Annual Report – Year Two

Strengthening the Professoriate @ Iowa State University

Report Period: 1 July 2011 – 30 June 2012

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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 research associates 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 second 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 multiple workshops as a means to provide information to faculty and facilitate networking among faculty and staff. We conducted a number of meetings and events across campus to increase the visibility of SP@ISU and related programs as well as awareness of the broader impacts criterion.

SP@ISU is also pursuing significant work in the area of evaluation. We have applied techniques such as aggregated assessment, social network analysis, summative content analysis, and linguistic analysis to guide and support program activities. An initiative to provide survey-based evaluation services to undergraduate research programs across campus potentially serves as a model and pilot for aggregated assessment that is more efficient and statistically robust for small programs. The SP@ISU project is using social network analysis techniques to identify grantsmanship relationships and strengths among faculty. 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. As a first step to improving the ability of faculty to write effective broader impacts plans, SP@ISU is using several techniques to describe components of a successful plan. A preliminary study used summative content analysis of BI language in abstracts of ISU proposals that received NSF funding. A planned study will use computational linguistics techniques to analyze the quality of the writing and integration of broader impacts plans within proposals. This work will result in new resources for faculty to assist in the writing of grant proposals.

Utilizing recommendations from the External Evaluation report and key stakeholders the focus of year 2 of the project was program visibility and networking, faculty involvement and information sharing, and planning and evaluation. While we continue work in these areas planning for year 3 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  
Executive Director – ISU ADVANCE Program  
Worked more than 160 hours  
Dr. Bowen participated in all program planning and meetings. Being in the position of 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. She serves as the chairperson for the Executive Steering Committee and plays an active role in recognizing the scholarship of broader impacts.
Sandra Norvell, PI Team Member
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 all SP@ISU PI 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.

Chitra Rajan, PI Team Member
Associate Vice President for Research
Worked less than 160 hours
Dr. Rajan participates in all SP@ISU PI Team 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.

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 second year of SP@ISU include:

  Katherine Bruna, Equity Advisor in the College of Human Sciences
  Associate Professor of Curriculum and Instruction
  Worked less than 160 hours

  Kristen Constant, Equity Advisor in the College of Engineering
  Professor of Materials Science and Engineering
  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
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.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. Advisory Council Members
- Mark Ackermann, Interim Associate Dean, College of Veterinary Medicine
- 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, Interim Associate Dean, College of Liberal Arts and Sciences
- Jay Staker, Extension Youth Development Specialist, 4-H Youth Development
- Karen Zunkel, Director of the Program for Women in Science and Engineering
II.B.3. SP@ISU Workshop Presenters

**Achieving Success in Broader Impacts**
- Sharron Quisenberry, Vice President for Research and Economic Development
- Drena Dobbs, Professor of Genetics, Development, and Cell Biology
- Jim McCalley, Harpole Professor of Electrical and Computer Engineering
- Basil Nikolau, Professor of Biochemistry, Biophysics and Molecular Biology

**Campus Programs and Broader Impacts Resource Fair**
- Liz Addis, Postdoc Research Associate, Howard Hughes Medical Institute
- Leo Aguilera, Graduate Assistant, Electrical and Computer Engineering; represented IT-Adventures
- Emily Alexander, Student, represented Toying with Technology
- Mandi Anderson, Research and Evaluation Scientist, Research Institute for Studies in Education
- Holly Bignall, Extension Program Specialist, Youth and 4-H
- Karen Bovenmyer, Program Coordinator, Center for Excellence in Learning and Teaching; represented Preparing Future Faculty and the Center for the Integration of Research, Teaching and Learning
- Bonnie Bowen, Executive Director, ISU ADVANCE
- Heather Conley, Chief Operating Officer, Iowa NSF EPSCoR
- Kristen Constant, Professor of Materials Science and Engineering; ISU ADVANCE Equity Advisor
- Aurelio Curbelo, Director of Ag Multicultural Programs
- Leslie Hogben, Professor of Mathematics; Director of Diversity for the Mathematics Department
- Michael Dahlstrom, Assistant Professor, Greenlee School of Journalism and Communication; represented Science Communication at ISU
- Adrienne Fight, Student, represented Summer Program for Enhancing Engineering Development
- Katie Freking, Student, represented Toying with Technology
- Larry Genalo, Professor of Materials Science and Engineering; represented Toying with Technology
- Kim Glenn, Program Coordinator, Engineering Precollege Programs
- Jean Goodwin, Professor of English; represented Science Communication at ISU
- Tom Greenbowe, Professor of Chemistry, and Professor of Curriculum and Instruction; represented Howard Hughes Medical Institute project
- Thelma Harding, Program Coordinator, Graduate College; Director, Ronald E. McNair Program
- Carol Heaverlo, Outreach Program Coordinator, Program for Women in Science and Engineering
- Megan Heitmann, Program Assistant, SP@ISU
• Doug Jacobson, Professor of Electrical and Computer Engineering; represented IT-Adventures
• Steve Karsjen, Program Manager, Public Affairs, Ames Lab
• Mari Kemis, Assistant Director, Research Institute for Studies in Education
• Susan Lamont, Distinguished Professor of Animal Science; ISU ADVANCE Equity Advisor
• Lisa Larson, Professor of Psychology; ISU ADVANCE Equity Advisor
• Adah Leshem, Pre-College Education Director, NSF Engineering Research Center for Biorenewable Chemicals; also represented Plant Genomics Education Outreach
• Yvette McCulley, Science Consultant, Iowa Department of Education; State Coordinator, Real World Design Challenge
• Tracie Miller, Program Assistant, Center for Excellence in Science, Mathematics and Engineering Education
• Danielle Mitchell, Program Assistant, IINSPIRE-LSAMP Alliance
• Craig Ogilvie, Assistant Dean, Graduate College
• Jo Anne Powell-Coffman, Interim Department Chair of Genetics, Development, and Cell Biology; represented Howard Hughes Medical Institute Project
• Jacqueline Pryor, Postdoc Associate, Graduate College; Assistant Director, Ronald E. McNair Program
• Chitra Rajan, Associate Vice President for Research; represented Iowa NSF EPSCoR
• Stacy Renfro, Program Assistant, Center for Excellence in Science, Mathematics and Engineering Education
• Derek Robison, Student, represented Toying with Technology
• Diane Rover, Professor of Computer and Electrical Engineering; Director, SP@ISU; Director, IINSPIRE-LSAMP
• Andrew Ryder, Research and Evaluation Scientist, Research Institute for Studies in Education
• Frankie Santos Laanan, Professor of Curriculum and Instruction; Director, Center for Excellence in Science, Mathematics and Engineering Education
• Judith Spitzli, Mathematics Consultant, Iowa Department of Education
• Jay Staker, Program Director, Extension-Science, Engineering and Technology; Associate Director of Education, Iowa Space Grant Consortium
• Susan Yager, Associate Professor of English; Faculty Director, Honors Program

II.B.4. 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
• 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
• 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
• NSF Engineering Research Center for Biorenewable Chemicals (CBiRC)
• Office of Community College Research and Policy (OCCRIP)
• Plant Genomics Education Outreach
• Preparing Future Faculty (PFF)
• Program for Women in Science and Engineering (PWSE)
• 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.
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 Executive Vice President and Provost and the Office of the Vice President for Research and Economic Development. As shown in Figure 1, 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.

**Figure 1.** A schematic representation of SP@ISU as a gathering place to connect with external resources through NSF-funded and other campus programs with a goal of fostering and maintaining a broader impacts culture.

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 2**

The key activities for year 2 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 of the first year, the second year emphasized marketing to improve program visibility and increase the participation of tenured faculty. Many of the activities that improved SP@ISU visibility on campus also created or strengthened networks among key groups of people involved in our program activities.

**III.B.1. Advisory Council Reorganization**

During year 2 we reorganized the Advisory Council to represent specific goals of the project in relation to developing a broader impacts culture on campus. The Advisory Council now has 12 members, comprised of the associate deans of research from the five STEM colleges as well as faculty and staff having valuable experience and perspectives to inform and advise the project. The names and titles of Advisory Council members are listed in section II.B.2 above. The Council meets once a semester. Topics that were discussed at meetings during year 2 include: SP@ISU visibility on campus, faculty needs and interests, broader impacts activities in ISU proposals, faculty advancement and broader impacts work, current project activities and improvements, and the addition of faculty leaders for future years. In addition to advising on SP@ISU activities the Advisory Council members assist in promoting program activities and involving SP@ISU in activities within their own colleges and programs when appropriate.

**III.B.2. Presentations to College Cabinets and Key Campus Groups**

**College Cabinets**

Working through the Associate Deans of Research, Diane Rover and Megan Heitmann presented SP@ISU program objectives and activities to three of the five STEM College Cabinets during year 2. They presented to the College of Engineering, College of Agriculture and Life Sciences, and the College of Veterinary Medicine. The Cabinets consist of college leadership and department chairs. These presentations gave the key leadership of each college the opportunity to learn more about the goals of SP@ISU and discuss issues that specifically related to their college or departments. When SP@ISU then promoted its events in the spring, in addition to their normal promotional outlets, they also sent the information to the department chairs.
Grant Coordinators
SP@ISU presented their program at two different Grant Coordinator meetings during year 2. Diane Rover and Megan Heitmann presented at the College of Liberal Arts and Sciences Grant Coordinator meeting in January. Based on the positive feedback they received from this group and the value they saw in knowing about the resources SP@ISU offers, Megan Heitmann presented at a University Grant Coordinators meeting in May. Reaching out to this group was seen as helpful to the grant coordinators since they work with faculty in the development stages of new proposals.

ISU Postdoc Association (ISUPDA)
SP@ISU was asked to be a guest at an ISUPDA Cabinet meeting to discuss ways in which SP@ISU could assist postdocs in their professional development and effective ways to communicate with this group. Based on this productive meeting, Diane Rover, Michael Kessler, and Megan Heitmann participated in a panel at an ISUPDA General Meeting. Two issues that were of interest to the postdocs were 1) opportunities for current postdocs to participate in broader impacts programs and activities on campus while at ISU and 2) things to consider about incorporating broader impacts as postdocs begin to write their own grant proposals and develop their own research programs.

New Faculty Workshop: Introduction to Research Services
Every year the Office of the Vice President for Research and Economic Development conducts a workshop for new faculty to acclimate them to research services available at ISU. In the fall of 2011, SP@ISU provided information for the binder that is given to all new faculty and presented at this fall workshop.

Iowa EPSCoR Broader Impacts Planning Day
The Iowa EPSCoR project held its first Broader Impacts Planning Day on June 20, 2012, at the University of Northern Iowa. Chitra Rajan led the meeting as director of the FLARE Institute (http://iowaepscor.org/FLARE). Diane Rover is a member of the Diversity Team, one of three teams that work with research platforms to implement broader impacts for the project. The other two teams are Workforce Development and Faculty Development. SP@ISU will share best practices with Iowa EPSCoR institutions and partners.

