

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Annual Report – Year Three

Strengthening the Professoriate @ Iowa State University

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SP@ISU
Strengthening the Professoriate

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I. Executive Summary

The mission of Strengthening the Professoriate at Iowa State University (SP@ISU) is to support faculty as they develop Broader Impact (BI) activities for NSF proposals, integrate these activities into their research program, and document their BI work for the promotion and tenure process. Postdoctoral scholars and advanced graduate students also participate as they prepare their professional credentials for the professoriate. The outcome for SP@ISU will be more competitive NSF proposals, a new generation of faculty who integrate BI work into their research programs, and increased participation of those traditionally underrepresented in STEM, all outcomes that will strengthen the professoriate.

SP@ISU has continued innovative programming throughout the third year of the grant, and we will build on this throughout the remaining years of the award. We are assembling a network of experts on campus to assist, mentor, and support PIs in developing broader impacts plans. We offered workshops as a means to provide information to faculty and facilitate networking among faculty and staff. We conducted a number of meetings and events at the college level across campus to increase the visibility of SP@ISU and related programs as well as awareness of the changes in the Broader Impacts Criterion.

SP@ISU is also pursuing significant work in the area of evaluation. We have applied techniques such as NSF grant application analysis, social network analysis, and linguistic analysis to guide and support program activities. The SP@ISU project is using social network analysis techniques to identify grantsmanship relationships and strengths among faculty. We have started the process to incorporate connections with campus programs into these analyses. This will provide SP@ISU the opportunity to show the effects of relationships that will strengthen professional development opportunities for faculty, examine broader impacts accountability commitments, enhance program evaluation, and further understanding of collaboration activities. Understanding grant-related faculty success and networking is seen as a first step to influencing the broader impacts culture on campus and may also lead to new metrics to evaluate progress. To assist faculty with developing their broader impacts plans, SP@ISU is using several techniques to describe components of a successful plan. A preliminary study done during year two of the project used summative content analysis of BI language in abstracts of ISU proposals that received NSF funding. Computational linguistics techniques have been used to analyze the quality of the writing and the integration of broader impacts plans within NSF proposals.

Drawing on recommendations from the external evaluation report and key stakeholders, the focus of year 3 was program visibility and networking, faculty involvement and information sharing, and planning and evaluation. While we continue work in these areas, planning for year 4 of the project will include defining and assessing measurable outcomes to evaluate program impact and sustainability.

II. Participants

II.A. People

Sharron Quisenberry, Principal Investigator
Vice President for Research and Economic Development
Worked more than 160 hours

Dr. Quisenberry led all program planning and meetings. She represents the program at the highest administrative level to ensure recognition of the importance and strategic implications of broader impacts at the university. She has spoken and presented on behalf of SP@ISU at many university meetings and workshops.

Bonnie Bowen, Co-Principal Investigator
Adjunct Assistant Professor of Ecology, Evolution, and Organismal Biology
Worked more than 160 hours

Dr. Bowen participated in all program planning and meetings. Being the former Executive Director of ISU ADVANCE, she has provided a link to broadening participation activities on campus and is integral in the appointment and training of the college Equity Advisors.

Diane Rover, Co-Principal Investigator and SP@ISU Director
Professor of Electrical and Computer Engineering
Worked more than 160 hours

In addition to being a Co-PI on the project, Dr. Rover is also the Director for SP@ISU. She is responsible for implementing directives that result from PI Team meetings and Executive Steering Committee meetings. She is also responsible for development and planning of all training opportunities for faculty, evaluation efforts, and SP@ISU events. She also serves as the link to faculty on campus.

Megan Heitmann, SP@ISU Program Assistant
Worked more than 160 hours

Ms. Heitmann provides support to all aspects of the SP@ISU program. She assists in scheduling and providing agendas for meetings, maintaining the website, drafts reports and memos, organizes program workshops, and supports faculty who are preparing proposals.

Elizabeth Hoffman, Chair of the Executive Steering Committee
Executive Vice President and Provost
Worked less than 160 hours

Dr. Hoffman previously served as a consultant for the National Science Board so to avoid a conflict of interest she assumed an advisory role on the SP@ISU project. Dr. Hoffman stepped down as Executive Vice President and Provost in July 2012. Prior to that, she served the program as chairperson for the Executive

Steering Committee and played an active role in recognizing the scholarship of broader impacts.

**Mari Kemis, Interim Internal Assessment Coordinator
Assistant Director, Research Institute for Studies in Education**

Worked less than 160 hours

Ms. Kemis has been hired in the interim to serve as SP@ISU's Internal Assessment Coordinator after the departure of Dr. Jason Pontius. Ms. Kemis provides access to and assessment of all relevant ISU databases and assists in the development of the program's formal evaluation plan.

**Sandra Norvell
Grants Officer, Center for Excellence in Arts and Humanities**

Worked less than 160 hours

As the Grants Officer for the Center for Excellence in Arts and Humanities, Ms. Norvell provides the connection between SP@ISU and non-STEM faculty on campus. She supports and promotes all program activities to these faculty members. She also participates in SP@ISU Team meetings.

**Jason Pontius, Internal Assessment Coordinator
Coordinator of Continuous Academic Program Improvement**

Worked less than 160 hours

Dr. Pontius provides access to and assessment of all relevant ISU databases. He has been integral in providing frameworks to assess the culture of broader impact efforts on campus. He has also assisted in the development of the program's formal evaluation plan and works with the External Evaluation Consultant to implement this plan. Dr. Pontius left Iowa State University and SP@ISU in November 2012.

**Chitra Rajan
Associate Vice President for Research**

Worked less than 160 hours

Dr. Rajan participates in SP@ISU meetings and provides support for the campus-wide REU evaluation effort that was created by SP@ISU. As a Co-Director for the Iowa EPSCoR program and the lead for its Future Leaders in Advancing Renewable Energy (FLARE) Institute, she provides additional connections to broader impacts programs on and off campus. She has also helped organize workshops and has spoken on SP@ISU at university meetings.

