

NSEC Annual Report 2017

Creating and Studying a National Network of
Centers of STEM Education: Developing
Foundational Infrastructure for Educational
Transformation
Award #1524832

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STEM education centers (SECs) serve as the hubs of campus-based efforts to transform undergraduate STEM education. They are positioned to serve as unique and powerful agents to **scale evidence-based practices and programs that support student success in STEM across departments, colleges, and institutions**. Centers are the primary locus for translating research into practices and programs that support the success of students (majors, non-majors, and future teachers) in STEM.

The purpose of the Network of STEM Education Centers (NSEC) is to support and amplify the work that STEM Education Centers are doing to improve undergraduate education by:

- 1) Building a learning, research, and implementation network for centers via conferences, workshops, communications, staff interactions, and an online platform.
 - NSEC Conferences and Workshops – 5 national conferences including 99 centers; with additional 5 national workshops, webinars and other community-building efforts.
 - Listserv of 300+ members from 149 institutions
- 2) Showcasing, celebrating, and understanding the work of centers that are transforming undergraduate STEM education via case studies, research on center impacts, and center profiles.
 - NSEC has a robust and growing web presence: with 110 live [center profiles](#), a [STEM Education Innovation Database](#), resources, & news for the community and stakeholders,
 - Leading research on Understanding STEM Education Centers with 10 site visits, cross site analysis, case studies and currently developing a survey, piloted in the fall 2017 with full distribution spring 2018. Results will include a landscape analysis, productive models and resources.
 - Understanding the Formation of networks and best practices for building effective networks via national workshop and assembling tools for network leaders.
- 3) Serving as a resource and catalyst for centers, policy-makers, funders, administrators, and the public on what works in STEM education.
 - NSEC has built a [toolkit](#) for centers, providing resources for centers on core activities: communication, funding, organization, evaluation, partnerships.
 - NSEC has supported national meetings on [Teaching and Learning Centers and SECs](#), [Diversity and Inclusion in STEM](#), and an [inventory of state-wide STEM education](#).
- 4) Creating a coalition to address and engage in practices that are cross- and multi-institutional via seed grants for collaborative research and implementation proposals.

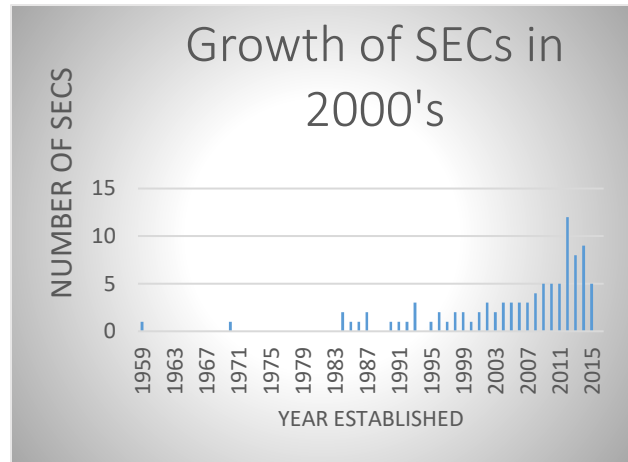
NSEC has supported major STEM education community transformation communities: a [network for RETs](#), a [coalition for cross-DBER work](#), the [inventory of state-wide STEM education](#) efforts, and forming efforts in disciplines and community college partnerships.
- 5) Collectively working to improve institutional and national policies which strengthen undergraduate STEM education

NSEC collaborates with National Academies, disciplinary societies, and professional organizations (AAU, ASCN, BVA, CIRTL, NABI, QUBES, POD, and others), to advance and advise on national issues in STEM education.

NSEC is building a community of centers that helps address key needs of centers, university administrators, funders, policymakers, and national constituents.

NETWORK OF STEM EDUCATION CENTERS

STEM education centers (SECs) serve as the hubs of campus-based efforts to transform undergraduate STEM education. They are positioned to serve as unique and powerful agents to **scale evidence-based practices and programs that support student success in STEM across departments, colleges, and institutions**. Centers are the primary locus for translating research into practices and programs that support the success of students (majors, non-majors, and future teachers) in STEM.



While undergoing tremendous growth and attention presently, such units for institutional change and capacity building have long-standing history on our campuses. One of the first SECs emerged in 1959, but SECs have rapidly expanded since 2009.¹

Only recently has a network of such centers formed – the Network of STEM Education Centers (NSEC, 2016), supported by the National Science Foundation (#1524832) and the Association of Public and Land-grant Universities (APLU).

