions and then by de-briefing with one another during team time or once back home.

Junior Faculty on a Mission: STEM Education Reform and Professional Development

Robert Seiser, Steve Cohen, Kristen Leckrone, Virginia McHugh-Kurtz, Aaron Shoults-Wilson, and Dave Szpunar, Roosevelt University

Quantitative Reasoning

David Ferguson, Stony Brook University

Adapting Large Lecture Formats to SENCERized Teaching and Civic Engagement

Garon Smith, University of Montana

Our Students as Partners in SENCERizing the Curriculum

Ellen Goldey, Wofford College

Alli Creed and Adri Lehman, Indiana State University

Major Curricular Revision to Promote Interdisciplinary STEM and Non-STEM Linkages

Edward Katz and Keith Krumpke, University of North Carolina at Asheville

A SENCER Model Presentation: Mysteries of Migration

Tom Wood, George Mason University

Developing SENCER Initiatives for New Teams

Ann Staton and Richard Sheardy, Texas Woman's University

Writing for Life: A Scientific Communication Course with SENCER Ideals

Sandra Westmoreland, Texas Woman's University

Innovation in Unexpected Spaces: Building a Community of Educators for Transformational Change

Julia Metzker, Karynne Kleine, and Amy Kelley, Georgia College & State University

Developing a Culture of Sustainability: A Campus Tour

Lindsey Cromwell Kalkbrenner and Amy Shachter, Santa Clara University

Merging "The 3 E's: Education, Ecology, & eLearning" in a Track of SENCER Course Redesigns

David Green, Florida Gulf Coast University

A Hard Road Traveled: The Contributions of Science in Public Policy Debate

Joe Karlesky, Franklin and Marshall College

Work Sessions II

Active Learning

Monica Devanas, Rutgers University

Controversial Topics in STEM Education

Jay Labov, National Research Council

Addressing Diversity Issues in STEM Education

David Ferguson, Stony Brook University

Ellen Mappen, National Center for Science and Civic Engagement

Getting Started with the SENCER-SALG

Stephen Carroll and Melissa Ganus, Santa Clara University

Environmental Service-Learning in the STEM Disciplines

Glenn Odenbrett, National Center for Science and Civic Engagement

Pamela Proulx-Curry, Eastern Maine Community College

Saturday, August 4, 2012

All Institute Session: Karen Oates, presiding

Introducing the SENCER Leadership Fellows

David Ferguson, Stony Brook University

Strategic Synergies

Robert Franco, Kapi'olani Community College

Plenary Address: Real STEM Education—It’s Not Just What You Know But What You Can Do With What You Know

Barbara Tewksbury, Hamilton College

Work Sessions III

Developing an Effective Interdisciplinary Program for Three or More General Education Courses

Charles Elliott, Gerald Kobylski, Nicholas Talbot, and Chris Weld, United States Military Academy

Critical Thinking About Really Big Questions: Integrating the Disciplines

Ellen Goldey and Byron McCane, Wofford College

Undergraduate Academic Engagement with America’s Great Outdoors

Thomas Wood, George Mason University

Glenn Odenbrett, National Center for Science and Civic Engagement

From Strategic Partnerships to a Culture of Commitment —Global Issues in Science and Civic Engagement

Sherryl Broverman, Duke University

Debra Meyer, University of Pretoria (South Africa)

Karen Oates, Worcester Polytechnic Institute

Thea Weiss Sampietro, Zurich Institute of Applied Sciences (Switzerland)

From Knowing to Doing: How to Set Goals, Encourage Practice, and Assess Results

Barbara Tewksbury, btewksbu@hamilton.edu

Concurrent Sessions II

SENCERizing Biology to Improve Health Literacy: Forging Connections

Marion Fass, Beloit College

SENCERized Calculus – The Wartburg Calculus Curriculum

Mariah Birgen, Wartburg College

Teaching and Learning Centers as Partners in the STEM Reform Process

Monica Devanas, Rutgers University

Assimilating Native Culture into the SENCER Curriculum

Amy Shachter (moderator), Santa Clara University

Lawrence Duffy, University of Alaska

Bob Franco, Kapi’olani Community College

Garon Smith, University of Montana

That’s Interesting! Understanding and Using Student Interest as an Educational Strategy

Trace Jordan, New York University

The Art of SENCERizing a Trans-Disciplinary General Education Science Sequence

Ben Hutchinson, Autumn Marshall, Christin Shatzer, and Tamera Klingbyll, Lipscomb University

Integrating GIS into a SENCER Model Course:

Barbara Tewksbury, Hamilton College

SENCER and the Dual Poster Concept: Translating Science into Common Language

Cynthia Maguire, Texas Woman's University

Street Science: Iterative Critical Thinking and Science Literacy Course Development

Susan K. Hippensteele, Denise E. Konan, Corey E. Flanders, and Katherine Livins, University of Hawaii

Calling All Physicists: New Learning and Civic Engagement Challenges and Opportunities At Home and

Theo Koupelis, Edison State College

Adrienne Wootters, Massachusetts College of Liberal Arts

Forming Sustainable Civic Engagement Partnerships with Community-Based Organizations