III.B.3. Equity Advisors and Faculty Leaders

College Equity Advisors
An innovation central to the ISU ADVANCE program that is continuing through SP@ISU involves college Equity Advisors (EAs). The EAs guide the development of a broader impacts culture among faculty, postdoctoral scholars, and students. In the current ISU ADVANCE Program (2006-2012), the EAs play a central role in implementing the goals of the ISU ADVANCE Program and are the primary leaders of college-level efforts to transform STEM fields for women faculty and faculty of color. The EAs work with the departments in their colleges to bring about changes in culture, structures, and practices. The EAs provide leadership in the development and implementation of ADVANCE workshops and networking events in colleges and campus-wide. As part of
the SP@ISU program, Equity Advisors continue their ISU ADVANCE activities and also lead activities to enhance broader impacts. This relationship is illustrated in Figure 2 below.

While three colleges (Liberal Arts and Sciences, Agriculture and Life Science, and Engineering) had Equity Advisors under the ADVANCE program, the other two STEM colleges (Veterinary Medicine and Human Sciences) are also funding Equity Advisors as a part of SP@ISU. The College of Human Sciences appointed a faculty member as their Equity Advisor in 2011 and the College of Veterinary Medicine is in the process of selecting an Equity Advisor.

Establishment of Faculty Leaders
Also shown in Figure 2, 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. The faculty leaders minimally work with SP@ISU for 2 years to advance an initiative and build community around that initiative. The three current FLs are faculty who already
have shown a serious interest in the goals of SP@ISU and were involved with project activities during year 1. Mike Kessler, Associate Professor of Materials Science and Engineering, focuses on NSF CAREER initiatives and early career faculty development, the integration of research and teaching, and faculty excellence in broader impacts. Holly Bender, Associate Director for the Center for Excellence in Learning and Teaching, is the Director of Preparing Future Faculty and now also leads ISU’s involvement in the University of Wisconsin’s Center for the Integration of Research, Teaching, and Learning (CIRTL) network; she focuses on graduate student and postdoc training as well as broadening participation of students in STEM. This work leverages our on-campus resources in this area and also gives us important connections in the CIRTL network for SP@ISU innovations (such as the REU evaluation). Jean Goodwin, Associate Professor of English and a faculty member involved in SciComm@ISU, focuses on the broad dissemination of research including communicating the benefit to society. The FLs actively promoted aspects of broader impacts that SP@ISU emphasized in year 2. As role models, the FLs also cultivate a grassroots approach within SP@ISU to achieve greater faculty awareness of and involvement with established and/or research-based broader impacts activities.

III. C. Faculty Involvement and Information Sharing

Increasing faculty involvement, especially from tenured faculty, will assist the SP@ISU program in facilitating a university culture shift in valuing broader impacts activities. Through this added involvement it is also imperative to gather information from and work in conjunction with other campus programs so this information may be shared efficiently and effectively with faculty. Through these activities we have facilitated interactions among faculty members, among various programs, and between faculty and programs.

III. C.1. Workshop Series

During year 2 of our project, SP@ISU hosted two events to provide opportunities for faculty, post-docs, graduate students, and staff to learn more about broader impacts and resources on campus. Presentations, video and information from these events are available on the SP@ISU website. Workshop surveys were developed and disseminated; the results are in section IV.B.1. The presenters and their affiliations on campus are listed in section II.B.3 above.

Achieving Success in Broader Impacts (March 6, 2012)

SP@ISU hosted a lunchtime discussion featuring faculty members who have been successful in obtaining grant funding and who have strong areas of broader impacts. This was an opportunity for faculty who are currently working on or plan to submit proposals to learn from those who have been successful. Sharron Quisenberry, Vice President of Research and Economic Development and SP@ISU PI, provided opening remarks. Faculty Leader, Michael Kessler, moderated an interactive discussion. Three successful faculty highlighted their work. Short overviews of the faculty speakers are given below:
• **Drena Dobbs**, representing the College of Liberal Arts and Sciences, joined Iowa State University in 1987 and is a Professor of Genetics, Development, and Cell Biology. Her research focuses on the structure, function and dynamics of macromolecules, with an emphasis on regulatory protein-RNA interactions in disease. She shared some of her experiences with NSF broader impact activities gained through her roles as PI/Director of ISU’s NSF IGERT Training Program in Computational Molecular Biology and as co-PI for ISU’s NSF GK12 Training Program in Growing the Green Collar Workforce for the 21st Century. [http://www.gdcb.iastate.edu/faculty_and_research/bios/ddobbs.shtml](http://www.gdcb.iastate.edu/faculty_and_research/bios/ddobbs.shtml)

• **James McCalley**, representing the College of Engineering, joined ISU in 1992 and is the Harpole Professor of Electrical and Computer Engineering. He is a registered professional engineer in California and a fellow of the Institute of Electrical and Electronic Engineers (IEEE). His research includes electric power system operation, risk-based decision and control, power system dynamics, long-term energy system planning, and wind energy integration. In his 20-year academic career, he has served as PI or co-PI on 14 NSF projects, providing a good experience base in developing effective broader impacts for NSF proposals and implementing them once funded. [http://home.eng.iastate.edu/~jdm/index.htm](http://home.eng.iastate.edu/~jdm/index.htm)

• **Basil Nikolau**, representing the College of Agriculture and Live Sciences, has taught and conducted research since 1988 at ISU and is the Frances M. Craig Professor of Biochemistry. Research in the Nikolau Group is focused on the comprehensive understanding of metabolism. The group is particularly focused on the discovery and characterization of novel metabolic processes, and the associated biocatalysts, utilizing expanding genomics resources as the starting point for these endeavors. Among his broader impact activities, Dr. Nikolau partners with the NSF Engineering Research Center for Biorenewable Chemicals (CBiRC) to offer a summer Research Experience for Undergraduates (REU) Program and a Research Experience for Teachers (RET) Program. [http://www.public.iastate.edu/~nikolau/index.shtml](http://www.public.iastate.edu/~nikolau/index.shtml)

**Table 1. Information regarding participants of the Achieving Success in Broader Impacts Workshop**

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<th>Total Participants</th>
<th>62</th>
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<td>Administration</td>
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<tr>
<td>Professor</td>
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<tr>
<td>Associate Professor</td>
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<tr>
<td>Assistant Professor</td>
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<tr>
<td>Postdoc Associate</td>
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<tr>
<td>Graduate Student</td>
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<tr>
<td>Staff Member</td>
<td>14</td>
</tr>
<tr>
<td><strong>Participants in Non-STEM</strong></td>
<td>10</td>
</tr>
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</table>
Campus Programs and Broader Impacts Resource Fair (April 4, 2012)
SP@ISU, collaborated with the Center for Excellence in Science, Mathematics, and Engineering Education (CESMEE), to host a “Spotlight on STEM Education” event during spring 2012. SP@ISU organized a Campus Programs and Broader Impacts Resource Fair that was followed by CESMEE’s STEM Education Spring Seminar.

During the Campus Programs and Broader Impacts Resource Fair, campus programs and other potential broader impacts partners were available to consult and discuss options for collaboration with faculty in assisting with their broader impacts plans. Thirty-two programs represented by forty-two faculty and staff were available to speak with attendees.

Dr. Timothy Scott, Associate Dean for Undergraduate Programs in the College of Science and Associate Professor of Science Education Policy at Texas A&M University, College Station, was the inaugural speaker at the STEM Education Spring Seminar presented by CESMEE. Dr. Scott, who also serves as co-director of the Center for Mathematics and Science Education at Texas A&M, gave a presentation about his experience with STEM education initiatives.

<table>
<thead>
<tr>
<th>Total Participants</th>
<th>20</th>
</tr>
</thead>
<tbody>
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<td>Participants by Rank</td>
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</tr>
<tr>
<td>Professor</td>
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</tr>
<tr>
<td>Associate Professor</td>
<td>1</td>
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<td>Assistant Professor</td>
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<td>Postdoc Associate</td>
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<td>Graduate Student</td>
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<td>Staff Member</td>
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<tr>
<td>Non-ISU Attendees</td>
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</table>

III.C.2. NSF TUES Webinar Facilitation
SP@ISU, along with CELT, CESMEE, and the College of Engineering, facilitated three NSF Transforming Undergraduate Education in STEM (TUES) Program webinars in March and April that were relevant and beneficial to faculty as well as our own program staff. These are online webinars conducted by NSF and a contractor, and universities participate by facilitating interactive sessions on campus.

Proposal Writing Strategies and Reviewer Feedback
The objective of this workshop was to help the participants develop a competitive proposal for a TUES project or other undergraduate STEM education projects. The workshop first presented the results from the analysis of reviewers’ responses in a recent survey conducted during TUES Type 1 panel meeting and identified the most common strengths and weaknesses of a proposal mentioned by the reviewers.
Following this, the workshop offered a systematic process for converting an idea into a competitive TUES project. The logical presentation of ideas and plans were presented along with the key components of a proposal.

**Project Evaluation Workshop**
The goal of this workshop session was to prepare faculty members to work with an evaluator to plan and implement an effective evaluation of an education research or development project. In pursuit of this goal, the session increased the participants' awareness of the role of goals and outcomes in the evaluation process, of the nature of the cognitive and affective outcomes, and of evaluation tools for monitoring these types of outcomes.

**Making an Impact: Building Sustainable, Transportable Projects**
The goal of this webinar was to help participants better understand faculty change processes to design education research and development projects with broad impact. A major emphasis in TUES is to transform the STEM education enterprise. In line with this agenda, which reflects other national STEM education agendas, this webinar moved beyond dissemination of educational interventions developed at one institution to a broader discussion of how to integrate sustainability and transportability principles into project design from the beginning. Specific topics included: (1) traditional dissemination approaches, (2) assumptions about faculty change, (3) models and theories underlying faculty instructional decisions, and (4) how to practically apply research on faculty change to design a transformative project.

**III.C.3. Partnerships and Event Co-Sponsorship with Other ISU Programs**

**Center for Excellence in Learning and Teaching (CELT)**
CELT’s mission is to support, promote, and enhance teaching effectiveness and student learning; encourage scholarship of teaching and learning; communicate the importance of teaching and learning to both internal and external audiences; and serve as a catalyst for learning-centered education. The components of CELT’s work include: Preparing Future Faculty (PFF), increased emphasis on scholarship of teaching and learning (SoTL), instructional design, and effective practice in using learning technologies.

SP@ISU partnered with CELT, the Office of the Executive Vice President and Provost, and the Computational Advisory Committee to offer the “Academic Writing for Graduate Students and New Faculty” seminar series encouraging research and grant writing excellence. Diane Rover served as a panelist during the “Grant Writing Sub-series” of this seminar.

To help expand career preparation for postdoctoral fellows, CELT teamed with the Graduate College, SP@ISU, and the Postdoctoral Association to offer additional opportunities for mentoring. CELT extended an invitation for postdoctoral associates to participate in the center’s Preparing Future Faculty and all general CELT programming.
The Associate Director of CELT and Director of PFF, Holly Bender, also serves as an SP@ISU Faculty Leader.