The purpose of the Network of STEM Education Centers (NSEC) is to support and amplify the work that STEM Education Centers are doing to improve undergraduate education by:

- 1) Building a learning, research, and implementation network for centers via conferences, workshops, communications, staff interactions, and an online platform.
- 2) Showcasing, celebrating, and understanding the work of centers that are transforming undergraduate STEM education via case studies, research on center impacts, and center profiles.
- 3) Serving as a resource and catalyst for centers, policy-makers, funders, administrators, and the public on what works in STEM education via a national online platform of effective practices and programs, directory of experts in STEM education, and research on effective center and institutional practices, and center impacts.
- 4) Creating a coalition of actors that can address and engage in practices that are cross- and multi-institutional via seed grants for collaborative research and implementation proposals.
- 5) Collectively working to improve institutional and national policies which strengthen undergraduate STEM education through guiding documents, participation in national dialogues, and policy statements.

¹ Data is from 93 centers that have completed profiles at [NSEC](#). It does not capture all SECs that currently exist or that have been established but no longer exist.

NSEC seeks to support the community of STEM education centers emphasizing campus-based efforts to transform undergraduate STEM education. These centers are expanding across the country due to their successes in broadening participation in STEM, fostering university-community relations, improving undergraduate retention and success, raising institutional profiles, and increasing the success of research grants.

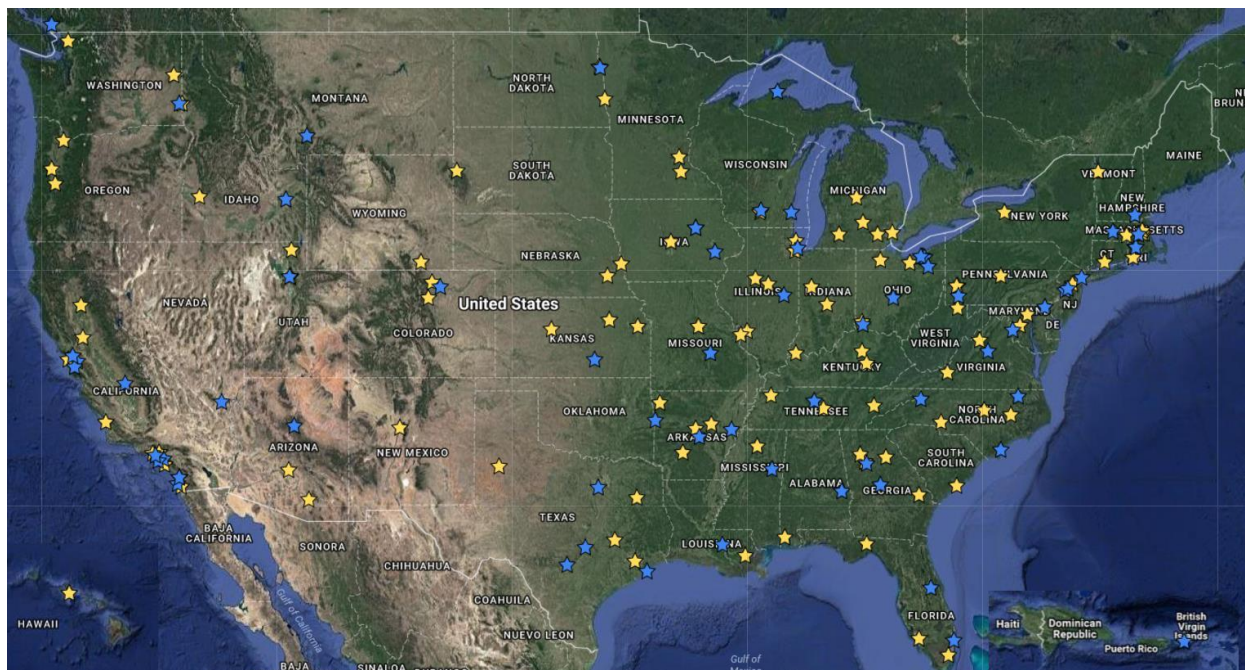


Figure 1. Centers in the Network of STEM Education Centers (NSEC).

Yellow stars are institutions with centers that have a profile at NSEC. Blue stars are institutions that have attended a conference or joined the NSEC listserv. NSEC currently links 201 STEM Education Centers/Institutes/Programs (SEC) at 163 institutions (from 297 SECs at 218 institutions identified to date).

NSEC is building a community of centers that helps address key needs of centers, university administrators, funders, policymakers, and national constituents.

Centers

NSEC supports centers' needs for community and networking; increased institutionalization; sustainable funding; resources, strategies, and tools; and access to national discussions on supporting transformation of undergraduate STEM education. This network of centers provides:

- Collective expertise for what works
- Opportunity to share best practices and dialogue
- Professional Development
- Illustrative examples of what is working to help to guide process
- Opportunity to share, celebrate, and promote success
- Opportunity to share different metrics for success and communication and advocacy tools
- Guidance on how centers are successfully growing and/or narrowing/focusing their mission.