Glenn Odenbrett, National Center for Science and Civic Engagement

Empowering Citizens, Scientists, and Governments through the Eye on Earth Network

Shoshanna Budzianowski, Microsoft Corporation

Dinner Honoring Leaders in the SENCER Community

Sunday, August 5, 2012

All Institute Session: Monica Devanas, presiding

The SENCER Models

Eliza Reilly, Franklin and Marshall College

Plenary Presentation: That's a Really Good Question: Designing Queries to Assess Learning

Christopher Lazzaro, The College Board

Stephen Carroll, SALGSITE.org

Work Sessions IV

“A Really Good Question”: New Trends and Tools in Assessment

Christopher Lazzaro, The College Board

Stephen Carroll, SALGSITE.org

I Thought I Could Learn Something: Generative Learning and the “Science/Religion” Conflict

Byron McCane and Ellen Goldey, Wofford College

Writing in SENCER Courses: Beyond “Add and Stir”

Cathy Middlecamp, University of Wisconsin – Madison

Glenn Odenbrett, National Center for Science and Civic Engagement

Creating a “SENCER Climate” on Campus: Strategies for Involving Faculty and Administrators

DonnaJean Fredeen, Southern Connecticut State University

Using Social Media to Improve Learning and Civic Engagement

Janet Fouts, Tatu Digital Media
Amy Shachter, Santa Clara University

Concurrent Sessions III

Uranium and American Indians

Cathy Middlecamp, University of Wisconsin – Madison

What Makes a Healthy City: Mapping and Measuring Health

Marion Fass, Beloit College

Dramatic Demonstrations to Engage Large Classes

Garon Smith, University of Montana

How to Build a Certificate Program in Sustainability

Richard Sheardy, Cynthia Maguire, and Richard Jones, Texas Woman's University

Institutionalizing SENCER at a State University: Strategies and Pedagogies

James Tait, Susan Cusato, and DonnaJean Fredeen, Southern Connecticut State University

The Basics of Community-Based Research

Amy Shachter, Santa Clara University

Changing as a Teacher and the Making of Majors Courses in Evolutionary Medicine and Genetics

Terry McGuire, Rutgers University

How to Publish in Science Education and Civic Engagement: An International Journal

Trace Jordan, New York University

Eliza Reilly, Franklin and Marshall College

Engaging Artistic, Design, Graphic and Fashion Marketing Students Using the Images of Science

David McMullen and Joseph Liddicoat, SUNY, Fashion Institute of Technology

Interdisciplinary Coursework with SENCER Components - Environmental Health and Media Perceptions

Orianna Carter, Ohio University

Technology Education for All College Students: One Approach to Putting the “T” in STEM

Herbert Schanker, CUNY, College of Staten Island

Teaching Scientific Methods through Civic Engagement (and Vice-Versa)

Robert Seiser and Virginia McHugh-Kurtz, Roosevelt University

Monday, August 6, 2012

Institute Workshops

Writing Good Proposals to Support Scaling Up Your SENCER Work

Myles Boylan, National Science Foundation

Bringing SENCER Alive on Your Campus: How to Get Your Colleagues and Administration on Board

Donna Jean Fredeen, Southern Connecticut University
Rob Sanford, University of Southern Maine

Using Resources/Building Partnerships: Connections between Higher Education Faculty and Informal Science Educators

Steven J. Bachofer, St. Mary's College of California
Alix Dowling Fink, Longwood University
Sue Ellen McCann, KQED Public Media
Ellen Mappen, National Center for Science and Civic Engagement

Designing SENCER Mathematics Courses

David Ferguson, Stony Brook University

Designing STEM Majors Courses

Joseph Kirsch, Butler University
Terry McGuire, Rutgers University

Exploring Public Health

Marion Fass, Beloit College

Inquiring into Our Students' Learning: The Scholarship of Teaching and Learning

Matt Fisher, Saint Vincent College

Innovative Approaches to Service Learning in the STEM Disciplines

Glenn Odenbrett, National Center for Science and Civic Engagement

Thinking Evolutionarily: Evolution Education Across the Life Sciences

Jay Labov, National Research Council
Eric Meikle, National Center for Science Education
Lisa Urry, Mills College (representing the University of California-Berkeley's Museum of Paleontology)

Leadership Fellows Roundtable Discussion

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

Strategic Synergies Work Group

Robert Franco, Kapi'olani Community College

All Institute Lunch and Closing Session: Amy Shachter, presiding

The Future of SENCER and an Invitation for You to Have a Role in It

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

2. Invited Posters

Institute attendees were invited to submit proposals to present posters. Posters were selected following a competitive application process. They illustrate broad applications of the SENCER approach at colleges and universities. Those selected for presentation were on display during the majority of the Institute and authors were on hand to discuss their work during a designated session at Santa Clara University. Abstracts for the posters were published and distributed to all Institute attendees. The full text of the poster abstracts are published online at <http://www.sencer.net/Symposia/SSI2012/SSI2012%20Poster%20Book.pdf>. The invited posters and poster authors were:

Soil: Bridging Chemistry Students and Community

Richard A.F. Warby, Benjamin Rougeau, and John Pratte, Arkansas State University

Win, Lose or Draw; Codes and Secret Messages: Analytical Reasonings Courses at Butler University

Karen Holmes, Butler University

Analytical Reasoning at Butler University

Lacey Echols, Butler University

Concept Inventories: Assessing Alternative Conceptions in an Earth System Science SENCER Course

Meredith McAllister, Butler University

Bob Holm, Auburn University

Film Learning in the Classroom

Joseph Liddicoat, New York University

Ronald Kopp, City University of New York

Implementing Hierarchical Civic Engagement Strategies Into Two Environmental Sustainability-Focused General Education Course Redesigns

David Green, Florida Gulf Coast University

Igniting Streams, Igniting Minds: Fostering Collaborations to Solve Local Watershed Issues through Inquiry-based Science

Dennis Taylor and Vanessa Consolo, Hiram College

The Benefits of Including an English Major in a SENCER Student Leadership Team

Allison Creed and Jim Speer, Indiana State University

Applying the SENCER Ideals to Health Promotion and Aging: The Nexus of Bench and Social Science in a Service-Learning Course

Tina M. Kruger, Indiana State University

An Example of the Art of Integrating Science using SENCER

Ben Hutchinson, Tammy Klingbyll, Autumn Marshall, and Christin Shatzer, Lipscomb University

SALT and SENCER: A University-Wide Service-Learning Program Enhances Science Education through Civic Engagement

Christin Shatzer, Ben Hutchinson, Autumn Marshall, and Tammy Klingbyll, Lipscomb University

Stewardship of Public Lands: Transcending the Compartmentalization of General Education through a Pedagogy of Place
Alix Dowling Fink, Longwood University

Interdisciplinary SoTL: A Quantitative and Qualitative Comparison of Homework Structures in a Multivariable Calculus Class
John C. Nardo, Judith Lynn Gieger, Leah R. Zinner, and Karen L. Schmeichel, Oglethorpe University

Princeton Science and Engineering Education Initiative
Carolyn D. Sealfon and Els N. Paine, Princeton University

Pollinators: A Case Study in Sustainability and Systems Thinking
Susan Cusato, Southern Connecticut State University

Science Education in Collaboration with Informal Science Educational Institutions – Working outside the Ivory Tower
Steven Bachofer and Monica Fitzgerald, St. Mary's College of California

Communicating Your Science in Common Language: SENCER and the Dual Poster Concept
Cynthia Maguire, Texas Woman's University

Service-learning and the Environmental Forum
Ellen E. Faszewski Wheelock College
Jack Duggan, Wentworth Institute of Technology
Michael Berger, Simmons College

IV. Regional Symposia

The SENCER Centers for Innovation (SCI) provide expertise, local support for members of the SENCER Community, and meetings and workshops to complement national SENCER Summer Institutes and Washington Symposia.

The SCIs were inaugurated in 2008, and since then, have grown and expanded in number. Central Plains, hosted by Butler University, is the newest Center, formed in 2012. Butler University has been actively involved in the SENCER community for several years, is the host for our newest SENCER Center for Innovation: Central Plains. SENCER alumni at Butler have already coordinated regional meetings for Indiana schools, and hosted the 2011 Summer Institute. Butler is a comprehensive university whose students benefit from outstanding opportunities for experiential education. Ninety-five percent of Butler graduates have participated in some form of internship, student teaching, clinical rotation, research or service learning.

SCI events are open to educators, administrators, and students from around the country and internationally, but are especially designed with the needs and interests of their regional areas in mind. Since the winter of 2012, when funds for this grant were first accessed, the following regional events have occurred:

SCEWestNet Organizational Meeting

March 2-3, 2012

Santa Clara University

The National Center for Science and Civic Engagement received a grant from the W.M. Keck Foundation to promote, support and sustain college-level science education reform in the western region of the United States. The work grows out of work started through NSF funding of the SCI-West. Leaders of the new initiative met in San Jose, CA, to coordinate efforts and plan network building activities to be conducted over the next two years. Present at the meeting were WestNet leaders Larry Duffy (University of Alaska Fairbanks), Douglas Latch and Lindsay Whitlow (Seattle University), Amy Shachter (Santa Clara University), Steven Bachofer (Saint Mary's College), Garon Smith (University of Montana), Gary Booth (Brigham Young University), Robert Franco (Kapiolani Community College), and Richard Sheardy (Texas Woman's University). NCSCE staff David Burns (PI), Amanda Moodie (Network Coordinator), and Danielle Kraus Tarka (Associate Director) joined the group with the meeting facilitator, Jonathan Bucki, evaluator, Stephen Carroll, and social media consultant, Janet Fouts. ***Funds to support this meeting came out of the grant from the Keck Foundation. However, given that the work emerged from the SENCER project, we wanted to note it here.***

SENCER MidAtlantic Regional Conference

Saturday, March 24, 2012

Monmouth University, West Long Branch, New Jersey

The 2012 Midatlantic Spring Conference was hosted by Monmouth University in West Long Branch, NJ on Saturday, March 24. The program featured poster presentations, short talks, and panel discussions. Talks included a plenary address by Tom Wood of George Mason University entitled "Teaching Through Nature, Naturally..." and a panel discussion on informal science education and SENCER initiatives with Ellen Mappen (NCSCE), Tony MacDonald (Urban Coast Institute, Monmouth University, Robin Sakina Mama (School of Social Work, Monmouth University), and Tom Wood. Short talks selected after a competitive submission process included presentations by faculty and administrators from the United States Military Academy, Mount Saint Mary College, New York City College of Technology, Monmouth University, and Rutgers University.