**Preparing Future Faculty (PFF)**
PFF supplements departmental graduate preparation by offering new teaching, mentoring, and learning possibilities, which give postdoctoral fellows, Ph.D. students, and master's students further credentialing for a competitive academic job market. During fall 2011, Dr. Bender introduced broader impacts activities to PFF students. During spring 2012, Dr. Rover participated on a faculty panel and highlighted broader impacts activities.

SP@ISU joined PFF in a proposal led by Dr. Bender to join an expansion of the NSF-funded Center for the Integration of Research, Teaching and Learning (CIRTL) network at the University of Wisconsin. The CIRTL mission is to "enhance excellence in undergraduate education through the development of a national faculty committed to implementing and advancing effective teaching practices for diverse learners as part of successful and varied professional careers." SP@ISU is collaborating with the ISU CIRTL project. ([http://archive.inside.iastate.edu/2011/1103/cirtl.php](http://archive.inside.iastate.edu/2011/1103/cirtl.php))

**Center for Excellence in Science, Mathematics, and Engineering Education (CESMEE)**
CESMEE has as its mission to promote research and development efforts in science, technology, engineering and mathematics (STEM) education through collaboration with STEM teachers, teacher educators, researchers, and practitioners in Iowa, the nation and the world. CESMEE focuses on identifying effective means by which to create change in STEM education, PreK-18.

SP@ISU presented at a CESMEE “Collaboration Coffee” event in December 2011. These Collaboration Coffees are an informal way to help create awareness of the diverse STEM education projects across campus and beyond. As mentioned above in section III.C.1 above, SP@ISU also partnered with CESMEE to offer a “Spotlight on STEM Education” event.

**ISU Honors Program**
The University Honors Program at Iowa State promotes an enriched academic environment for students of high ability, regardless of major, who are interested in taking advantage of educational and intellectual opportunities and challenges. These include the pursuit of a broad liberal education, the ability to individualize the student's program of study, access to graduate-level courses, and the opportunity to be involved in research projects. SP@ISU is working with the Honors Program on mutual goals to enhance the effectiveness, administration and evaluation of undergraduate research experiences on campus.
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’s research strives to transform the chemical industry by integrating biological and chemical catalysis systems to produce biorenewable chemicals. CBiRC provides educational programs that attract a diverse set of students into the engineering field and produce a new cadre of globally competitive college graduates capable of designing integrated chemical/biological processing systems. CBiRC is interested in creating synergies on campus that will build communication and collaboration among its diverse areas of science. SP@ISU leadership has met with the Director of CBiRC as well as the Education Directors to assist in this effort. 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 is a program that aims to 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. 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.

Representatives from SciComm@ISU serve on the Advisory Council and as a Faculty Leader. SP@ISU was a co-sponsor for the SciComm@ISU “Between Scientists & Citizens: Assessing Expertise in Policy Controversies” conference. This Conference gathered scholars from the humanities and social sciences to deepen their understanding of effective and appropriate science communication in policy controversies. 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.4. Website Resources
SP@ISU’s website contains a database of programs on campus that work with broader impacts initiatives (http://www.spisu.iastate.edu/programs). The website also provides a compilation of literature and resources related to broader impacts, including information about recent changes to the merit review criteria recommended by the National Science Board (http://www.spisu.iastate.edu/resources). Information is categorized according to areas of broader impacts. For programs, contact information is given. These databases will 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 as well as a quick link from the Office of the Vice President for Research and Economic Development homepage.
III.D. Planning and Evaluation

SP@ISU has utilized various evaluation tools during the first two years of the project. The recommendations from the external evaluation consultant are utilized to assist in planning program activities. Other evaluation tools, utilized by the internal assessment coordinator and through partnerships with campus evaluation programs, assist SP@ISU in providing faculty with broader impacts exemplary practices information and identify key paths to disseminate this information.

III.D.1. External Evaluation Consultant Site Visit
SP@ISU External Evaluation Consultant, Dr. Mariko Chang, visited ISU Nov. 7-9, 2011, to conduct interviews with key stakeholders. Evaluation methods include interviews with the project team and key stakeholders, the analysis of workshop survey data, documentation of program activities, and internal evaluation documents. She submitted a report on her findings to the SP@ISU team in December 2011. The SP@ISU team took the recommendations from this report and organized their program activities in accordance with them. Dr. Chang’s report can be found in appendix A.

III.D.2. A Model for Aggregated Assessment of Broader Impacts Activities
SP@ISU partnered with Survey and Behavioral Research Services (SBRS) to provide centralized REU evaluation services as well as pool resources from programs across campus to increase the assessment capability of any individual program. This project offers ISU the capability to create a large database of students who participate in summer research programs and track them longitudinally. This will result in more reliable data to show the impact of these programs, as well as making longitudinal and aggregated data available to support new proposals. The project, depicted in Figure 3, potentially serves as a model and pilot for aggregated assessment of other projects as well.

Figure 3. Model of the aggregate assessment of undergraduate research programs.
III.D.3. Faculty and Research Grant Network Analysis
Planned outcomes of the SP@ISU include increasing faculty involvement in BI activities, increased collaboration with BI programs, and an increase in awards and funding with integrated BI plans. To help measure these outcomes, SP@ISU is employing Social Network Analysis (SNA) techniques to characterize the social structure or relationships between ISU faculty based on various attributes. SNA provides a way to visualize relationships between people and groups that often are not normally apparent. In simplified terms, SNA helps map the different degrees of separation or connection people have with one another.

SNA was used to identify faculty who have been NSF PIs or co-PIs and exhibit high levels of connection with other faculty. These highly connected individuals have had success on multiple grants and have worked with a variety of different faculty. These faculty have the potential to help SP@ISU efficiently and effectively share BI information across campus, partner with BI programs, and build grassroots support for BI, thus directly or indirectly helping SP@ISU achieve the outcomes noted above. During year 2 of the project, we utilized SNA to identify speakers for our “Achieving Success in Broader Impacts” workshop. These highly connected and successful faculty speakers were very well received, and the workshop had the highest attendance of any other so far in the project.

Also in year 2, we expanded the SNA to look at all faculty members who submitted an NSF grant proposal regardless of funding success. This broader analysis allows us to better find faculty in need of specialized training and allows us to establish a baseline level of connectivity for all individual faculty by which to measure change over time. Findings from the faculty and research grant network analysis are presented in section IV.C.3 below.

III.D.4. Broader Impacts Plan Analysis
As SP@ISU seeks to improve the ability of faculty to write effective broader impacts plans, we sought to first understand the components of a successful plan. Toward that end, we piloted a study with ISU’s Research Institute for Studies in Education (RISE) for summative content analysis of BI plans in ISU proposals that received NSF funding. The purpose of this study was to understand how broader impacts are captured in proposal abstracts. Using qualitative content analysis, 665 NSF grant abstracts for funded awards by ISU researchers were examined for the types and frequency of broader impacts language. Findings from the broader impacts plan analysis are presented in section IV.C.4 below.

III.D.5. Grant Writing Tool
During SP@ISU’s involvement with the “Academic Writing for Graduate Students and New Faculty” seminar series, program leadership became aware of the Research Writing Tutor (RWT). The RWT, developed by Dr. Elena Cotos, is web-based software tool that analyzes students’ writing and offers feedback tailored to their field of study (http://archive.inside.iastate.edu/2011/0120/rwt.php). SP@ISU asked Dr. Cotos to explore the feasibility of applying the same analyses to grant writing, specifically broader impacts sections of proposals. This tool goes beyond content analysis, and in addition to complementing other efforts to help faculty write effective broader impacts plans, it is a unique and innovative approach to plan analysis and faculty training. A pilot phase of this project will begin fall 2012.
using institutional funds. During spring 2013, Dr. Cotos will host a workshop for ISU faculty to present her findings and a framework for writing broader impact sections of proposals.

III.E. Dissemination

NSF Joint Annual Meeting 2012 and Poster Presentation
Members of the SP@ISU PI Team attended the NSF Division of Human Resource Development Joint Annual Meeting in June 2012. The team members who attended were Sharron Quisenberry, Diane Rover, Bonnie Bowen, and Megan Heitmann. SP@ISU also submitted and presented a poster for the Poster Session.

JAM12 Poster Presentation
Title: Creating Synergies to Broaden Participation at Iowa State University
Authors: Sharron Quisenberry (PI), Diane Rover (Co-PI), Bonnie Bowen (Co-PI), Megan Heitmann (Program Assistant)
HRD Program Affiliation: Innovation through Institutional Integration (I3)

Abstract:
The Strengthening the Professoriate program at Iowa State University (SP@ISU) supports the development and evaluation of innovative and effective broader impacts activities by faculty. SP@ISU facilitates connections between researchers and resources on campus to develop and implement broader impact plans in NSF grants. SP@ISU is enriching the broadening participation environment on campus in a number of ways. To build synergy on campus, SP@ISU is facilitating communication and collaborations among campus broadening participation programs. An innovation developed by the ISU ADVANCE program that continues through SP@ISU is the work of Equity Advisors within colleges to bring about changes in culture, structures, and practices. In compiling information about broader impacts work of ISU faculty, SP@ISU completed a preliminary study that analyzed the content of publicly available funded proposal abstracts to characterize the nature of the work, including the types and frequency of broadening participation terms found in the abstracts.

The JAM12 poster is Appendix B.

IV. Findings

IV.A. Recommendations from Key Stakeholders

IV.A.1. Advisory Council
SP@ISU leadership met with the Advisory Council in December 2011 and May 2012. In December, the council agreed on its advisory role. The council discussed and provided input about topics including SP@ISU visibility and BI awareness, faculty needs and interests, BI
activities in ISU proposals, faculty advancement and BI work, and institutional support for BI activities and evaluation. The council suggested that SP@ISU work with faculty mentoring programs, i.e., senior faculty serving as mentors for junior faculty, as a way to influence the BI culture on campus and help junior faculty. Council members expressed support for SP@ISU efforts to learn more about the BI plans in proposals submitted by faculty. In May, the council discussed the external evaluator recommendations and reviewed year 2 activities. The council recommended that SP@ISU strengthens partnerships with programs having diversity outcomes so that there are clear opportunities for faculty to work with these programs as part of BI plans in their research. The council discussed department chairs being a good point of contact to dispense information regarding program activities to faculty and an their involvement in faculty advancement and BI work discussions. During the year, the council also reviewed the NSB Merit Review Criteria Recommendations and Revisions report, and concluded that SP@ISU goals are still relevant and consistent with the report. The minutes from these meetings have been and will be referred to when implementing and planning SP@ISU activities.

IV.A.2. Equity Advisors and Faculty Leaders
Equity Advisors meet monthly to discuss activities and common challenges within their colleges. In discussions about SP@ISU, they agree that one of the main opportunities they will have to influence the broader impacts culture will be through their role in mentor training within their colleges. They will also help in promoting SP@ISU activities within their colleges and follow-up with college leadership after events.