**Jonathan Wickert, Chair of the Executive Steering Committee
Senior Vice President and Provost**

Worked less than 160 hours

Dr. Wickert was appointed as Senior Vice President and Provost the end of July 2012. He assumed the role of chairperson for the SP@ISU Executive Steering Committee and plays an active role in recognizing the scholarship of broader impacts.

II.A.1. Equity Advisors

Equity Advisors (EAs) are appointed in the five STEM colleges and guide the development of a broader impacts culture among faculty, post-doctoral scholars, and students. They also provide a valuable connection between the SP@ISU program and college administration. The EAs who served during the third year of SP@ISU include:

Nicola Bowler, Equity Advisor in the College of Engineering

Professor of Materials Science and Engineering

Worked less than 160 hours

Mary Lynn Damhorst, Equity Advisor in the College of Human Sciences

Professor of Apparel, Events & Hospitality Management

Worked less than 160 hours

Susan Lamont, Equity Advisor in the College of Agriculture and Life Sciences

Charles F. Curtiss Distinguished Professor of Animal Science

Worked less than 160 hours

Lisa Larson, Equity Advisor in the College of Liberal Arts and Sciences

Professor of Psychology

Worked less than 160 hours

Catherine Logue, Equity Advisor in the College of Veterinary Medicine

Professor of Vet Microbiology and Preventive Medicine

Worked less than 160 hours

II.A.2. Faculty Leaders

Faculty Leaders (FLs) serve as role models and support networking initiatives among faculty and staff to build a culture of broader impacts at Iowa State. Each FL has expertise in an area of broader impacts and works to advance ISU's initiatives in these areas and build a community of experts around them.

Holly Bender, Faculty Leader

Associate Director, Center for Excellence in Learning and Teaching;
Director, Preparing Future Faculty and the Graduate Student Teaching Certificate

Professor of Clinical Pathology in the College of Veterinary Medicine

Worked more than 160 hours

Jean Goodwin, Faculty Leader

Associate Professor of English

Faculty member involved in Science Communication @ ISU

Worked more than 160 hours

Michael Kessler, Faculty Leader

Associate Professor of Materials Science and Engineering

Worked more than 160 hours

II.A.3. Advisory Council Members

- Joe Colletti, Senior Associate Dean, College of Agriculture and Life Sciences
- Michael Dahlstrom, Assistant Professor, Greenlee School of Journalism and Mass Communications
- Malika Jeffries-El, Associate Professor, Department of Chemistry
- Mari Kemis, Assistant Director, Research Institute for Studies in Education
- Balaji Narasimhan, Associate Dean, College of Engineering
- Craig Ogilvie, Assistant Dean, Graduate College
- Carla Peterson, Associate Dean, College of Human Sciences
- Raj Raman, Professor and Associate Chair for Teaching, Department of Agriculture and Biosystems Engineering; University Education Program Director, Center for Biorenewable Chemicals
- Martin Spalding, Associate Dean, College of Liberal Arts and Sciences
- Jay Staker, Extension Youth Development Specialist, 4-H Youth Development
- Qijing Zhang, Associate Dean, College of Veterinary Medicine
- Karen Zunkel, Director of Undergraduate Support Services, Senior Vice President and Provost's Office

II.A.4. Undergraduate Students

The undergraduate students assist the SP@ISU staff with basic office tasks, compiling and drafting written pieces, and updating the website.

Kayla Greiner

Worked more than 160 hours

Steven Johnson

Worked more than 160 hours

II.B. Collaborators

II.B.1. External Evaluation Consultant, Dr. Mariko Chang

Dr. Chang provides the external perspective to SP@ISU activities. She has developed the program's formal evaluation plan, works with the Internal Assessment Coordinator to implement this plan, and performed formal program evaluation for year 1 of the project.

II.B.2. SP@ISU Broader Impacts Evaluation Workshop Presenters

Effective Broader Impacts Evaluation Practices for Grants Session
Presenters

Mack Shelley, University Professor, Political Sciences and Statistics

Mari Kemis, Associate Director, Research Institute for Studies in Education

Panelists

Mack Shelley, University Professor, Political Sciences and Statistics
Mari Kemis, Associate Director, Research Institute for Studies in Education
Michael Kessler, Associate Professor, Materials Science and Engineering
Soko Starobin, Assistant Professor, School of Education
Susan Lamont, Charles F. Curtiss Distinguished Professor, Agriculture and Life Sciences

Assessing Undergraduate Research Experiences Session

Presenter

David Lopatto, Professor, Psychology, Grinnell College

Panelists

David Lopatto, Professor, Psychology, Grinnell College
Mari Kemis, Associate Director, Research Institute for Studies in Education
Monica Lamm, Associate Professor, Chemical and Biological Engineering
Sunday Tim, Associate Professor, Agricultural and Biosystems Engineering

Assessing K-12 Outreach Programs Session

Presenter

Nancy Franz, Associate Dean, Extension and Outreach to Families in the College of Human Sciences

Panelists

Nancy Franz, Associate Dean, Extension and Outreach to Families in the College of Human Sciences
Mandi Anderson, Research and Evaluation Scientist, Research Institute for Studies in Education
Connie Hargrave, Associate Professor, School of Education; and Director, Science Bound
Adah Leshem, Pre-College Education Program Director, Center for Biorenewable Chemicals
Gene Lutz, Professor, Sociology; and Director, Center for Social and Behavioral Research, University of Northern Iowa

II.B.3. SP@ISU Partner Programs

The SP@ISU project collaborates with a number of ISU internal organizations and departments to share information and programming. These programs have worked on collaborative projects, participated in collaboration meetings, and presented at SP@ISU workshops. The SP@ISU partners include:

- Ames Laboratory
- Biotechnology Outreach Education Center (BOEC)
- Center for Excellence in Science, Mathematics, and Engineering Education (CESMEE), College of Human Sciences
- Center for the Integration of Research, Teaching, and Learning (CIRTL)

- Engineering Precollege Programs
- Future Leaders in Advancing Renewable Energy (FLARE) Institute
- George Washington Carver Internship Program, College of Agriculture and Life Sciences
- Graduate College
- Graduate Research Assistantship Match (GRAM), College of Agriculture and Life Sciences
- Howard Hughes Medical Institute Project (HHMI)
- Iowa EPSCoR
- Iowa Illinois Nebraska STEM Partnership for Innovation in Research and Education (IINSPIRE-LSAMP)
- Iowa Space Grant Consortium
- ISU ADVANCE
- ISU Extension – 4-H
- ISU Honors Program
- IT-Adventures
- Mathematics Department
- Molecular Biology, Biotechnology and Genomics Departments
- NSF Engineering Research Center for Biorenewable Chemicals (CBIRC)
- Office of Community College Research and Policy (OCCRP)
- Plant Genomics Education Outreach
- Preparing Future Faculty (PFF)
- Program for Women in Science and Engineering (PWSE)
- Psychology in Education Research Lab (PERL)
- Research Experience for Undergraduates (REU) Programs (various)
- Research Institute for Studies in Education (RISE)
- SACNAS Chapter: Devoted to Advancing Hispanics, Chicanos and Native Americans in Science
- Science Bound
- Science Communication @ ISU
- Student Enrollment and Engagement through Connections (SEEC), College of Engineering
- Summer Program for Enhancing Engineering Development (SPEED)
- Survey and Behavioral Research Services
- Toying with Technology
- Four TRiO Programs

More information about each of these partners is available at the SP@ISU website, www.spisu.iastate.edu/programs.

II.B.4. SP@ISU External Partners

Centers for Ocean Sciences Education Excellence (COSEE)

Individuals involved in a conference call regarding the COSEE BI Wizard.

- Seth Trooper, Director of Operations, Office of Technology Commercialization, Rutgers University
- Janice McDonnell, Science, Engineering, and Technology (SET) 4-H Agent, Institute of Marine and Coastal Sciences, Rutgers University
- Sage Lichtenwalner, Data Translator, Institute of Marine and Coastal Sciences, Rutgers University
- Carrie Ferraro, Project Coordinator, Institute of Marine and Coastal Sciences, Rutgers University

Broader Impacts Infrastructure Summit

The following is a list of institutions that were represented at the Broader Impacts Infrastructure Summit at the University of Missouri. The summit is leading to the formation of a national alliance of organizations that will ultimately work with NSF to establish the best practices and direction of broader impacts infrastructure support.

- Boston University (Massachusetts)
- Brown University (Rhode Island)
- Center for Advancement of Informal Science Education (Washington D.C)
- Danforth Plant Science Center (Missouri)
- Florida Atlantic University
- Harvard University (Massachusetts)
- Illinois Institute of Technology
- Indian River State College (Florida)
- Iowa State University
- National Science Foundation (Virginia)
- Northwestern University (Illinois)
- Northeastern University (Massachusetts)
- Ohio State University
- Oregon Museum of Science and Industry
- Penn State University
- Rochester Institute of Technology (New York)
- Southern Illinois University-Edwardsville)
- Stanford University (California)
- University of Alaska, Fairbanks
- University of California- Berkeley
- University of California- Santa Cruz
- University of Florida
- University of Massachusetts- Amherst

- University of Missouri
- University of New Hampshire
- University of North Texas
- University of Pennsylvania
- University of Wisconsin- Madison
- University of Wyoming
- Vanderbilt University (Tennessee)
- Washington University (St. Louis, Missouri)

III. Activities

III.A. Overview of Project

SP@ISU is funded by a 5-year award received from the NSF Innovation through Institutional Integration (I³) program in 2010 (<http://NSF-i3.org>). Additional institutional support comes from the Office of the Senior Vice President and Provost and the Office of the Vice President for Research and Economic Development. SP@ISU is a community-based, integrative initiative to support faculty and the university in the planning, implementation, and evaluation of broader impacts work in concert with research.

SP@ISU is organized around four goals:

1. Build on current NSF programs to increase efficiency and effectiveness of ISU programs to broaden participation in STEM
2. Create a clearinghouse of programs, resources, information, and a network of people to assist and guide in the development of a broader impacts culture at Iowa State University
3. Facilitate and enhance the knowledge base needed by faculty to develop well-researched broader impacts plans as part of their research enterprise
4. Develop protocols for assessment and evaluation of a faculty member's broader impacts initiatives for inclusion in the promotion and tenure process

These goals are the basis for an SP@ISU logic model that guides project management.

Key Activities for Year 3

The key activities for year 3 of the project focused on program visibility and networking, faculty involvement and information sharing, and planning and evaluation. These activities were based on the project logic model and were in response to the external evaluator recommendations. The key activities address multiple goals and recommendations.

III.B. Program Visibility and Networking

To build on the momentum and progress to date, the third year emphasized increasing program visibility and the participation of tenured faculty. Many of the activities that improved SP@ISU visibility also created or strengthened networks among key groups of people involved in our program activities.

III.B.1. Presentations to Key Campus Groups

New Faculty Orientation

SP@ISU was represented at the Orientation for New Tenure-Eligible Faculty hosted by the Senior Vice President and Provost Office in August 2012. Drs. Rajan and Rover presented a session on "Building a Successful Research

Program through External Grants”, and Dr. Rover hosted a break out session for “Enhancing your Research Grants” emphasizing broader impacts.