Scholarship of Teaching and Learning Workshop

April 14, 2012

Texas Woman's University

The scholarship of teaching and learning (SoTL) has been described as inquiring into our students' learning. But what does that look like in real life? How does this work to help make teaching public and community property? How is SoTL different from just being a good teacher? How does this form of scholarship connect to the concerns of faculty?

On April 14, Texas Woman's University offered a free SoTL workshop led by Dr. Matt Fisher. Fisher is a faculty member at Saint Vincent College and Carnegie Scholar, the SENCER Scholarship of Teaching Learning (SOTL) Coordinator, and Senior Fellow of the National Center for Science and Civic Engagement. Workshop participants developed an understanding of important characteristics of the scholarship of teaching and learning, as well as a collection of information, tools and resources for engaging in this work for their own professional development. Participants had the opportunity, as part of the workshop, to begin developing a question they want to investigate and learn what evidence would be appropriate to gather as part of their project.

Butler University Annual Undergraduate Research Conference

April 20, 2012

The first SCI-Central Plains event was held in conjunction with Butler's 24th annual undergraduate research conference, which typically involves 600 students from 30 Midwest colleges and universities. David Burns, founder and principal investigator of SENCER provided an overview, and Dr. Laura Behling, Associate Provost at Butler University, talked about the focus of Butler's newly-named SENCER Center for Innovation (SCI). Faculty from Butler who have re-designed courses according to the SENCER ideals then presented on their work. Dr. Tara Lineweaver (Psychology) and Dr. Phil Villani (Biological Sciences) explained their "Food: Pasture, Table, Body, Mind" course, including their work with a local food pantry; Dr. Jen Kowalski (Biological Sciences) and Dr. Angela Ockerman (Pharmaceutical Sciences) detailed their course "Life, Death and Immortality"; and Dr. Michael Samide (Chemistry) talked about "Incorporating SENCER Ideals into the Chemistry Curriculum," including the work he and his students do in conjunction with the Indianapolis Museum of Art. All faculty presentations articulated how they re-imagined their science curricula in order to incorporate civic engagement.

Upcoming SCI Events

New England Regional Meeting

October 27, 2012

Hosted by Wheelock College in MA

The agenda for the meeting will include: (1) How service learning and Campus Compact support SENCER collaborations; (2) examples of Faculty/student/community collaborations; (3) student perspectives, and (4) how to integrate SENCER into your CV and your tenure portfolio. This meeting is co-sponsored by SENCER, New England Campus Compact, Wheelock College, and The Colleges of the Fenway Center for Sustainability and the Environment.

Sustainability, Quantitative Reasoning, and the Liberal Arts: Enhancing Student Success Through Civic Engagement

November 10, 2012

Hosted by Beloit College in WI

The conference goals include: (1) exploring the use of civic engagement to strengthen quantitative reasoning in courses across the curriculum; (2) learning how to design a SENCER course, using civic engagement to strengthen student learning; (3) promoting the incorporation of sustainability into the liberal arts curriculum; (4) sharing examples of pedagogies across the disciplines that enhance civic engagement and student learning; (5) strengthening our regional network; and (6) being able to tour Beloit College's new LEED Platinum Science Center, and learning how students contributed to its planning.

The keynote speaker will be Dr. Cynthia Kaus, Chair of Mathematics Department, Metropolitan State University. Dr. Kaus has pioneered the use of case studies and civic engagement around issues of environmental sustainability and social justice in Mathematics courses from statistics through calculus. Her course, Introductory Statistics with Community Based Projects was selected as a SENCER model course.

V. Assessment and Evaluation

SENCER conducts evaluations of all national events (reports for the SENCER Summer Institute are still being analyzed and reports from the Washington Symposium were positive). We use this feedback to shape future events, taking into account the needs of the community. All subgrantees are required to use the SENCER-SALG as part of evaluation of supported courses and programs, and all members of the

SENCER community, whether recipients of a subgrant or not, are strongly encouraged to utilize the SALG. The Summer Institute program regularly features multiple sessions on assessment and evaluation, introduction to the SENCER-SALG, and support for advanced applications. In the spring of 2012, Dr. Stephen Carroll, SALG PI, published the following analysis of SENCER-SALG submissions and results:

SALG Results Show SENCER Faculty Achieve in Raising Higher-Order Learning Gains

By Dr. Stephen Carroll, Principal Investigator, SALG

Analysis of the SALG (Student Assessment of their Learning Gains) data from September 2007 to September 2011 reveals that the SENCER project is succeeding on a number of levels. First, the data show that an ever-increasing number of SENCER faculty are using the SALG to assess and improve their teaching. Over the past four years, SENCER faculty conducted 1,314 SALG surveys, slightly more than 27% of the total number of SALG surveys delivered. The number of SENCER surveys has increased every year. The first year, 2008-2009, saw the largest increase, from 67 to 1019. In the next year, 2009, the number of users swelled to 1594 and expanded to 2026 in 2010 and 2174 in 2011 (1). This substantial and consistent growth shows that SENCER faculty are getting useful data from the SALG.