Joint Equity Advisor and Faculty Leader Meeting
At the recommendation of the External Evaluation report, SP@ISU conducted a joint EA and FL meeting during the spring semester. This meeting provided an opportunity for the three Faculty Leaders and four Equity Advisors to introduce themselves and explain ways that they are participating in SP@ISU. Three important areas of interest and future work are: (1) Workshops for new faculty that will occur through the coming academic year will provide opportunities for Faculty Leaders and Equity Advisors to introduce broader impacts to young scholars at ISU. (2) The College of Agriculture and Life Sciences has a long history of activities that encourage diversity and broadening participation. The Equity Advisor serves as a point person for communication with SP@ISU colleagues and will share information as these programs grow in the coming year. (3) Reorganization in the College of Human Sciences is expected to open new opportunities for outreach and collaboration, as well as an opportunity to suggest developing a statement that values broader impacts within the School of Education.

IV.A.3. Executive Steering Committee
The Executive Steering Committee, which consists of SP@ISU leadership and is chaired by the Executive Vice President and Provost, met in October 2011 and April 2012. During these meetings program leadership updated Dr. Elizabeth Hoffman, Executive Vice President and Provost, on program activities and objectives. Provost Hoffman also provided her feedback and recommendations. Topics discussed included: the role of Equity Advisors in SP@ISU, the project’s mid-point review, project evaluation measures, and faculty recognition associated with broader impacts work. Provost Hoffman agreed that pairing Equity Advisor’s SP@ISU efforts
with faculty mentoring in the colleges would be valuable. She recommended that SP@ISU begin preparing for the mid-point review by working with the project evaluators on specific measures of success recognized by stakeholders. She would like to see scholarship and grantsmanship measures associated with broader impacts work, or in some way relate the importance of BI to these areas. In addition, the evaluation of broader impacts work across projects is of special interest. Provost Hoffman also affirmed the importance of outcomes related to faculty development and the broader impacts culture at Iowa State, which are more difficult to measure.

**IV.B. Workshop Series Findings**

The participants of the “Achieving Success in Broader Impacts Workshop” and the “Campus Programs and Broader Impacts Resource Fair” completed evaluation forms to provide feedback to the program.

**IV.B.1. Achieving Success in Broader Impacts Workshop**

We received 27 completed evaluations from the “Achieving Success in Broader Impacts” workshop. Ninety percent of respondents either agreed or strongly agreed that the workshop increased their understanding of the broader impacts criteria and increased their knowledge of where to obtain broader impacts information and resources. Furthermore, 96% stated they were likely to seek information from broader impacts partners on campus as they develop their plans and 81% said they were likely to share the information they learned from the workshop with other faculty and staff. Some suggestions for future workshops included: writing samples and techniques, reviewing and discussing a broader impacts plan from an NSF proposal, and evaluation and assessment of broader impacts.

**IV.B.2. Campus Programs and Broader Impacts Resource Fair**

We received 9 completed evaluations from those who attended the “Campus Programs and Broader Impacts Resource Fair.” The low number is likely due to the placement of the registration table, such that not all participants were accounted for, and to the open-house format of the event. One hundred percent of respondents agreed or strongly agreed that the program fair increased their knowledge of where to get broader impacts information and resources and they were likely to seek information from broader impacts partners on campus as they develop future broader impacts plans.

We also received feedback from 11 of the 26 programs who had representatives at the fair. We asked them open ended questions about what went well, what could be improved, and suggested topics for future events. Many commented on the value they gained from not only talking with faculty but also discussions with other program representatives. They also saw it as a successful event for the first year and encouraged SP@ISU to host this event annually.
IV. Planning and Evaluation Findings

IV.C. External Evaluation Report Recommendations

SP@ISU leadership utilized the recommendations from the External Evaluation Report to guide activities during year 2. While the entire report can be found in appendix A, the recommendations are excerpted here.

The recommendations are intended to build on the first year, assist with the implementation of new and continued program activities, and establish effective metrics from which to evaluate progress toward program goals. Key recommendations are listed by broad topical area and/or activity.

Connections with campus partners:
- Partners are excited about working with SP@ISU, but are unsure of what a mature partnership will look like. Meet one-on-one with major partners to discuss common goals and ways that SP@ISU can better connect partners with each other and with faculty member’s broader impact activities.

Equity Advisors and Faculty Leaders:
- Hold a group meeting with Equity Advisors and Faculty Leaders to provide guidance as they transition into their new (or expanded) roles. They can discuss ideas, talking points, concerns, and strategies for helping SP@ISU achieve its goals. The group should decide if it wants to continue to meet on a regular basis and if so, how often. Discuss ways of documenting the activities of the Equity Advisors and Faculty Leaders.
- Equity Advisors and Faculty Leaders will play a critical role in building support for a culture that values broader impacts by faculty and recognizes broader impacts activities in the tenure and promotion process. They should engage in dialog with department chairs, deans, and faculty as to the benefits of a broader impacts culture, and ways to include broader impacts activities in the promotion and tenure process in a meaningful way that does not “compromise” current standards.

Workshops and webinars:
- Align evaluation questions with project goals and major evaluation questions to measure the impact of activities on SP@ISU goals.
- Continue to collaborate with the Office of the Associate VP for Research (and other offices) to provide workshops on grant-writing and topics that can address broader impacts.

Broader impacts plan analysis:
- Expand analyses to include broader impacts of ISU’s unfunded NSF proposals.
- Use results from analyses to inform SP@ISU activities.

Groundwork for including broader impacts activities in the promotion and tenure process:
• Continue to work with deans, department chairs, and faculty to discuss ways of incorporating broader impacts activities in the tenure and promotion process and building support for their inclusion.

• Work with administrators and faculty to develop guidelines or best practices for incorporating broader impacts activities in the Position Responsibility Statement (PRS) and tenure and promotion process.

• Work with the Office of the Associate Provost for Academic Personnel and Chief Diversity Officer to hold chair workshops and devise other strategies for engaging chairs in the process of developing a culture that values broader impacts activities and rewards them in the tenure and promotion process.

Faculty and research grant network analysis:
• Identify highly-connected faculty and target them for information about SP@ISU’s goals and resources. Highly-connected faculty may also be good candidates to serve as broader impacts mentors or consultants.

• Proceed with proposed analyses to measure changes in collaboration over time and whether faculty who participated in SP@ISU activities are more likely to collaborate.

• Discuss how social network analysis can be used to inform other program goals (increase in faculty connections with broader impacts partners, increased involvement of non-STEM faculty as broader impacts experts, etc.).

• Share findings with other institutions, helping to position ISU as a leader in broader impacts activities and measurement.

Program visibility:
• Continue to make brief presentations at events such as department and university faculty meetings, Council of Deans meetings, President’s Council meetings, cabinet meetings, new faculty orientations, faculty mentoring programs, and grant coordinator meetings.

• Seek press coverage in campus media.

• Seek links to the SP@ISU website from related university sites, in particular the Office of Sponsored Programs Administration and the Office of the Vice President for Research and Economic Development.

Involvement of tenured faculty:
• Tenured faculty play a critical role in bringing about a cultural shift in valuing broader impacts activities. Incorporate them in as many program activities as possible and draw upon their expertise. In addition, some may be willing to serve as broader impacts mentors or consultants.

Summative statement by external evaluator: In conclusion, SP@ISU is off to a strong start and has the potential for establishing itself as a national leader in the development of a broader impacts culture that enhances faculty development, increases research productivity, and strengthens partnerships (a) between different campus broader impacts programs, and (b) between broader impacts programs and faculty.
IV.C.2. Aggregated Assessment of Broader Impacts Activities Findings
The “Assessment of REU Program Effectiveness at Iowa State University” draft report was completed by SBRS on February 12, 2012. The final report of this pilot evaluation project is available upon request by emailing spisu@iastate.edu. This project was a successful “proof of concept” for aggregating data across programs on campus. In a follow-up meeting with SBRS it was stated that since the basic structure has now been set up, recurring costs to maintain and use it should be minimal, and it can be adapted to other types of programs.

IV.C.3. Faculty and Research Grant Network Analysis Findings
During year 2 of the SP@ISU project we utilized SNA to identify faculty to involve in program activities and events. As an example, we used the information from Figures 4 and 5 to identify speakers for the “Achieving Success in Broader Impacts Workshop.” Faculty who showed up prominently on both graphs were contacted to be speakers.

Figure 4. Social network graph showing the major connections between Iowa State University PIs with 3 or more NSF funded grants from 2006-2011. Node size reflects the number of times a PI connects pairs of other PIs who would not otherwise be connected (i.e. betweenness). Larger nodes indicate higher levels of betweenness.
IV.C.4. Broader Impacts Plan Analysis Findings

The content analysis study was completed by RISE, and a report is available at the SP@ISU website:


The following is an example of the type of information that can be found in the report. This information was presented in the JAM poster session on broadening participation. Based on an analysis of broader impacts language in a set of NSF abstracts, Figure 6 shows the extent to which abstract text addressed broader impacts activities by number of references and percent of coverage for each category. Figure 7 shows data for the broadening participation category. As shown in the figures, broadening the participation of underrepresented groups was mentioned a total of 33 times and had a coverage percentage of 3.3. Analysis of those 33 statements revealed two subcategories of ways in which researchers mentioned broadening the participation of underrepresented groups: recruitment and providing research and/or education opportunities to underrepresented minorities. While several statements regarding broadening participation used broad language such as “diverse group” or “underrepresented groups,” several statements specifically indicated broadening participation for either women or women and racial/ethnic minorities.
Note: Percent coverage refers to the percentage of text devoted to a particular category compared to the total amount of text, and number of references refers to the number of times activities fitting into each category were mentioned.

Figure 6. Coverage of broader impacts categories in broader impacts statements.

Note: Percent coverage refers to the percentage of text devoted to a particular category compared to the total amount of text, and number of references refers to the number of times activities fitting into each category were mentioned.

Figure 7. Coverage of broadening participation subcategories.
During year 2 of our project, we were made aware of a similar study that was done at a national level and included in the NSB Merit Review Criteria Recommendations and Revisions report. The “Topic Modeling of Broader Impacts in NSF Proposals” findings can be found in Appendix F of the NSB report ([http://www.nsf.gov/nsb/publications/2011/meritreviewcriteria.pdf](http://www.nsf.gov/nsb/publications/2011/meritreviewcriteria.pdf)). Due to this national level report, we are reassessing our next steps with this project.

V. Research and Teaching Training and Development

Faculty, staff, and students involved with the project have increased their awareness of broader impacts opportunities on campus, their understanding of the NSF broader impacts review criterion, and their knowledge about effective broader impacts plans. This has resulted from networking and information sharing activities on campus and at national meetings.

VI. Outreach Activities

Given the nature of broader impacts, SP@ISU activities extend to faculty, staff, and programs outside of STEM disciplines. These programs and people are included in database and networking activities. 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](http://scicomisu.wordpress.com)). As part of her efforts during year 2, she organized a conference on campus held in early June 2012, “Between Scientists & Citizens: Assessing Expertise in Policy Controversies,” [https://sites.google.com/site/gpssarg/home](https://sites.google.com/site/gpssarg/home). SP@ISU was recognized as supporting this conference, and team members participated in conference activities. The conference attracted speakers and participants from around the country, expanding the reach of SP@ISU to a new community of practice.

The meetings with grant coordinators on campus, as suggested by the associate deans of research, are another example of informing a new group, in this case those who assist faculty in grant budget development.
VII. Contributions

The following table correlates our program goals with the areas we are contributing or plan to make contributions in the future. The sections within the table refer to activities that are described in the report above.