New Faculty Workshop: Introduction to Research Services

The Vice President for Research and Economic Development Office conducts a workshop for new faculty to acclimate them to research services available at ISU. In the fall of 2012, SP@ISU provided information for a binder given to all new faculty. Ms. Heitmann was present to answer questions during round table discussion.

Department Chairs Cabinet Meeting

The Associate Provost for Faculty invited SP@ISU to a Department Chairs Cabinet meeting in October 2012. SP@ISU met with influential department level administrators who are responsible for faculty development. In addition, it started discussion on the issue of recognizing faculty for their work in broader impacts during the annual review and promotion and tenure processes.

Department Chair Brown Bag Series

SP@ISU presented a workshop titled, “Maximizing Grants through Broader Impacts” as part of the Department Chair Brown Bag Series in March 2013. Information about SP@ISU was distributed and the issue of recognizing faculty for their work in broader impacts was discussed at length.

Meetings with College Associate Deans of Research and Equity Advisors

Equity Advisors (EAs) suggested that meetings with each of the college Associate Deans of Research and EAs would be beneficial to discuss college needs. One result of these meetings was invitations to present SP@ISU resources to faculty at college meetings in the spring of 2013, including: College of Liberal Arts and Sciences Representative Assembly, College of Engineering New Faculty Orientation, College of Veterinary Medicine Research Faculty Meeting.

III.B.2. Equity Advisors and Faculty Leaders

Equity Advisors (EAs) and Faculty Leaders (FLs) are charged with helping to guide the development of a broader impacts culture at ISU.

College Equity Advisors

The EAs guide the development of a broader impacts culture among faculty, postdoctoral scholars, and students under SP@ISU initiatives. Meetings with EAs and the Associate Deans for Research addressed college-specific interests, identified opportunities to share information, and led to action items that will be used to help shape SP@ISU activities in year 4.

Faculty Leaders

Faculty Leaders (FLs) serve as role models for faculty and support networking initiatives among faculty and staff to build a culture of broader impacts at Iowa State. Each FL has expertise in an area of broader impacts and works to advance

ISU's initiatives in these areas and to build around them a community of experts that expands the broader impacts network at Iowa State. FL activities included: postdoctoral scholars training, partnerships with other ISU programs (e.g., EPSCoR, CBiRC), connections with community groups, science communication training and evaluation, and organizing collaborations with non-STEM faculty.

III.C. Faculty Involvement and Information Sharing

Increasing faculty involvement, by senior as well as junior faculty is essential for SP@ISU to stimulate new perspectives on broader impacts activities on campus. Through added involvement, it is imperative to gather information from and work in conjunction with other campus programs to ensure information is shared more efficiently and effectively with faculty and the university community. SP@ISU has facilitated interactions among faculty members, among various programs, and between faculty and programs.

III.C.1. Broader Impacts Evaluation Workshop (11/28/12)

SP@ISU hosted a day-long Broader Impacts Evaluation Workshop to provide opportunities for faculty, postdoctoral scholars, graduate students, and staff to learn more about broader impacts evaluation and resources on campus. The event consisted of a morning session, "Effective Broader Impacts Evaluation Practices for Grants," followed by lunch and two concurrent afternoon sessions, "Assessing Undergraduate Research Experiences" and "Assessing K-12 Outreach Programs." Presentations, video, and information from these sessions are available on the SP@ISU website. Workshop surveys were developed and disseminated.

The morning session included presentations on the new NSF grant review standards pertaining to broader impacts, including how various assessment and evaluation approaches can be applied to different broader impacts areas. The presentations were followed by a panel session that included faculty with experience evaluating broader impacts activities.

The concurrent afternoon sessions were led by evaluation experts. Dr. David Lopatto, Professor of Psychology at Grinnell College was the Keynote Speaker at the afternoon session on "Assessing Undergraduate Research Experiences." He discussed two existing cross-institution surveys to evaluate undergraduate research experiences—SURE (Summer Undergraduate Research Experience) and CURE (Classroom-based Undergraduate Research Experience). He focused on the findings from these surveys and how other undergraduate research programs could participate to evaluate their own programs. A panel discussion followed that included faculty with experience evaluating undergraduate research experiences.

Dr. Nancy Franz, Director of ISU Extension and Outreach to Families, was the Keynote Speaker at the concurrent afternoon session, "Assessing K-12 Outreach Programs." Following her presentation, a panel discussed assessment of K-12 programs.

III.C.2. Partnerships with Other ISU Programs

Center for Excellence in Learning and Teaching (CELT)

SP@ISU partners with two of CELT's key Programs: Preparing Future Faculty (PFF), and the Center for the Integration of Research, Teaching, and Learning (CIRTL).

CELT teamed with the Graduate College, SP@ISU, and the Postdoctoral Association to offer additional opportunities for mentoring and expanding career preparation for postdoctoral scholars. CELT extended an invitation for postdoctoral scholars to participate in the center's Preparing Future Faculty and all general CELT programming.

The Associate Director of CELT and Director of PFF, Dr. Bender, also serves as an SP@ISU Faculty Leader.

Preparing Future Faculty (PFF)

PFF offers new teaching, mentoring, and learning possibilities, which give postdoctoral scholars, Ph.D. students, and master's students further credentialing for a competitive academic job market. In the fall of 2012, Dr. Bender introduced broader impacts activities to PFF students. Dr. Rover participated on a faculty panel and highlighted broader impacts activities in the spring of 2013.

Center for the Integration of Research, Teaching, and Learning (CIRTL)

SP@ISU collaborated with the ISU CIRTL project to cross promote activities that support graduate student and postdoctoral future faculty success.

Iowa EPSCoR

Iowa was recently awarded an NSF EPSCoR grant. Co-Director Dr. Rajan is a part of the SP@ISU team and ISU's Associate Vice President for Research. Iowa EPSCoR is helping to build the infrastructure to support SP@ISU's goal to increase the efficiency and effectiveness of ISU programs that support broader impacts activities and to provide the infrastructure to disseminate best practices beyond ISU.