Second, consistent with this finding, the data show that SENCER faculty, even more than SALG users in general, use information gained from the SALG to make substantive revisions to their course designs and pedagogy. Over the past three years, 87 out of approximately 200 SENCER faculty using the SALG have made changes in 387 SALG instruments for over 200 courses. A detailed analysis of students' answers shows that these modifications to their courses are working: the trend line shows that scores related to pedagogical goals are increasing for SENCER faculty (2). Moreover, this upward trend holds across all the main categories of pedagogical goals: those related to a) understanding course content, b) skill-building, c) changing attitudes toward science, and d) building habits of mind and behavior. In fact, the margins by which SENCER faculty outperformed their non-SENCER colleagues tended to be slightly larger in the areas of higher-order learning gains (those pertaining to affective factors and habit formation). This indicates that the learning gains made by students in SENCER courses were more likely to be long-lasting than the gains made in non-SENCER courses.

Finally, in 2007, 2008, and 2009, the scores for SENCER faculty were higher in almost all categories than for non-SENCER faculty. The fact that SENCER scores are higher than non-SENCER faculty is quite remarkable, since the research shows that students tend to give lower evaluation scores to faculty using innovative pedagogies like the ones used in SENCER courses (3). In 2010 and 2011, the situation got more complicated because the redesign of the SALG website attracted a much larger number of non-science faculty. Humanities and social science faculty tend to get higher ratings than physical sciences; major courses tend to get better ratings than general education courses; and upper-division courses tend to get better ratings than lower-division courses (4). (See chart 1) As SENCER courses are almost exclusively lower-division, general education, physical science courses it is unsurprising that the large increase of humanities and social science faculty using the SALG has driven the up the averages for non-SENCER faculty in the past two years. However, preliminary analysis of the data suggests that the averages for SENCER faculty remain above the averages for non-SENCER faculty in the sciences.

Overall, the data clearly show that SENCER is improving science education and civic engagement across the nation, supporting the NSF's STEM education goals. The trends indicated by the data are clear and strong and show unequivocally that the SENCER project is not only working, but that it is getting better with time.

Chart 1. Scores in SENCER and non-SENCER instruments

Gains are categorized by the type of question they represent as noted by SALG coordinators – affective (A), integrative (I), skills (S), and understanding (U).



Endnotes

1. Because the dataset for 2011 ends in September, we have captured only about 60% of the data for that year. Adjusting for normal distribution would suggest that about 3623 surveys were delivered by SENCER faculty in 2011.
2. The data for 2007 were left out of these calculations because the number of surveys returned was too small to be statistically significant.
3. See Seymour, E., Wiese, D., Hunter, A. & Daffinrud, S.M. (2000) Creating a Better Mousetrap: On-line Student Assessment of their Learning Gains. Boulder, CO: University of Colorado, Bureau of Sociological Research.
4. See Benton, Stephen L, and Cashin, William E. (2011) IDEA Paper #50: Student Ratings of Teaching: A Summary of Research and Literature, Kansas State University.

VI. Invited Presentations & New Partnerships

In 2012, SENCER leaders and community members have developed a number of new partnerships, and have been invited to present at association meetings that will allow us to further increase our outreach to new faculty, administrators, students, and institutions regarding our approach of connecting content with pressing civic issues. New partnerships and invited presentations include the following:

Council of Colleges of Arts and Sciences (CCAS)

This fall, leaders in the SENCER community will offer a workshop at the annual meeting for the Council of Colleges for Arts and Sciences (CCAS) entitled "Removing the Thorns from STEM: A Dean's Guide to Improving STEM Learning and Promoting Civic Engagement." Presenters will include DonnaJean Fredeen of Southern Connecticut State University, Karen Oates of Worcester Polytechnic Institute, Keith Krumpke of the University of North Carolina at Asheville, and Ann Staton of Texas Woman's University.

Hispanic Association of Colleges and Universities

SENCER PI David Burns, along with Dr. David Ferguson, Dr. Tomas Morales, and Danielle Kraus Tarka, will present 'Making Science Education Real, Relevant and Effective: A Leadership Imperative' at

the HACU Annual Conference this fall. The conference will be held in Washington, DC, and the SENCER session will be part of the program on Sunday, October 21. HACU membership includes more than 400 colleges and universities in the United States and internationally working toward Hispanic higher education success.

Pittcon

A group coordinated by Dr. Michael Samide of Butler University has been invited to present "Practical methods for implementing the undergraduate analytical science curriculum" at Pittcon in 2013. Pittcon, a conference focusing on laboratory science, is coordinated by The Pittsburgh Conference on Analytical Chemistry and Applied spectroscopy. The invited session is comprised of a series of talks that will address practical methods for adapting and implementing various curricular models that engage students in active learning. In addition to Michael Samide, speakers will include Olujide Akinbo (Butler University), Tom Wenzel (Bates College), Jill Robinson (Indiana University), Justin Shearer (Rose Hulman University), Sayo O. Fakayode (Winston Salem University), and David Burns.