<table>
<thead>
<tr>
<th>Goal 1: Build on current NSF programs to increase efficiency and effectiveness of ISU programs to broaden participation in STEM</th>
<th>STEM Discipline</th>
<th>Human Resource Development</th>
<th>Resources for Research and Education</th>
<th>Contributions beyond Science &amp; Engineering</th>
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<tr>
<td>Our efforts to increase collaboration among STEM Programs and NSF-funded programs will contribute to greater participation in STEM. (III.C.3.)</td>
<td>Our efforts to increase collaboration among STEM Programs and NSF-funded programs will contribute to greater participation in STEM. (III.C.3.)</td>
<td>The aggregate assessment of broader impacts activities project we have started will become a major resource for our University and potentially others as well (III.D.2.)</td>
<td>By cultivating partnerships with programs outside of the STEM fields, we can create greater resources for all ISU faculty to collaborate in new and innovative ways (III.C.3.)</td>
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<tr>
<td>Goal 2: Create a clearinghouse of programs, resources, information, and network of people to assist and guide in the development of a broader impacts culture at ISU</td>
<td>By establishing Equity Advisors’ and Faculty Leaders’ relationships with faculty, creating a network of experts, and employing innovative evaluation techniques, we can offer more “best practice” research to faculty. (III.B.3., III.D.3-5)</td>
<td>By creating a database of campus programs and a database of resources, faculty have access to resources that will assist them expanding their broader impacts efforts (III.C.4.)</td>
<td>Our evaluation efforts with aggregated assessment, social network analysis, content analysis, and linguistic analysis will have many applications beyond just science and engineering. (III.D.2-5)</td>
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<td>Goal 3: Facilitate and enhance the knowledge base needed by faculty to develop well researched broader impacts plans as part of their research enterprise</td>
<td>The workshops, webinars and event co-sponsorship activities are providing faculty with resources to improve their knowledge on broader impacts efforts as well as connect them with programs on campus that have expertise in working with all areas of broader impacts. (III.C.1-3)</td>
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<td>Goal 4: Develop protocols for assessment and evaluation of a faculty member’s broader impacts initiatives for inclusion in the promotion and tenure process</td>
<td>Incorporating broader impacts work into the P &amp; T process will provide faculty with recognition for their work and contribute to strengthening the professoriate at Iowa State. (IV.A.)</td>
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VIII. \( \text{I}^3 \) Matrix

The following table correlates the sections of the Annual Report with the areas that the Innovation through Institutional Integration (\( \text{I}^3 \)) Program would like us to report on. The matrix was received by our PIs at the \( \text{I}^3 \) meeting in November 2010. To learn more about these activities, please refer to the sections of the report above.

<table>
<thead>
<tr>
<th>Major Innovations: innovative programming, policies, and practices</th>
<th>Broadening Participation</th>
<th>Integration of Research and Education</th>
<th>Research and Evaluation</th>
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<tbody>
<tr>
<td>III.B.3. Equity Advisors and Faculty Leaders</td>
<td>III.B.3. Equity Advisors and Faculty Leaders</td>
<td>III.D.2. A Model for Aggregated Assessment of Broader Impacts Activities</td>
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<td>III.C.4. Website Resources</td>
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<td>III.D.3. Faculty and Research Grant Network Analysis</td>
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<td>III.D.4. Broader Impacts Plan Analysis</td>
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<td>III.D.5. Grant Writing Tool</td>
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<th>Nature of institutional integration and new synergies created</th>
<th>Broadening Participation</th>
<th>Integration of Research and Education</th>
<th>Research and Evaluation</th>
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Appendix A

External Evaluation Report
EXTERNAL EVALUATION

SP@ISU: STRENGTHENING THE PROFESSORIATE AT IOWA STATE UNIVERSITY: A CAMPUS NETWORK TO ENABLE STRONG SCIENCE AND DIVERSE COMMUNITIES

NSF GRANT NO. HRD-0963584

DECEMBER, 2011

Submitted By:

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978.844.3529
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1. **EXECUTIVE SUMMARY**

Strengthening the Professoriate at Iowa State University (SP@ISU) was funded by the National Science Foundation’s Innovation through Institutional Integration (I3) Grant. This is the first external evaluation of SP@ISU and covers the period of July 1, 2010 through June 30, 2011. The evaluation is formative in nature and includes the following objectives: (1) describing implementation activities, successes and challenges, (2) monitoring the status of implementation progress toward program goals, and (3) providing formative feedback to facilitate project refinements.

Dr. Chang visited ISU Nov. 7-9 to conduct interviews with key stakeholders. Evaluation methods include interviews with the project team and key stakeholders, the analysis of workshop survey data, documentation of program activities, and internal evaluation documents.

The first goal of SP@ISU is to build on current NSF programs to increase efficiency and effectiveness of ISU programs to broaden participation in STEM. Events pertaining to this goal included an Advisory Council Meeting and a K-12 Collaboration Meeting. Out of these meetings, two important products emerged: (1) a K-12 directory to facilitate communication across K-12 partner programs, and (2) partnership with the Survey and Behavioral Research Services (SBRS) Center to create a Combined Research Experience for Undergrads (REU) Evaluation Project that manages data collection and produces site-specific evaluation reports for individual PIs. The REU project is very promising and has the potential for being a model for other institutions.

Recommendations for Goal #1:
- Partner programs would like a stronger and more developed relationship with SP@ISU. Meet one-on-one with major partners to discuss common goals and ways that SP@ISU can better connect partners with each other and with faculty.
- REU partnership with SBRS is innovative and if successful, should be considered for dissemination to other institutions.

The program’s second goal is to create a clearinghouse of programs, resources, information, and network of people to assist and guide in the development of a broader impact culture at ISU. A key component of the second goal was identifying Faculty Leaders and incorporating Equity Advisors to help educate the ISU community about broader impacts and SP@ISU resources. In addition to the identification of Faculty Leaders and incorporation of Equity Advisors, a database of programs on campus that work with broader impacts initiatives was compiled and made available on the SP@ISU website. Two Study Circles were also held and a database of literature on broader impacts in graduate education were developed for Study Circle participants. The database of literature was also made available on the SP@ISU website.

Recommendations for Goal #2:
- Hold a group meeting with Equity Advisors and Faculty Leaders to provide guidance as they transition into their new (or expanded) roles. They can discuss ideas, talking points, concerns, and strategies for helping SP@ISU
achieve its goals. The group should decide if it wants to continue to meet on a regular basis and if so, how often.

- Discuss ways of documenting the activities of the Equity Advisors and Faculty Leaders.
- Continue to articulate the difference between ADVANCE and SP@ISU.
- Equity Advisors and Faculty Leaders will play a critical role in building support for a culture that values broader impacts by faculty and recognizes broader impacts activities in the tenure and promotion process. They should engage in dialog with department chairs, deans, and faculty as to the benefits of a broader impacts culture, and ways to include broader impacts activities in the promotion and tenure process in a meaningful way that does not “compromise” current standards.

To address the third goal of facilitating and enhancing the knowledge base needed by faculty to develop well-researched broader impact plans as part of their research enterprise, SP@ISU (a) held a series of workshops and webinars, (b) assisted faculty one-on-one with forming a broader impacts plan, and (c) commissioned a content analysis of broader impacts statements in the abstracts of funded NSF proposals submitted by ISU. A total of four workshops and two webinars were held, attended by 70 participants. The NSF Career Awards Workshop was attended by the greatest number of people (38 participants) and was favorably reviewed by the 8 participants who completed evaluation forms. Evaluation forms for the other workshops and webinars were completed by too few participants to determine effectiveness. In addition to the workshops and webinars, SP@ISU met with 5 faculty members one-on-one to discuss developing a broader impacts plan within their NSF proposal. Interviews indicate these individual sessions are valuable to faculty. The final activity supporting Goal #3 was contracting with ISU’s Research Institute for Studies in Education (RISE) to conduct a content analysis of broader impacts statements in abstracts of ISU’s funded NSF proposals from 2007-2011. This research holds a lot of promise for increasing knowledge about what characteristics of broader impacts contribute to funding success and the results are likely to be of interest to other institutions as well.

Recommendations for Goal #3:

- Evaluation of workshops and webinars needs to more closely link these activities with the achievement of program goals and major evaluation questions.
- Workshop and webinar evaluation should take place at the end of events to increase response rates.
- Continue to collaborate with the Office of the Associate VP for Research (and other offices) to provide workshops on grant-writing and topics that can address broader impacts.
- Expand the content analysis to include unfunded proposals. Results of the comparison of funded and unfunded proposals should inform SP@ISU activities and can be disseminated to help establish ISU as a leader in the field of broader impacts development.

The fourth goal is to develop protocols for assessment and evaluation of a faculty member’s broader impact initiatives for inclusion in the promotion and tenure process.
Findings indicate strong support for this goal in the upper administration and that the Position Responsibility Statement (PRS) is a key mechanism through which such change can be brought about. Support of deans, chairs, and faculty (senior faculty in particular) is critical for achieving Goal #4. While there is some evidence of support for this goal by deans, chairs, and faculty, SP@ISU needs to work to build more wide-spread support.

Recommendations for Goal #4:

- Continue to work with deans, department chairs, and faculty to discuss ways of incorporating broader impacts activities in the tenure and promotion process and building support for their inclusion.
- Work with administrators and faculty to develop guidelines or best practices for incorporating broader impacts activities in the PRS and tenure and promotion process.
- Work with the Office of the Associate Provost for Academic Personnel and Chief Diversity Officer to hold chair workshops and devise other strategies for engaging chairs in the process of developing a culture that values broader impacts activities and rewards them in the tenure and promotion process.

SP@ISU is also employing Social Network Analysis in its planning and evaluation. The research findings from this analysis and other innovative activities have the potential to help establish ISU as a leader in broader impacts research and evaluation.

Recommendations:

- Identify highly-connected faculty and target them for information about SP@ISU’s goals and resources. Highly-connected faculty may also be good candidates to serve as broader impacts mentors or consultants.
- Proceed with proposed analyses to measure changes in collaboration over time and evaluate whether faculty who participated in SP@ISU activities are more likely to collaborate.
- Discuss how social network analysis can be used to inform other program goals (increase in faculty connections with broader impacts partners, increased involvement of non-STEM faculty as broader impacts experts, etc.).
- Share findings with other institutions, helping to position ISU as a leader in broader impacts activities and measurement.

To build on the momentum and progress of the first year, the second year should be one of mass-marketing to improve program visibility and increase the participation of tenured faculty.

Recommendations:

- Continue to make brief presentations at department and university faculty meetings, Council of Deans meetings, President’s Council meetings, cabinet meetings, new faculty orientations, grant coordinator meetings, and college-level mentoring programs.
- Seek press coverage in campus media.
• Seek links to the SP@ISU website from related university sites, in particular the Office of Sponsored Programs Administration and the Office of the Vice President for Research and Economic Development.
• Increase involvement of tenured faculty, as mentors, consultants, presenters, and advocates.