Drs. Rover and Bowen are actively involved in Iowa EPSCoR's broader impacts activities and participated in a number of events and meetings during the year to both gain information that may be useful to SP@ISU and to disseminate our practices and resources to other Iowa institutions. Sixteen EPSCoR faculty have been involved in SP@ISU activities to date.

INSPIRE-LSAMP

The IINSPIRE-LSAMP Program is developing a model for Midwest colleges and universities to attract the states' growing underrepresented minority population into STEM fields and to attract students from other regions to STEM education. Dr. Rover serves as the Alliance Director for IINSPIRE-LSAMP and promotes SP@ISU practices, especially those involving broadening participation, to other alliance institutions. SP@ISU and IINSPIRE-LSAMP have assisted each other in promoting various professional development events and 27 faculty and staff from IINSPIRE-LSAMP alliance institutions have participated in SP@ISU activities.

NSF Engineering Research Center for Biorenewable Chemicals (CBiRC)

As an NSF Engineering Research Center, CBiRC promises to significantly influence research and broader impacts at Iowa State and with its many partners. CBiRC provides educational programs that attract a diverse set of students into the engineering field and produces a cadre of globally competitive college graduates capable of designing integrated chemical/biological processing systems. CBiRC leaders and faculty are actively involved with SP@ISU on the Advisory Council, as program partners, and as workshop speakers and participants.

Science Communication @ ISU (SciComm@ISU)

SciComm@ISU consists of a team of social science and humanities faculty who share a research interest on how science can contribute to policy controversies. They support scientists and engineers who want to become more effective public communicators by deepening their understanding of the roles expert knowledge can play in democratic decision-making.

Representatives from SciComm@ISU serve on the Advisory Council and as Faculty Leaders. SP@ISU was a co-sponsor for the SciComm@ISU "Rhetoric and Science: Two Cultures or One?" and "Ethical Issues in Science Communication: A Theory-Based Approach" workshops this year. SP@ISU's partnership with SciComm@ISU and their events helps increase awareness about broader impacts and create partnerships with non-STEM faculty.

III.C.3. Website Resources

SP@ISU's website contains a database of programs on campus that work with broader impacts initiatives and provides a compilation of literature and resources related to broader impacts. Information is categorized according to areas of broader impacts, and for programs, contact information is provided. These databases continue to grow and be updated as the project moves forward. The SP@ISU website is accessible from the alphabetical index on ISU's homepage and as a quick link from the Office of the Vice President for Research and Economic Development homepage.

III.D. Planning and Evaluation

The external evaluator, internal assessment coordinator, and partnerships with campus evaluation programs assist SP@ISU in planning, implementing and evaluating program activities.

III.D.1. External Evaluator Site Visit

SP@ISU External Evaluator, Dr. Mariko Chang, visited ISU Nov. 28-30, 2012, to conduct interviews with key stakeholders and participate in SP@ISU's "Broader Impacts Evaluation Workshop." Evaluation methods included interviews, the analysis of workshop survey data, documentation of program activities, and internal evaluation documents. Dr. Chang submitted a report on her findings to the SP@ISU team in January 2013. The SP@ISU team has reviewed the recommendations and organized program activities around them.

III.D.2. Program Partnering Survey

SP@ISU conducted a survey to better understand how campus programs interact with faculty collaborators. We were aware of which faculty collaborated on NSF proposals and the programs on campus that partner with faculty, but were not aware of which faculty are partnering with which programs. The survey asked 31 campus programs to list faculty with whom their program had collaborated within the past five years. Understanding the connections among programs and faculty will allow for further Social Network Analysis investigation.

III.D.3. NSF Grant Application Success

Data from the Office of Sponsored Programs Administration detailing submitted NSF applications by ISU faculty from 2008 to 2010 were analyzed to examine the overall, per grant, and annual trend of total number of NSF applications, total NSF application success rate, and total NSF grant amount awarded. Data were analyzed for faculty who submitted NSF proposals as either PI or co-PI, and PI only. These data provide a context for gauging proposal and award activity on campus and serve as baseline data for SP@ISU evaluation.

III.D.4. Broader Impacts Text Analysis

SP@ISU is working with Dr. Elena Cotos, a linguistics researcher at ISU, to develop resources for faculty to assist in writing broader impacts statements for NSF proposals. SP@ISU facilitated the collection of 105 funded and unfunded NSF proposals from ISU faculty. Dr. Cotos uses computational linguistics techniques to analyze the quality of the writing and integration of broader impacts plans within proposals and was able to analyze and code 82 of the proposals.

III.E. Dissemination

III.E.1. Broader Impacts Infrastructure Summit

Members of the SP@ISU team attended the Broader Impacts Infrastructure Summit at the University of Missouri, April 24-26, 2013. The goals of the summit were to: bring broader impacts infrastructure professionals together to share best practices, ideas, and challenges; set the course for the future of broader impacts infrastructure support; and provide NSF with feedback regarding the realities of supporting broader impacts at the institutional and PI levels. Team members who attended were Dr. Quisenberry, Dr. Rover, and Ms. Heitmann; they submitted a poster for the poster session and presented a session titled, “Documenting Broader Impacts.”

IV. Findings

IV.A. Recommendations from Key Stakeholders

IV.A.1. Advisory Council

SP@ISU leadership met with the Advisory Council in December 2012 and May 2013. In December, the council discussed and provided input about topics including: SP@ISU leadership and personnel changes, collaboration efforts with Iowa EPSCoR, the Broader Impacts Evaluation Workshop, external evaluator visit, and preparation for a potential mid-point review. The council recommended that SP@ISU engage departments and chairs, including departments with BI expertise that might be useful to researchers. In May, the council discussed the external evaluator recommendations and reviewed year 3 activities. There was extensive discussion on SP@ISU’s involvement in the Broader Impacts Infrastructure Summit at the University of Missouri and ways SP@ISU can be institutionalized after grant funding ends. The council members want to stay actively involved in efforts to gain recognition for faculty working in broader impacts activities. The minutes from these meetings are used when implementing and planning SP@ISU activities.