International Science in Society Conference

The International Science in Society Conference, planned for November 2012 in California, will include presentations by leaders in the SENCER community. Richard Sheardy, professor of chemistry and co-director of the SCI-Southwest, will discuss Texas Woman's University's SENCER-inspired certificate program, Science, Society and Sustainability. Cynthia Maguire, a lecturer in chemistry and biochemistry at TWU will present Translating Science into Common Language: SENCER and the Dual Poster Concept, an initiative that encourages students to make a companion poster to their research that discusses the civic applications in language easily understandable by a non-expert.

Magna Publications

SENCER will partner with Magna Publications on a series of webinars designed around key implementation issues such as basic course design, assessment, pedagogy, civic engagement, and community building and planning. The online webinars will be supplemented by discussion groups following each live event. We anticipate that the first of these webinars will be available early this summer. Details on how to sign up will be published in the eNews. Webinars conducted in the fall will be especially oriented for team recipients of implementation awards following participation in SSI 2012, but will also be open to the public.

A social media survey conducted last spring conveyed that SENCER community members are interested in additional online resources, such as webinars, to supplement in-person meetings. The collaboration with Magna directly responds to this need, and will also serve to disseminate SENCER methods, campus applications, and results to the larger community of STEM educators. The partnership will be led by Dr. Monica Devanas, SCI-Midatlantic co-director and director of faculty development and assessment programs at Rutgers University.

Founded in 1972, Magna Publications serves the higher education community by facilitating faculty and staff development. Magna publishes newsletters and white papers, produces live online seminars, hosts national conferences, and creates video recordings. In 2011, our online seminar by the authors of the book *Academically Adrift* was shown at more than 650 locations, and an additional 250 recordings were sold. The reach of this program included several thousands of people. Approximately 4,000 campuses nationally and internationally have purchased Magna Publications products. Magna's current audience includes the names of approximately 200,000 individuals. During each of the last few years, Magna has produced about 80 new online seminars a year. Magna currently produce six newsletters. Faculty Focus has the highest circulation with more than 75,000 subscribers.

AAAS Science and Human Rights Coalition

As colleges strive to connect the learning and work of science to solving vexing problems that raise important civic questions, whether they know it or not, they are participating in the worldwide challenge of promoting a human right: access to the benefits of science. The American Association for the Advancement of Science's (AAAS) Science and Human Rights Coalition has focused attention on promoting greater public understanding and making this right "real" in the lives of people here and around the world.

The Coalition (including 32 institutional members and other affiliated organizations and individuals) aims to "advance the right to 'the benefits of scientific progress and its applications' by combining the efforts of scientific associations across disciplines to tackle this long-neglected human right." In early July, the National Center received word that it had been elected to membership on the AAAS Science and Human Rights Coalition. Karen Oates and David Burns were welcomed as members of the Coalition Council, the group's governing unit.

According to the AAAS, the Coalition

is a network of scientific and engineering membership organizations that recognizes a role for science and scientists in efforts to realize human rights. The aim of the Coalition is to facilitate communication and partnerships on human rights within and across the scientific community, and between the scientific and human rights communities.

What is this "right to the benefits of scientific progress"? Here is a bit of history and a description (excerpted from a longer document available [here](#)):

In May 1948, the American Declaration of the Rights and Duties of Man was adopted by the International Conference of American States, the predecessor to the Organization of American States. Seven months later, the United Nations General Assembly adopted the Universal Declaration of Human Rights (UDHR). Article 27 of the UDHR states that, "Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits." Developed by the UN Human Rights Commission under the leadership of Eleanor Roosevelt, the UDHR is not a legally binding instrument. However, when Article 27 became the basis for Article 15 of the International Covenant on Economic, Social and Cultural Rights 1966, then the right to enjoy the benefits of scientific progress became a legally binding norm of international law.

The Coalition asserts that: "The protection and advancement of human rights require the active engagement of scientists - their knowledge, tools, and voices. While some scientific associations and scientists have made vital contributions to human rights, as a group they have lacked a forum in which to learn from colleagues with experience in human rights, explore new areas of human rights work, and develop together new contributions to human rights efforts. The AAAS Science and Human Rights Coalition was formed to fill this gap."

Among the Coalition's efforts that are especially aligned with those of our Center is the interest in developing and distributing materials to be used in courses for college students that will connect human rights issues and learning in our various disciplines.

In announcing NCSCE's election to the Council, Jessica Wyndham, Coalition Coordinator, said, "We are thrilled to welcome the National Center for Science and Civic Engagement as a member of the AAAS Science and Human Rights Coalition. The Center will surely have much to add to the Coalitions work in bringing human rights to the teaching of science and engineering."