The first year was a very successful one. The project initiated its proposed activities, successfully transitioned to a new Project Director, and is engaging in research and developing innovative programs that have the potential to position ISU as a national leader in the development of a broader impacts culture that enhances faculty development, increases research productivity, and strengthens partnerships (a) between different campus broader impacts programs, and (b) between broader impacts programs and faculty.
2. PROJECT OVERVIEW

Strengthening the Professoriate at Iowa State University (SP@ISU) has been funded by the National Science Foundation’s Innovation through Institutional Integration (I3) Grant. SP@ISU seeks to strengthen university-wide and faculty efforts to develop rigorous and effective activities that will strengthen broader impact programs and develop tools so that faculty efforts that support broader impacts are recognized in a rigorous manner in the Promotion and Tenure process. The following broader impacts criterion are the focus of SP@ISU:

1. How well does the activity advance discovery and understanding while promoting teaching, training, and learning?
2. How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)?
3. Will the results be disseminated broadly to enhance scientific and technological understanding?

SP@ISU has 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 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

3. EVALUATION OBJECTIVES AND METHODS

3.1 EVALUATION PERIOD AND OBJECTIVES

The period of evaluation covers the projects first year: July 1, 2010 through June 30, 2011. Evaluation objectives for this time period are primarily formative and include:

1. Describing implementation activities, successes and challenges
2. Monitoring the status of implementation progress toward program goals
3. Providing formative feedback to facilitate project refinements

3.2 EVALUATION METHODS

Dr. Chang visited ISU from November 7-9 to conduct interviews with the project team and other stakeholders. A total of 29 people were interviewed November 7-9, 2011, representing the following stakeholders: all members of the project team (PI, Co-PIs, Program Assistant, Internal Assessment Coordinator), Equity Advisors, Faculty Leaders, Administrators (Deans, Department Chairs, Chief Diversity Officer), Advisory Council,
Partners Programs, and Program Participants. Three interviews with program participants were conducted by phone after the site visit. The total number of interviews conducted was 32.

In addition to data from interviews, the evaluation incorporates data from the following sources:

**Workshop and Webinar Evaluations:** Workshop and webinar evaluation forms were developed by the SP@ISU project team and distributed to participants electronically post workshop/webinar.

**Documentation:** Lists of workshop and webinar participants and basic demographic information on participants were provided by the SP@ISU project team.

**Institutional Data:** Data on the composition of ISU faculty by rank, college, and sex were obtained from the ISU Factbook 2010-2011, available at: www.ir.iastate.edu/factbk.html.

### 4. FINDINGS

#### 4.1 Goal #1: Build on current NSF programs to increase efficiency and effectiveness of ISU programs to broaden participation in STEM.

Activities corresponding to Goal 1 included:
- Advisory Council Meeting
- K-12 Collaboration Meeting
- Combined Research Experience for Undergrads (REU) Evaluation Project

#### 4.1.1 University-Wide Program Collaborations

The October 2010 Advisory Council Meeting was an excellent way to initiate university-wide program collaborations. Interviews with attendees suggest that this meeting was productive for introducing the goals of SP@ISU and facilitating partnerships. The K-12 Collaboration Meeting held in November 2010 and development of a K-12 directory demonstrate SP@ISU’s responsiveness to identified needs of its partner programs. Over the course of the grant, SP@ISU should seek feedback from partner programs regarding the use of the directory and solicit ideas for additional resources that could be provided by SP@ISU.

Feedback from these introductory meetings led to Research Experience for Undergrads (REU) Evaluation Project. The Survey and Behavioral Research Services (SBRS) Center at ISU will manage the data collection and provide site-specific evaluation reports to individual PIs. This project is extremely promising and should increase the efficiency and effectiveness of REU programs on campus. Successful implementation is likely to be of
interest to other institutions and the project has the potential to be a model for other universities.

The Project Team found that the Advisory Council as originally structured was too large and decided to reduce its size for effectiveness. This structural change will enable SP@ISU to better leverage its Advisory Council. The SP@ISU team should use the Advisory Council strategically, seeking advice as to how to best guide partnerships toward common goals and to market SP@ISU activities.

Interviews suggest that many SP@ISU partners are unsure of how a mature partnership with SP@ISU will look. Although some mentioned an initial meeting with SP@ISU, many reported that a follow-up meeting would be useful to continuing the discussion about the possibilities for partnership and mutual benefits.

ISU’s participation in the NSF-EPSCoR Program and recent grant to create the Future Leaders in Advancing Renewable Energy (FLARE) Institute can be leveraged with SP@ISU to increase the efficiency and effectiveness of ISU programs to broaden participation in STEM.

4.2 GOAL #2: Create a clearinghouse of programs, resources, information, and network of people to assist and guide in the development of a broader impacts culture at ISU.

The following activities were implemented during the first year to address Goal #2:

- Created a database of programs on campus that work with broader impacts initiatives and made it available through the SP@ISU website
- Held two Study Circles on the topic of Graduate Education
- Created a database of literature on broader impacts and posted it on the SP@ISU website
- Appointed an Equity Advisor in the College of Human Sciences and Faculty Leaders in the College of Veterinary Medicine, College of Liberal Arts and Sciences, and College of Engineering

4.2.1 Database of Broader Impacts Partner Programs

SP@ISU should be commended for creating the database of programs so quickly. Now that it is available, it is imperative to market it so faculty and administrators know it is there as a resource. As awareness of the program database grows over the course of the grant, it will be important to get faculty and partner feedback on how the database is being used and make appropriate updates.

Along with the list of broader impact partner programs, it may be useful to provide some more detailed examples of ways that the programs have partnered with faculty (or could partner with faculty) to help faculty appreciate the array of possibilities. (Sometimes this is included with the list of programs, but could be done more often and with a bit more
detail.) The examples might be built more fully within the list of programs or perhaps in its own section of the website that highlights some examples of how faculty have partnered with campus programs to develop their broader impacts activities.

Some people interviewed during the visit mentioned that the Plant Genome Outreach Program might also be included in the list of BI partner programs.

Broader impacts partners were enthusiastic about SP@ISU’s intention to help connect faculty with their broader impacts efforts. Some broader impacts partners also expressed the desire to see increasing numbers of faculty being referred to them as a result of SP@ISU activities.

4.2.2 Study Circles and Database of Literature

Eight faculty members attended the Study Circles. Data from interviews indicate that although participants found the study circles valuable, they have been suspended because of the large time commitment they require from participants. Feedback from those attending the study circles reinforced that a workshop format requiring a lesser time commitment would be preferable. The database of literature that was created for the Study Circles and subsequently posted on the website can be accessed by interested faculty members and administrators.

4.2.3 Equity Advisors and Faculty Leaders

The Equity Advisor roles were created under ISU’s ADVANCE grant and their work is highly respected by the ISU community. Having them on-board with SP@ISU is an asset. As they incorporate SP@ISU activities under their umbrella of responsibilities, it will be important for them to educate the ISU community of the difference between ADVANCE and SP@ISU since there is some confusion about the difference between the two in the broad ISU community.

In conjunction with the Equity Advisors, Faculty Leaders will lay the groundwork for a network of people able to assist and guide the development of a broader impacts culture. Now that these key individuals have been identified, they need to be provided with the information and tools to guide such a change. Because some were just appointed and because SP@ISU is still in its initial stages, some of the Faculty Leaders and Equity Advisors would like additional guidance as to how they will carry out their charge. SP@ISU might draw upon the experience of the ADVANCE team to develop these leaders and equip them with the information they need to help spearhead a broader impacts cultural shift. Documenting their activities will also be necessary for evaluating their impact.
4.3 GOAL #3: Facilitate and enhance the knowledge base needed by faculty to develop well-researched broader impacts plans as part of their research enterprise.

Activities pertaining to Goal #3 include:
- Workshops on topics related to broader impacts and NSF-TUES webinars
- Assisting faculty one-on-one with forming a broader impacts plan
- Content analysis of broader impacts statements in the abstracts of funded NSF proposals submitted by ISU

4.3.1 Workshops and Webinars

Project activities related to Goal 3 included four workshops and two NSF TUES webinars:
- **Workshops:**
  - Developing the Broader Impacts Component of NSF Proposals (9/29/10)
  - NSF Career Awards (2/24/11)
  - NSF Broader Impacts: K-12 Education and Education Research (3/2/11)
  - NSF Broader Impacts: Sampling of Opportunities (3/8/11)
- **NSF TUES Webinars:**
  - Project Evaluation (4/6/11)
  - Mock Panel Review (4/13/11)

The project was able to move fairly quickly during the first year to get so many workshops and webinars up and running. The topics are relevant to the focus of the grant and attendance appears to be good overall. Attendance ranged from 6 participants at each of the NSF-TUES webinars to 38 participants at the NSF Career Awards workshop. As shown in Table 1, the majority of participants were Assistant Professors (60% of workshop participants and 33% of webinar participants). Postdocs, graduate students, and staff combined comprised 22% of workshop participants and 25% of webinar participants.

**Table 1. Rank and STEM-status of Workshop and Webinar Participants**

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<tr>
<th>Rank</th>
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<th>Webinars</th>
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<td>35</td>
<td>4</td>
</tr>
<tr>
<td>Associate Professor</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Professor</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Postdoc Associate</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Graduate Student</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Staff Member</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td><strong>Participants in Non-STEM</strong></td>
<td><strong>10</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>58</strong></td>
<td><strong>12</strong></td>
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</table>

1 Data from SP@ISU Annual Report submitted to NSF, July 1, 2010 June 30, 2011. Participation data was not collected for the first workshop on Developing the Broader Impacts Component of NSF Proposals.
On-line workshop and webinar evaluation forms were emailed to participants after the events. Workshop and webinar evaluations focused on the following outcomes: (a) whether the content was relevant to the participant’s role as a faculty member, administrator, staff member, and/or student, (b) whether the workshop/webinar increased the participant’s knowledge about the specific topic, (c) whether the workshop/webinar offered practical information that the participant will apply in his or her work, and (d) if the workshop/webinar gave the participant the opportunity to discuss important issues with colleagues. Evaluation forms also asked about NSF funding, whether the participant followed up with one of the presenters after the workshop/webinar, and sought suggestions for future SP@ISU workshop topics. Response rates to the evaluation forms were low, with 0-1 completed evaluation forms for each event, with the exception of the Career Awards Workshop, in which 8 participants (21% of total participants) completed evaluation forms. Of the 8 respondents from the Career Awards workshop, 75% agreed that the workshop content was relevant to their role as a faculty member, administrator, staff member and/or student, 63% agreed that the workshop increased their knowledge about NSF Career Awards, and 63% agreed that the workshop offered practical information that he/she will apply in their work.

To facilitate formative feedback and ensure that the necessary data is being collected to evaluate progress toward goals, the evaluation of workshops and webinars needs to be further developed. The workshop evaluation forms are an important component of the evaluation and while the questions asked are useful, they are currently not providing the information necessary to measure progress toward program goals. Future evaluation for workshops and webinars should do the following:

- Since response rates were so low for online post-workshop/webinar evaluations, have participants fill out an evaluation form at the end of the workshop or webinar. Ensure there is adequate time for participants to fill out the evaluation form and emphasize the evaluation forms provide important information to improve and evaluate the program.