IV.A.2. Equity Advisors

Equity Advisors (EAs) meet throughout the year to discuss activities and common challenges within their respective colleges. EAs agree that one of the main opportunities they have to influence the broader impacts culture at ISU is through their role in faculty mentor training. EAs promote SP@ISU resources within their colleges as they make presentations. The EAs suggested conducting individual meetings with the Associate Deans of Research in each college to help identify needs and to promote discussion of faculty recognition for broader impacts activities.

IV.A.3. Executive Steering Committee

The Executive Steering Committee, chaired by the Senior Vice President and Provost, met in March 2013. During this meeting program leadership updated Provost Wickert on program activities and objectives. Provost Wickert provided his feedback and recommendations. Topics discussed included: assistance to faculty and colleges to facilitate their needs, project evaluation measures and resources, faculty recognition associated with broader impacts work, and national involvement and leadership opportunity for ISU. Provost Wickert agreed that ISU has a unique opportunity to be a leader nationally on modeling institutional support for faculty doing work in broader impacts areas. He also affirmed the importance of outcomes measures associated with faculty broader impact activities, as it pertains to promotion and tenure.

IV.B. Workshop Series Findings

IV.B.1. Broader Impacts Evaluation Workshop

Ninety-eight people attended at least one of the workshop sessions. Almost half (49%) of the attendees were ISU faculty, mostly at the rank of Assistant Professor. The remaining attendees were comprised of staff members (22%), graduate students and postdoctoral scholars (14% combined), administration (2%), and attendees from other institutions (11%). The Colleges of Liberal Arts and Sciences, Engineering, and Agriculture and Life Sciences were most heavily represented.

Evaluation surveys were distributed near the close of each session and participants were encouraged to complete the surveys. In terms of the larger goal, to help facilitate and enhance the knowledge base required for developing well-researched broader impacts plans as part of faculty research enterprises, workshop participants overwhelmingly agreed the keynote presentations were useful and each session increased their understanding of evaluation methods, and knowledge of where to get broader impacts evaluation information and resources. The majority of participants found the panel topics and discussion useful. One theme that emerged in the open-ended questions on the evaluation form was that participants would like to see more specific examples of broader impacts sections from funded proposals.

IV.C. Planning and Evaluation Findings

IV.C.1 External Evaluation Report Recommendations

Recommendations from the year three external evaluation report, received January 2013, are excerpted below. This report is used for reflection on year three activities and planning for year four.

The recommendations are intended to build on the accomplishments to date, support the continued implementation of program activities, and ensure that effective metrics are in place to measure the impact of program activities. Key recommendations include:

1. Continue to enhance the visibility and accessibility of SP@ISU and its resources.
 - Awareness of SP@ISU is increasing, but faculty felt that the program could be even more visible and reported that many faculty were unaware of the helpful resources that SP@ISU provides. Interviewees recommended that SP@ISU should make brief presentations at departmental faculty meetings, emphasizing the main resources available to help faculty (even if they made an initial presentation earlier).
 - Restructure the website, making it easier to find key resources and add more concrete examples (templates, examples of broader impacts sections from successful grants, etc.).
 - Track website traffic to better understand which resources are most frequently used and understand how users are navigating the site and accessing information. This data can be used to help restructure the website and make it more user friendly.
 - Continue to target highly-connected faculty (for example through social network analysis), inviting them to speak at events and informing them of resources available through SP@ISU.
 - Continue to work with EPSCoR (and other partners) to promote overlapping goals and disseminate best practices.
2. Continue to collaborate with other efforts to evaluate faculty broader impacts activities and reward faculty for engaging in broader impacts work.
 - Meet with Dr. Dawn Bratsch-Prince, Associate Provost for Academic Personnel, to discuss how task force efforts to review ways to encourage faculty to engage in and then receive credit for outreach and extension work can be tied to SP@ISU's efforts.
 - Continue to collaborate with Dr. Freeman and the efforts of CELT to advance the discussion of valuing the scholarship of teaching and learning in the tenure and promotion process.
 - Consider developing best practices for ways departments can include broader impacts activities in the position responsibility statement and the promotion and tenure process and assist the support of the provost's office in building institutional support for these best practices.
3. Continue to explore social network analyses
 - Continue to identify highly-connected faculty and target them for information about SP@ISU's resources and invite them to participate in SP@ISU events.
 - Proceed with previously proposed analyses to measure changes in collaboration over time (increase in faculty connections with broader impacts partners, increased involvement of non-STEM faculty as broader impacts experts, etc.).
4. Document the contributions of Equity Advisors and Faculty Leaders.
 - Discuss ways of documenting the impact of the Equity Advisors and Faculty Leaders. One possibility would be to ask them to provide a brief verbal report to SP@ISU each semester about key activities and perceived areas of impact.

5. Be proactive with the upcoming retirement of Dr. Sharron Quisenberry
 - Utilize the resources available to Dr. Quisenberry before her retirement to continue to garner institutional support and visibility for SP@ISU.
 - Give careful consideration of the selection of a new PI to guide the remaining institutional transformation.

6. Learn more about how faculty utilize SP@ISU resources, including how they choose broader impacts partners to help increase connections between faculty and partner programs.
 - Data derived from the partner survey (in progress) should be useful for learning which faculty are involved with which programs and can be used as a baseline measure. The data may also suggest useful avenues for additional queries (for example targeted follow-up interviews) to better understand why faculty choose to partner with programs.
 - Discuss the feasibility and value of collecting additional data from faculty who have recently submitted NSF grant proposals to learn whether they used information or SP@ISU resources in the crafting of their proposals, including how they identified broader impacts partners.