According to Karen Kashmanian Oates, co-founder of and now senior advisor to SENCER, "the work of the AAAS Coalition is synergistic with what we have been doing for over 10 years. With this new association, the National Center joins a vibrant community. We are dedicated to advancing the mission of connecting science to benefitting society through support for partnerships around the globe and dissemination of the good work of our members. This includes the advancement of democratic principles and practices, as well as the use of progressive pedagogies."

VII. Features on SENCER Campus-Based Work

Great work is being done by educators, administrators, and students across the country in their adaptation of the SENCER ideals and methods to courses and programs, as evidenced by the presentations and posters noted earlier in this report. Included here are features on campus work that illustrate just a small portion of the efforts conducted by the SENCER community.

West Point Launches Major Curricular Initiative: Puts SENCER Ideals in Action

By David Burns

I think it is safe to say that the team from the U.S. Military Academy (West Point) captured the attention, admiration, and affection of the SENCER community members who first met them at SSI 2011 at Butler. West Point trains cadets who face the most challenging of "unscripted problems" and, after serious self study, had concluded that when considering its general education program, a "siloed" approach had to yield in favor of a strategy that was far more inter-disciplinary in nature. So, with the assistance of Barb Tewksbury, they decided to investigate the SENCER approach.

Now, a bit more than a year later and following another highly productive stint at SSI 2012 in Santa Clara, the West Point team is rolling out a new linked-course sequence focused on energy. They have developed what they are calling an "energy spine" on which to organize learning in chemistry and mathematics (and other disciplines, as well).

This spine metaphor immediately resonated with me as it made me recall that, in the early days of our work on HIV, I used to say that students had the "skeleton" of their version of the HIV story on which to "hang" or array what they would be learning in biology or other disciplines. Little did I know how this notion caught one of the central tenets of new research on cognitive science and new findings about novice versus expert learning. It just made sense to me. Endo-skeletons always have! So I was delighted when our colleagues from the U.S. Army put even more spine in SENCER!

It's also always gratifying and inspiring to get reports on how things are going in the projects our colleagues are carrying out on campus. Last Sunday, I received an update from one of the leaders of the USMA effort, Jerry Kobylski, an Academy Professor in the Department of Mathematical Sciences. Just days after SSIU 2012, this report was thus especially welcome.

I asked Jerry for permission to share some of it with you. He graciously consented. Here is a summary of his report along with a stunning photo of West Point and the Hudson River by Dr. Frank Wattenberg. Here's some of what Jerry reported:

... Administrative support for our effort continues to be steady. Our Dean (Provost), BG Timothy Trainor, has always been a strong supporter of our efforts. In fact, he is the one who asked us to years ago to investigate ways that our academic program could become more interdisciplinary. The support from him, our administration, and our faculty continues to grow.

The Core Interdisciplinary Team recently presented our planned effort to approximately 100 faculty who would be teaching in the interdisciplinary program. We outlined the strategic picture and motivation of why we were engaging in this effort to include addressing the following questions why interdisciplinary,

why energy, why now, and why at West Point. I think we definitely "set the hook" with our faculty, hopefully the hook sticks. Many told us afterwards how appreciative they were and how much they were looking forward to teaching in this endeavor.

Now comes a harder sell, to our students. This past week we attempted to "set the hook" with our cadets, approximately 2000, or half of the Corps of Cadets. We invited two guest speakers to speak in three separate presentations to each year group, and then to the faculty. One was a senior civilian leader (two star military equivalent) who has played a significant role in developing the Army's strategy with respect to energy for the future. Needless to say he understood and is a strong supporter of interdisciplinary study. The second speaker was recently redeployed from a tour in Afghanistan as a company commander for a forward support battalion.

In joint presentations, our two speakers highlighted the strategic importance and concerns of energy security. The tactical introduction included first-hand description of his experience of managing the logistical complexities of day-to-day operations at the forward operating bases (FOBs) in Afghanistan. We hope these presentations captured cadet interest and attention so the points driven home regarding energy security in subsequent classroom work and discussion will have a lasting effect and will positively influence their future careers both at USMA and in the Army.

Last week in my introductory calculus course for the freshman, we gave the students a "taste" of the energy problem. We issued a short essay question on ways to reduce energy usage at West Point, using a problem-solving process as an outline for the essay.

Cadets will keep these essays and then bring them to their English class where the English teachers will have the students reflect on their writing and thoughtfulness in this essay, and then build on in another essay, this time a requirement in the English course. This essay will create a benchmark for us to compare student work at the end of the semester and at the end of the academic year. Topics to be compared include student composition skills, knowledge of significant energy principles, and an awareness of the importance of an interdisciplinary thought process. We also issued our SALG survey last week, again to benchmark student learning growth.

"The views expressed herein are those of the author and do not purport to reflect the position of the United States Military Academy, the Department of the Army, or the Department of Defense."

Well, this surely is an impressive start to what is one of the largest applications of the SENCER ideals since the program began. Jerry and his colleagues are grateful for all the support they have received. They continue to solicit advice and counsel as this venture progresses. I have invited Jerry and Joe to keep us updated on progress and look forward to being able to share the results with you as they emerge.