- The questions on the evaluation form should be aligned with the specific project goals they seek to address and the corresponding major evaluation questions outlined in the evaluation plan. The major evaluation questions for Goal #3 (per evaluation plan) include:
  - Do faculty, post-docs, and advanced graduate students have an increased understanding of broader impacts criteria?
  - Do faculty develop well-researched broader impacts plans a part of their research enterprise
  - Are broader impacts efforts sustained by the university through multiple faculty members with multiple grants?

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2 The first workshop on Developing the Broader Impacts Components of NSF Proposals was not evaluated.
3 Possible responses included: strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. In the description here, the categories of “agree” and “strongly agree” are combined to a single category of agreement.
To illustrate, a workshop on developing broader impacts components of NSF proposals might include the following types of likert-type scale\(^4\) questions (note: these are examples only):

- “The workshop increased my understanding of broader impacts criteria”
- “The workshop increased my knowledge of where to get broader impacts information and resources”
- “As a result of today’s workshop, I have a better understanding of how to integrate broader impacts initiatives within my own research”
- “I am likely to seek information from broader impacts partners on campus as I develop future broader impacts plans”

If other major evaluation questions emerge over the course of the grant, they can be included as well.

- Evaluation forms can also include open-ended questions such as the most and least useful aspects of the workshop/webinar, and suggestions for topics of future workshops/webinars.
- Dr. Chang can assist with the creation of or review the revised evaluation forms.
- Continue to track attendance at workshops and webinars and collect basic demographic information from attendees (ex. department/office, rank, sex).

Workshops and webinars are likely to remain a key component of enhancing faculty knowledge about broader impacts. Effective evaluation will allow for fine-tuning and will ensure that these events are having the intended effects.

Continue to collaborate with the Office of the Associate Vice President for Research on workshops on grant-writing that can incorporate information on broader impacts and the resources available through SP@ISU.

### 4.3.2 One-on-one Meetings with Faculty

In addition to the workshops and webinars, the SP@ISU office assisted 5 faculty members one-on-one with developing a broader impacts plan within their NSF proposal. Interviews suggest that this is a valuable service that is favorably evaluated by faculty.

This service could be better highlighted on the SP@ISU website. Currently one-on-one meetings listed on the home page under the “Consulting” link. When people click on the link, they are brought to the “Who We Are” web page. More helpful would be for people to be given a specific contact person. Also, the consultation service could be listed with the other activities under “SP@ISU Resources for Researchers working on BI plans” on the “About” web page.

\(^4\) For example, the workshop surveys were using a scale with the following 5 choices: strongly disagree, disagree, either agree nor disagree, agree, and strongly agree.
4.3.3 Content Analysis of Broader Impacts Statements in Abstracts

To increase knowledge about broader impacts components of successful NSF proposals, SP@ISU contracted with ISU’s Research Institute for Studies in Education (RISE) to conduct a content analysis of Broader Impacts statements in abstracts of funded NSF proposals from 2007-2011 submitted by ISU. The results of the analysis document that the use of broader impacts language and wording has increased over time but that some areas of broader impacts are more frequently addressed than others. SP@ISU and the researchers at RISE are recommending the analyses be expanded to compare broader impacts statements of funded and unfunded proposals submitted by ISU. (IRB approval has been obtained from ISU to request copies of funded and unfunded grant applications from ISU faculty.)

SP@ISU should proceed with the additional content analyses of broader impacts statements of unfunded NSF proposals for purposes of comparison with the analysis of funded proposals. Knowledge arising from the content analyses should be used to inform the activities of SP@ISU and can be disseminated to other institutions.

4.4 Goal #4: Develop protocols for assessment and evaluation of a faculty member’s broader impacts initiatives for inclusion in the promotion and tenure process.

To institutionalize a university culture that values broader impacts activities, it is critical to develop protocols for including a faculty member’s broader impacts contributions in the promotion and tenure process.

The upper administration at ISU clearly support including a faculty member’s broader impacts initiatives in the promotion and tenure process. The support of the upper administration is critical for bringing about such a cultural shift. Moreover, faculty, administrators, and other stakeholders mentioned that a culture that values broader impacts is also consistent with ISU’s mission as a land-grant university.

Interviews with upper administration, deans, and department chairs suggest agreement that the Position Responsibility Statement (PRS), which forms the basis upon which faculty are evaluated, can incorporate broader impacts activities. The challenge will be working with departments and colleges so that such activities are valued and included in the PRS. Administrative partners (deans, department chairs) noted that department culture is critical for determining whether broader impacts activities are valued and that true change would require not only that broader impacts activities be included in the PRS but that department culture also value the broader impacts activities, especially the senior faculty who will be voting on tenure and promotion cases. Possible concerns that requirements may be “watered down” if broader impacts activities are included should be addressed to increase faculty and administrator support.

To achieve Goal #4, SP@ISU might consider developing guidelines or best practices with strategies for including broader impacts activities in the PRS and the promotion and tenure
process. Criteria for what counts as broader impacts activities and the weight or value attached to activities is likely to vary across departments, but broad guidelines would be useful for helping departments develop mechanisms for valuing broader impacts initiatives. The SP@ISU Project Team, Equity Advisors, and Faculty Leaders will be critical for creating buy-in for developing protocols for assessing and evaluating broader impacts activities in the promotion and tenure process.

The Office of the Associate Provost for Academic Personnel and Chief Diversity Officer has monthly chair development workshops and Dr. Bratsch-Prince may be willing to include a session on broader impacts, such as the role of the chair in promoting a broader impacts culture. SP@ISU should continue meeting with Dr. Bratsch-Prince to find ways to partner to educate chairs and build support for SP@ISU goals.

4.5 SOCIAL NETWORK ANALYSIS

SP@ISU’s Internal Assessment Coordinator, Jason Pontius, will be using Social Network Analysis to identify faculty with high levels of connectivity with other faculty through grants. SP@ISU intends to target highly-connected individuals for spreading information and knowledge about broader impacts and the resources that SP@ISU brings to help faculty develop integrated broader impacts plans with their research. The Social Network Analysis will also be used to measure changes in collaboration over time in order to (a) identify if faculty collaboration on grants has increased and (b) identify if faculty who participated in SP@ISU activities are more likely to collaborate than those faculty who did not participate.

In addition to the proposed uses of the Social Network Analysis above, it can be used to examine whether there is an increase in the involvement of non-STEM faculty in STEM-funded research as broader impacts experts and whether there are increases in faculty connections with broader impacts partners.

The Social Network Analysis is an innovative and very promising area of evaluation and original research. The analyses and findings are likely to be of interest to other universities and hence have the potential to help position ISU as a leader in faculty development pertaining to broader impacts activities.

4.6 OTHER FINDINGS

The SP@ISU team is exceptionally strong. Stakeholders repeatedly brought up unsolicited comments regarding how much faith they have in the SP@ISU team. Moreover, the change in Program Director early in the first year did not derail the project’s progress nor dampen the engagement of the ISU community toward the project’s goals.

In Year 2, it is critical to improve the visibility of SP@ISU and articulate its goals:

- SP@ISU Project Team, Equity Advisors, and Faculty Leaders need to aggressively
Interviewees felt the following methods of communication would be especially beneficial:

- Brief (5-10 minute) presentation at department faculty meetings, university faculty meetings, Council of Deans meetings, President’s Council meetings, cabinet meetings, department chair meetings, and grant coordinator meetings
- Brief presentation and packet of information distributed at orientation for new faculty
- College-level mentoring programs (or other mentoring programs) can also be a vehicle for faculty-to-faculty distribution of information about SP@ISU and broader impacts resources
- Press releases and articles in campus media

- Seek links to the SP@ISU website from related university sites, in particular the Office of Sponsored Programs Administration and the Office of the Vice President for Research and Economic Development.
- There is still some confusion in the broader ISU community of the distinction between ADVANCE and SP@ISU. SP@ISU team members, Equity Advisors, and Faculty Leaders can help clarify the differences in their communications about the program. Increasing the visibility and marketing of SP@ISU will also help clear up any confusion.

A key evaluation task for Goals #2 and #3 for SP@ISU will be to determine whether faculty are using the SP@ISU resources and if so, how the resources affect their ability to develop well-researched broader impacts plans as part of their research enterprise. A key desired measure is whether SP@ISU is helping faculty improve their ability to develop strong broader impacts plans and hence increasing their ability to secure NSF funding. SP@ISU has received IRB approval to use information from the OSPA “Gold Sheet” to contact faculty for copies of submitted NSF proposals including NSF reviewer comments, if available. SP@ISU’s Internal Evaluation Team plans to use the information to conduct Mock Review Panels to track the ability of ISU faculty to review broader impacts plans. In addition, I recommend that the SP@ISU team discuss the possibility of using Gold Sheet data to inform the evaluation in the following additional ways:

- Gold Sheet data can be used to compare funding success of faculty who participated in SP@ISU activities and those who did not (i.e., Are faculty who have participated in SP@ISU activities more likely to receive NSF funding than those who did not participate?)
- Gold Sheet data can be used to compare NSF reviews of broader impacts statements for faculty who participated in SP@ISU activities and those who did not (i.e., Do faculty who participated in SP@ISU activities receive more favorable reviewer comments to their broader impacts plans than those who did not participate?) Devising strategies for measuring reviewer comments for broader impacts plans is far from straightforward, but the team should discuss whether to attempt to initiate this type of analysis. When the team initiates requests to PIs for copies of proposals for the Mock Review Panels, they might want to look at the broader impacts plans and reviewer comments to see if it would be wise to attempt to measure or categorize reviewer comments on broader impacts plans.
Continue tracking program participation. Information on participation will be critical for comparing the outcomes of faculty who participate and those who do not participate in SP@ISU activities.

Depending on the demands of the content analysis and management of the data from the Gold Sheets, Jason Pontius may need assistance from a graduate student. The project team should periodically check with him to discuss whether any additional support is necessary.

4.7 Scope of Impact

To gauge who participated in SP@ISU during the first year, Table 2 presents characteristics of participants. Participants include those who attended a focus group,

<table>
<thead>
<tr>
<th>Rank:</th>
<th># Participated</th>
<th>% of Total Participants</th>
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</thead>
<tbody>
<tr>
<td>Assistant Professor⁵</td>
<td>45</td>
<td>46%</td>
</tr>
<tr>
<td>Associate Professor</td>
<td>14</td>
<td>14%</td>
</tr>
<tr>
<td>Professor</td>
<td>13</td>
<td>13%</td>
</tr>
<tr>
<td>Postdoc Associate</td>
<td>6</td>
<td>6%</td>
</tr>
<tr>
<td>Graduate Student</td>
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<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td>19</td>
<td>19%</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>College:</th>
<th># Participated</th>
<th>% of Total Participants</th>
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</thead>
<tbody>
<tr>
<td>Agriculture &amp; Life Sciences⁶</td>
<td>11</td>
<td>11%</td>
</tr>
<tr>
<td>College of Human Sciences</td>
<td>8</td>
<td>8%</td>
</tr>
<tr>
<td>Engineering</td>
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<td>20%</td>
</tr>
<tr>
<td>Liberal Arts and Sciences</td>
<td>37</td>
<td>37%</td>
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<tr>
<td>Veterinary Medicine</td>
<td>6</td>
<td>6%</td>
</tr>
<tr>
<td>Business, Design (combined)</td>
<td>3</td>
<td>3%</td>
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<tr>
<td>Other (e.g., Partner Programs)</td>
<td>15</td>
<td>15%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex:</th>
<th># Participated</th>
<th>% of Total Participants</th>
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<tbody>
<tr>
<td>Female</td>
<td>37</td>
<td>37%</td>
</tr>
<tr>
<td>Male</td>
<td>62</td>
<td>62%</td>
</tr>
</tbody>
</table>

| # Participating in More Than One Event | 15 | 15% |
| TOTAL:                                 | 99 | 100% |

⁵ Assistant Professor includes tenure-eligible Assistant Professors and non-tenure-eligible Assistant Professors (Adjunct, Affiliated, Research Assistant Professors).