7. Continue to provide opportunities for partner programs to interact with each other and with faculty.
 - Partners are eager to develop more connections with faculty interested in partnering on broader impacts activities. SP@ISU should enlist suggestions from partners and the Advisory Council as to how to facilitate connections. Collecting additional data (above) may also yield new suggestions.

Summative statement by external evaluator: In conclusion, SP@ISU has made important progress towards its goals during the first two years of the grant, most notably the goal of creating a clearinghouse of programs, resources, information, and a network of people to assist and guide the development of a broader impact culture at ISU (Goal #2) and the goal of facilitating and enhancing faculty knowledge-base for developing well-researched broader impact plans as part of their research enterprise (Goal #3).

Efforts in this third year should focus on continuing to enhance the program's visibility and accessibility of resources, strengthening collaborations with those working toward overlapping goals, and facilitating the institutionalization of practices and procedures that support a culture at ISU that values and rewards broader impacts activities. Moreover, SP@ISU is supporting the development of some interesting new tools and methods; disseminating these findings, tools, and best practices can help position ISU as a national leader at a time when attention to broader impacts is growing across institutions in the United States.

IV.C.2. Program Partnering Survey Findings

At the time of this report, 7 of 31 programs surveyed had responded, listing a total of 317 faculty collaborators, including 277 distinct collaborators, 35 collaborators mentioned by two programs, and 7 collaborators mentioned by more than two programs. The seven programs that responded to the survey demonstrated different patterns across the 5 years of collaboration (2008-2012). Overall, faculty interaction either increased in the last 2 years or remained somewhat consistent over the 5 years. One program reduced its collaborative activities with faculty in the last few years, which is likely due to changes in program leadership. It is interesting to note that faculty from different institutions in the state of Iowa were listed as collaborators. Responses from the remaining programs will be sought to develop a more complete picture of faculty involvement with partner programs.

IV.C.3. NSF Grant Application Success

Data analysis indicated that faculty who had higher success during the 2008-2010 baseline period were more likely to participate in SP@ISU activities. A comparison of SP@ISU faculty with non-SP@ISU faculty resulted in significant differences for the following measures: number of funded NSF grants per year, number of funded NSF grants as PI per year, overall annual NSF success rate, annual NSF success rate as PI, total funding per year, PI funding per year, total funding per NSF application, and total funding per NSF application as PI. Analysis of 2011-2012 data is in progress. Because SP@ISU began in June 2010, the baseline data preceded SP@ISU. SP@ISU will review more recent data and continue tracking the data in relation to SP@ISU participation.

IV.C.4. Broader Impacts Text (BIT) Analysis Findings

The BIT Analysis project aims at developing materials to assist faculty writing Broader Impacts components of proposals. For this purpose, BI sections in NSF grant proposals were analyzed using linguistic techniques. The analysis revealed a rhetorical structure of three major communicative goals that are achieved with sixteen strategies. The framework was then validated through manual annotation of 112 BI texts. Further, qualitative analysis of the annotated texts allowed to comprehensively define the functional meaning of the discourse units employed in BI writing, describe their content and linguistic realizations, and identify surface level writing problems that affect the effectiveness of BI claims. In addition, comparative quantitative analysis of annotated BIs from successful and unsuccessful proposals revealed issues related to strategy use that need to be addressed in training. All these insights, as well as a selection of representative examples, have been translated to materials for the BI writing workshop, which will be offered to ISU faculty in June 2013.

V. Training and Professional Development

Faculty, postdoctoral scholars, graduate students, and staff have been involved in activities (e.g., Broader Impacts Evaluation Workshop; Iowa EPSCoR broader impacts activities; New Faculty Orientation and Research Workshops) that enhance their knowledge of broader impacts, evaluation of broader impacts, and resources that are available on campus. The bottom up-top down approach (e.g., multiple meetings with department chairs, college associate deans for research, college grant coordinators, Equity Advisors, Faculty Leaders, and faculty) that has been used to create awareness of broader impacts has resulted in networking and information sharing campus-wide. In addition, this approach has initiated institutional integration across grants and encouraged partnering of non-STEM and STEM faculty on proposals.

Institutional integration and infrastructure for broader impacts has emerged as a national issue relevant to educators, researchers, and university administrators across the country. SP@ISU team members provided and received training on infrastructure support of broader impacts at the Broader Impacts Infrastructure Summit at the University of Missouri, April 24-26, 2013. The goals of the summit were to: bring broader impacts infrastructure professionals together to share best practices, ideas, and challenges; set the course for the future of broader impacts infrastructure support; and provide NSF with feedback regarding the realities of supporting broader impacts at the institutional and PI levels. The summit was a springboard for a national alliance of universities. The SP@ISU program is prepared to contribute to this alliance.

VI. Dissemination to Communities of Interest

Given the nature of broader impacts, SP@ISU activities extend to faculty, staff, and programs outside of STEM disciplines. In many cases, non-STEM areas and professionals are critical to the success of broader impacts work. One of the planned outcomes for SP@ISU is to increase the partnering between STEM and non-STEM faculty on NSF proposals.

One of the Faculty Leaders, Jean Goodwin, is an English professor who specializes in science communication (<http://scicomisu.wordpress.com>). As part of her efforts, she organized a meeting of humanities faculty who are interested in partnering with faculty doing funded STEM research. This will lead to additional meetings and potentially a

database of non-STEM faculty with interest in STEM research that will be accessible on SP@ISU's website.

The meetings with department chairs, as suggested by the college associate deans for research and the SP@ISU advisory council, included chairs from non-STEM disciplines. They expressed great interest in encouraging their faculty to collaborate on interdisciplinary research to address broader impacts in concert with STEM faculty.