SSI 2012 Team Focus: Holy Names University

This year, Vanessa Handley, Julia Smith, Jennifer Sherwood, and Lizbeth Martin will join us from Holy Names University. Their goals for SSI attendance are:

"Our team has extensive experience developing and teaching introductory biology classes and, subsequently, a deep familiarity with the challenges, pitfalls and joys inherent to this endeavor. A resounding theme in departmental discussions this year has been the tension between maintaining rigor while at the same time serving the increasingly underprepared student populations in these classes. One of our central strategies has been engaging students and hopefully fostering learning and deeper understanding - through hands-on experiences. We are constantly seeking ways to make these experiences relevant to students' lives and interests and to develop research modules that are student-directed. While we have had initial success with these strategies, we have also found them very labor intensive to develop

and implement. Hence our team would welcome the opportunity to collaborate and benefit from the collective expertise of other participants at the Summer Institute."

Campus Focus: Indiana State SENCER Team Leads Wind Turbine Research

Since becoming involved with SENCER just a few years ago, the Indiana State University team has made numerous curricular changes and gained the support of the university president and other administrators. Dr. James Speer and the SENCER Student Leadership Team were awarded the 2011 William E. Bennett Award for Extraordinary Contributions to Citizen Science as a result of their efforts. In March, undergraduate Sabrina Brown presented a talk during the Washington Symposium on student contributions to discussions at ISU on installing a wind turbine, which was installed this past weekend on Earth Day. Students measured wind speeds and, with that data, determined the optimal location for the turbine. Please visit http://serc.carleton.edu/files/sencer/newsletters/wind_turbine_research_report.pdf to read the complete report prepared by Sabrina, Joseph L. Pettit, and James Speer.

See SENCER in Action at Indiana State University

Faculty, staff, and students from Indiana State University have been involved with SENCER for several years and have been incredibly impressive in the ways they have applied the approach to the curriculum and across the campus. Their work has been recognized in many ways, including the William E. Bennett Award for Extraordinary Contributions to Citizen Science to Dr. James Speer and the SENCER Student Leadership Team. The team put together a short video to discuss what they have done and the effect on the campus – we invite you to take a look at http://www.youtube.com/watch?v=jNJ_LnMZWds&noredirect=1.

Biology Graduate Students SENCERize Undergraduate Labs at Georgia College

By Caralyn Zehnder

Each year at Georgia College approximately 320 undergraduates, largely non-science majors, enroll in our Introduction to Environmental Science course. In 2009, we were awarded a SENCER sub-award to help facilitate SENCERizing the lab component of this course. The main goal for this project was to develop and implement a lab-designing workshop for biology graduate students in which workshop participants would design new labs for Introduction to Environmental Science. Eight biology graduate students took part in the year-long workshop. Workshop activities focused on goal-writing, active learning strategies, assessment, and review of their actual labs. Our graduate students designed three new SENCERized labs focusing on groundwater, air pollution and solar energy. Graduate student groups worked extremely hard and designed very high quality labs. One of the groups even purchased lab supplies and tried out the lab on their own in order to make sure that it really worked. These labs were reviewed by workshop participants, undergraduate environmental science majors, science faculty and members of the Innovative Course building group.

Undergraduate environmental science majors also took part in the lab redesign process. Before the workshop began, freshmen environmental science majors brainstormed to develop ideas, topics, and activities for interesting and engaging lab experiences. After the labs were written, a number of our students helped to test drive the new labs. Additionally, these students assisted in setting up a field site that the environmental science labs will be visiting to collect groundwater data. The students installed piezometers (wells used to measure groundwater) at a nearby wetland and also produced a map of the wetland for use in the class. This semester is the first time that we have implemented some of the new labs in our environmental science course. We are assessing student learning and we plan to continue revising the course based on student-feedback and our assessment results.

Campus Report: Calculus Research Projects at Roosevelt University

By Melanie Pivarski and Barbara Gonzalez

Two years ago Roosevelt University SENCERized its Calculus II course to include semester long research projects designed by faculty. This summer two Roosevelt University undergraduates, Carina Balan and Jonathan Castaldo, joined in the fun! They studied the literature on projects in calculus, and they each designed a project for us to use in our course here. Both students were funded as a part of an NSF-STEP grant.

Carina Balan is a sophomore Actuarial Science major. Carina's project builds on the idea of population growth. In it, students learn about modeling population in an ideal setting: a petri dish. They study different types of models and how they arise. Then they see how this applies to human population on earth. Carina presented her work in a talk at the 21st Argonne Symposium for Undergraduates in Science, Engineering, and Mathematics and also at Roosevelt University's Math x-Position. We are working with Dr. Robert Seiser, a SENCER leadership fellow here at Roosevelt, to use data from his lab in this project with our Calculus II classes this spring.

Jonathan Castaldo is a second year mathematics major who was a student in a SENCERized Calculus II course in Spring 2011. Jonathan's project deals with modeling greenhouse gases. In it, he leads students through how to find a line of regression using calculus and curve fitting. John presented his work in a talk at the 21st Argonne Symposium for Undergraduates in Science, Engineering, and Mathematics and also at Roosevelt University's Math x-Position. We plan to use his project in an upcoming semester of Calculus II.