⁶ One faculty member is listed in the ISU directory as belonging in both ALS and LAS. This person is included here in both colleges.
study circle, workshop, webinar, or received one-on-one assistance from SP@ISU. In the first year, 46% of participants were at the rank of Assistant Professor, with graduate students and postdocs comprising the smallest percentage of participants (2% and 6%, respectively). Liberal Arts and Sciences faculty comprised the largest percentage of participants (37%), followed by Engineering faculty (20%). 62% of participants were male and 15% participated in more than one event.

Table 3 presents data on SP@ISU faculty participation, as a percentage of eligible ISU tenured and tenure-eligible faculty. Participation was highest among Assistant Professors, with 14% of all tenure-eligible Assistant Professors at ISU participating in at least one SP@ISU event. At the college level, participation was highest in Engineering, with 10% of faculty participating, followed by the College of Human Sciences and the College of Liberal Arts and Sciences, both with 7% of total faculty participating.

<table>
<thead>
<tr>
<th>ISU Total</th>
<th># Participated</th>
<th>% Participants</th>
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</thead>
<tbody>
<tr>
<td>Rank:</td>
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<tr>
<td>Assistant Professor</td>
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<tr>
<td>Associate Professor</td>
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<td>Professor</td>
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<td>13</td>
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<tr>
<td>College:</td>
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</tr>
<tr>
<td>Agriculture &amp; Life Sciences</td>
<td>272</td>
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<tr>
<td>College of Human Sciences</td>
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<td>Engineering</td>
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<td>18</td>
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<td>Liberal Arts and Sciences</td>
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<td>32</td>
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<td>21</td>
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<tr>
<td>Male</td>
<td>925</td>
<td>49</td>
</tr>
<tr>
<td>TOTAL:</td>
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<td>70</td>
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Collectively, Tables 2 and 3 indicate that in terms of event participation, SP@ISU has had the greatest potential impact on Assistant Professors. 14% of all Assistant Professors at

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7 Participation data was not collected for the first workshop, but includes all other workshops.
8 The higher percentage of men as participants is likely a result of their larger proportion among ISU faculty. Table 3 indicates that men and women faculty are equally likely to participate, based on their representation.
9 Iowa State University Fact Book 2010-2011: www.ir.iastate.edu/factbk.html
10 One faculty member is listed in the ISU directory as belonging in both ALS and LAS. This person is included here in both colleges.
ISU participated and they comprised 46% of all SP@ISU participants. At the college level, the scope of impact is highest in Engineering and in the Liberal Arts and Sciences. While tenured faculty are involved in ways other than participation in events (such as Faculty Leaders and members of the project team), and while participation in SP@ISU events is not the sole indicator of faculty support for SP@ISU goals, as SP@ISU moves beyond its first year, engaging more Associate and Full Professors will be necessary to help bring about the cultural shift toward valuing broader impact activities and the facilitation of the knowledge base needed to help faculty develop well-research broader impact plans.

5. CONCLUSIONS AND RECOMMENDATIONS

In its first year, SP@ISU has achieved some significant accomplishments, most notably:
- Evidence of interest in SP@ISU goals and support for the goals among faculty, administrators, and partners
- Extremely innovative research is being conducted to examine broader impacts statements in abstracts of funded grants and to employ network analysis to identify highly-connected faculty to guide communication efforts and evaluate progress toward program goals
- Establishing a web site with rich content, including a database of campus programs that work with broader impacts initiatives
- Partnership with SBRS to provide a central place on campus to support REU evaluation and increase program assessment
- Implementing a series of workshops and webinars to increase knowledge of broader impacts criteria, components of successful NSF proposals, and awareness of campus partners involved in broader impact activities
- Appointment of Faculty Leaders and Equity Advisors to guide the development of a broader impacts culture

The following recommendation are intended to build on the successful first year, assist with the implementation of new and continued program activities, and establish effective metrics from which to evaluate progress toward program goals. Key recommendations by broad typical area and/or activity include:

Continue to strengthen connections with campus partners:
- Partners are excited about working with SP@ISU, but are unsure of what a mature partnership will look like. Meet one-on-one with major partners to discuss common goals and ways that SP@ISU can better connect partners with each other and with faculty member’s broader impact activities.

Equity Advisors and Faculty Leaders:
- Hold a group meeting with Equity Advisors and Faculty Leaders to provide guidance as they transition into their new (or expanded) roles. They can discuss ideas, talking points, concerns, and strategies for helping SP@ISU achieve its
goals. The group should decide if it wants to continue to meet on a regular basis and if so, how often.

- Discuss ways of documenting the activities of the Equity Advisors and Faculty Leaders.
- Equity Advisors and Faculty Leaders should continue to articulate the difference between ADVANCE and SP@ISU.
- Equity Advisors and Faculty Leaders will play a critical role in building support for a culture that values broader impacts by faculty and recognizes broader impacts activities in the tenure and promotion process. They should engage in dialog with department chairs, deans, and faculty as to the benefits of a broader impacts culture, and ways to include broader impacts activities in the promotion and tenure process in a meaningful way that does not “compromise” current standards.

Workshops and Webinars
- Evaluation forms should be filled out at events (rather than online post-event) to increase response rates.
- Better align evaluation questions with project goals and major evaluation questions to measure the impact of activities on SP@ISU goals (see p. 10-11).
- Continue to collaborate with the Office of the Associate VP for Research (and other offices) to provide workshops on grant-writing and topics that can address broader impacts.

Content Analysis
- Expand analyses to include broader impacts of ISU’s unfunded NSF proposals.
- Use results from analyses to inform SP@ISU activities.

Groundwork for Including Broader Impacts Activities in Promotion and Tenure Process:
- Continue to work with deans, department chairs, and faculty to discuss ways of incorporating broader impacts activities in the tenure and promotion process and building support for their inclusion.
- Work with administrators and faculty to develop guidelines or best practices for incorporating broader impacts activities in the PRS and tenure and promotion process.
- Work with the Office of the Associate Provost for Academic Personnel and Chief Diversity Officer to hold chair workshops and devise other strategies for engaging chairs in the process of developing a culture that values broader impacts activities and rewards them in the tenure and promotion process.

Social Network Analyses
- Identify highly-connected faculty and target them for information about SP@ISU’s goals and resources. Highly-connected faculty may also be good candidates to serve as broader impacts mentors or consultants.
- Proceed with proposed analyses to measure changes in collaboration over time and whether faculty who participated in SP@ISU activities are more likely to collaborate.
• Discuss how social network analysis can be used to inform other program goals (increase in faculty connections with broader impacts partners, increased involvement of non-STEM faculty as broader impacts experts, etc.).
• Share findings with other institutions, helping to position ISU as a leader in broader impacts activities and measurement

Improve Program Visibility
• Continue to make brief presentations at events such as department and university faculty meetings, Council of Deans meetings, President’s Council meetings, cabinet meetings, new faculty orientations, faculty mentoring programs, and grant coordinator meetings.
• Seek press coverage in campus media.
• Seek links to the SP@ISU website from related university sites, in particular the Office of Sponsored Programs Administration and the Office of the Vice President for Research and Economic Development.

Increase involvement of tenured faculty
• Tenured faculty play a critical role in bringing about a cultural shift in valuing broader impacts activities. Incorporate them in as many program activities as possible and draw upon their expertise. In addition, some may be willing to serve as broader impacts mentors or consultants.

In conclusion, SP@ISU is off to a strong start and has the potential for establishing itself as a national leader in the development of a broader impacts culture that enhances faculty development, increases research productivity, and strengthens partnerships (a) between different campus broader impacts programs, and (b) between broader impacts programs and faculty.
Appendix B

Joint Annual Meeting 2012 Poster
Creating Synergies to Broden Participation at Iowa State University

BP Program Partners

Iowa EPSCoR helps prepare a skilled and diverse workforce that can meet the needs of industry, academia, educators and government, and attract new businesses to Iowa.

ISU ADVANCE focuses on the recruitment, retention, and advancement of women and women of color in STEM fields to positions.

EDGE@ISU strengthens the ability of women, especially those in minority groups, to successfully complete graduate programs in the mathematical sciences.

INSPIRE@LSAMP is developing a model for Midwest colleges and universities to attract the state’s growing STEM population into STEM fields in Iowa, Illinois, and Indiana.

The Program in Women in Science and Engineering aims to increase the number of women in STEM disciplines by delivering a broad array of programs for females in grades K-12 and for students underrepresented in STEM fields.

The Ronald E. McNair Post-Baccalaureate Achievement Program aims to increase the number of underrepresented, low-income, and first-generation college students who receive a Ph.D.

Science Board programs and empowers Iowa ethnic minority middle and high school students to earn college degrees and pursue careers in the sciences.

Broader Impacts Fair

Coverage of Broader Impacts Categories

<table>
<thead>
<tr>
<th>Reference(s)</th>
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<tr>
<td>Discovery</td>
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<td>Engagement</td>
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Coverage of Broader Participation Subcategories

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<tr>
<td>Outreach</td>
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<tr>
<td>Service</td>
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</table>

Broader Impacts Statements in Abstracts

The purpose of this study is to understand how broader impacts are captured in proposal abstracts. Using qualitative content analysis, 464 NSF grant abstracts for funded awards were examined for the types and frequency of broader impacts language.

The participation of underrepresented groups was mentioned a total of 63 times and had a coverage percentage of 3.22. Analysis of these 33 statements revealed subcategories of ways in which researchers mentioned broadening the participation of underrepresented groups: recruitment and providing research and/or education opportunities to underrepresented minorities. While several statements mentioned broadening participation, the majority used broad language such as “diverse group” or “underrepresented groups.”

Evaluation

A Model for Aggregated Assessment of Broader Impacts Activities

SP@ISU has partnered with Behavioral and Social Research Services (BSR) to provide a centralized place on campus that can support REU evaluation as well as peer resources from programs across campus to increase the assessment capability of any individual program.

This project offers ISU the capacity to create a larger database of students who participate in summer research programs and track them longitudinally.

Grant No. HRD-0963584, July 2010 - 2015

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