Although the focus of SP@ISU is on NSF's broader impacts criterion and integration across NSF programs, the information shared and resources developed by SP@ISU are proving to be relevant to a spectrum of researchers. Researchers whose primary funding is from other federal and state agencies that also must demonstrate public/societal benefit and accountability, such as the USDA or Iowa DOT, are participating in SP@ISU activities.

The collaboration of SP@ISU with Iowa EPSCoR has led to dissemination of information to the other public state universities in Iowa.

VII. Plans for Year 4

SP@ISU is on track to accomplish all project goals that are in line with the logic model and the external evaluator recommendations. A sustainable broader impacts culture at Iowa State will continue to be developed through internal and external networks. The internal campus-wide (STEM and non-STEM collaborations) network uses a bottom up (faculty, postdoctoral scholars, graduate student, and staff driven) and top down (university provost, vice presidents, deans, associate deans, and department chairs) approach to develop a shared understanding and commitment to broader impacts. The national external network is driven by leading universities interested in developing a broader impacts infrastructure community. SP@ISU will continue to facilitate BI networking on campus, improve documentation and communication of BI activities, promote BI evaluation, and measure success in achieving SP@ISU goals. In addition, SP@ISU will participate nationally and provide leadership to the broader impacts infrastructure community.

VIII. Products

Mariko Chang (2013). *External Evaluation – SP@ISU: Strengthening the Professoriate at Iowa State University: A Campus Network to Enable Strong Science and Diverse Communities.*

Sharron Quisenberry, Bonnie Bowen, Diane Rover, Megan Heitmann (4/25/13). Broader Impacts Infrastructure Summit. *Strengthening the Professoriate @ Iowa State University poster.* University of Missouri – Columbia.

Sharron Quisenberry, Diane Rover, Megan Heitmann (4/25/13). Broader Impacts Infrastructure Summit. *Documenting Broader Impacts.* University of Missouri – Columbia

Strengthening the Professoriate at Iowa State University program (2012). *SP@ISU Brochure*

Strengthening the Professoriate at Iowa State University program (4/11/13). *SP@ISU Newsletter.* The SP@ISU newsletter was developed to share information with program participants and the university community. Newsletters highlight broader impacts resources, events, and opportunities for the ISU community.

Strengthening the Professoriate at Iowa State University website

<http://www.spisu.iastate.edu>

SP@ISU's website contains a database of programs on campus that work with broader impacts initiatives and provides a compilation of literature and resources related to broader impacts. Information is categorized according to areas of broader impacts, and for programs, contact information is provided.

IX. Impacts

IX.A. Impact on STEM Disciplines

SP@ISU has provided networking opportunities for NSF-funded programs via workshops, the development of a website and newsletter, and through planned activities and events to increase awareness and the potential for collaboration among STEM programs. This has contributed to greater participation of STEM faculty, postdoctoral scholars, and graduate students in current ISU programs as they develop broader impact projects related to their research activities.

IX.B. Impact on Other Disciplines

SP@ISU-sponsored activities, events, and resource materials are available to the university-wide community. Faculty, postdoctoral scholars and graduate students beyond the STEM disciplines (e.g. Business, Design, Education, English, Human Sciences, and Psychology) have participated in activities and events and used resources provided by SP@ISU.

IX.C. Impact on Human Resources Development

Faculty development is an emphasis of SP@ISU. Workshops, fairs, webinars, and event co-sponsorship are advancing the knowledge, skills and abilities of faculty, postdoctoral scholars, and graduate students. While brochures, newsletters, and the website are providing information about available resources, programs and expertise.

A network of administrators and faculty from ISU STEM colleges participate in the SP@ISU Advisory Council to inform and advise the project. This enhances visibility and increases efficiency and effectiveness of ISU programs by assisting in promoting program activities and faculty awareness and participation.

Equity Advisors in the ISU STEM colleges and Faculty Leaders establish relationships with faculty from across the campus, create a network of experts that assist and guide in the development of a broader impacts culture at ISU, and employ innovative techniques to assist faculty in best practices associated with the development and implementation of broader impacts.

SP@ISU is contributing to campus discussions about recognizing broader impacts efforts in the promotion and tenure (P&T) process. There are continuing conversations at all levels of the university on the importance of a broader impacts culture. It is important to

promote greater awareness that public funding is making a difference at the community and statewide levels through social, environmental, and economic impacts.

IX.D. Impact on Institutional Resources that Form Infrastructure

SP@ISU sponsored a workshop on evaluation of broader impacts. The presentations and panel discussions provided faculty, postdoctoral scholars, students, and staff who attended with knowledge and perspectives on evaluation that they will be able to use in their research proposals and in their ongoing research projects. Project evaluation is often neglected and is not well understood by STEM faculty. SP@ISU's impact on the institution's approach to evaluation is an important contribution to the university.

IX.E. Impact on Information Resources that Form Infrastructure

A database of campus programs and broader impact resources has been placed on an actively managed website to assist faculty in developing broader impacts and identifying potential areas and individuals for collaboration. Resources have been developed (e.g., brochures) that provide information on NSF's new merit review criteria, requirements for proposals, how broader impacts will be reviewed, and resources and links. These materials are provided online but have also been distributed via meetings with faculty groups in colleges and through university college and department administration. A new newsletter has been initiated that provides resources, events, and opportunities for faculty to become and stay engaged.

IX.F. Impact on Society beyond Science and Technology

Providing resources, a collaborative model of campus-wide interaction, and a plan that embraces a bottom-up (faculty) and top-down (university, college, and department administration) strategy will enhance our institutional capabilities of establishing and sustaining a broader impacts culture that will impact society beyond science and technology. The effective transfer of knowledge from a university to society will occur if there is an institutional commitment to broader impacts culture and the development of an integrated institutional infrastructure for broader impacts. SP@ISU is laying the foundation for this culture and infrastructure.