University leadership

To increase institutionalization and legitimacy of these centers, NSEC is building a network that university administrators highly value because of the richness of cross-institutional learning; research on center impacts that support investments in these organizations; access to funders; and national recognition via their center's accomplishments.

Funders/Policy-makers

To support funders, policy-makers, and external constituents, NSEC is leveraging the vast expertise of the community of centers to help solve national challenges in education and are implementing these solutions at scale across the network of centers. We seek to establish SECs as critical partners for supporting transformation of undergraduate STEM education.

See Appendix 2 for the logic models for how NSEC can engage centers, administrators, and policymakers.

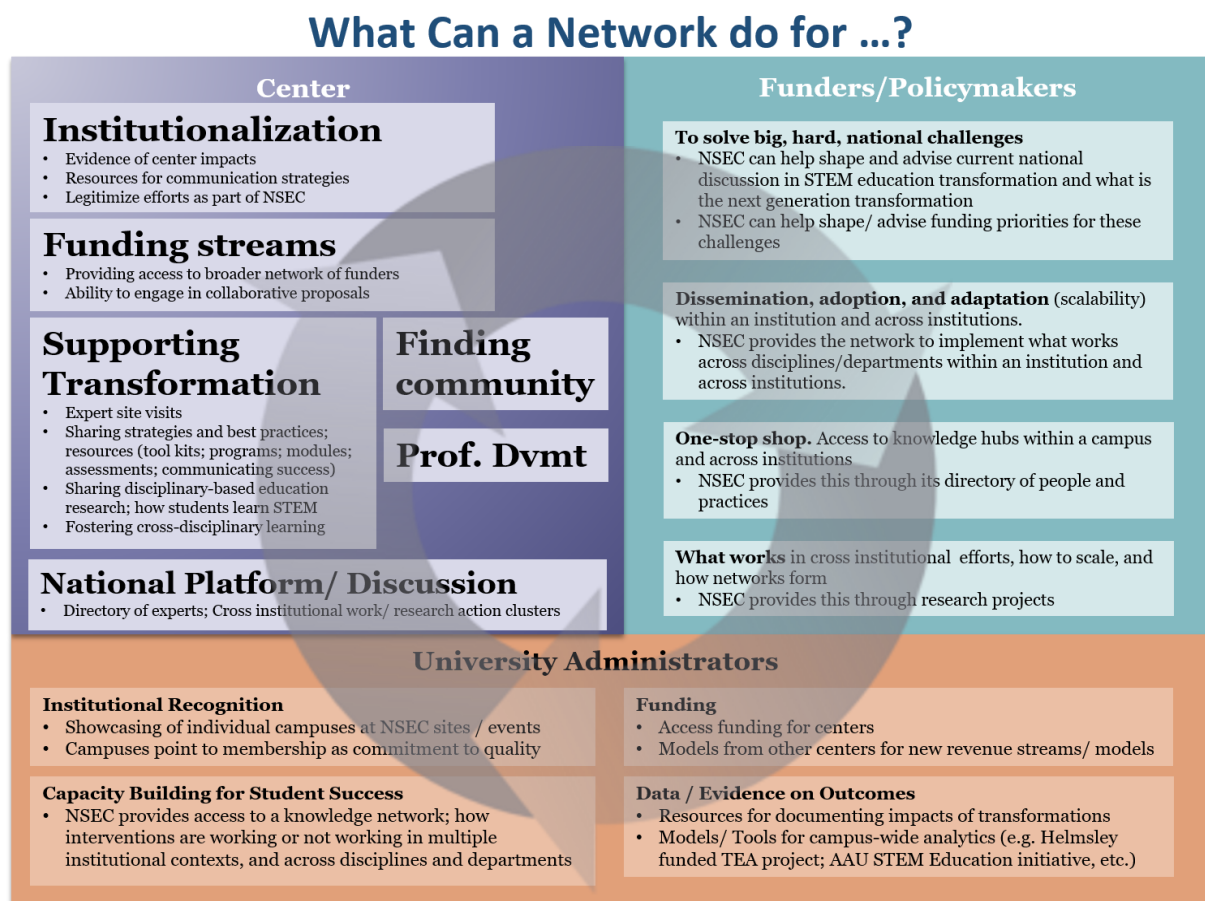


Figure 2. Benefits of NSEC, defined by stakeholder community

A preliminary analyses of center profiles yielded these insights on the **missions of SECs**:

- STEM centers work with their institutions to contextualize undergraduate STEM education needs of our nation from K-12 education into higher education and the workforce.
- STEM education centers facilitate innovation through research activities to identify evidence-based best practices for teaching and learning, often in collaboration with other research institutes. Common research foci include strengthening gateway courses, increasing student persistence, and inclusive teaching pedagogy.
- STEM education centers disseminate knowledge and support the application and implementation of new knowledge and practices for individuals, into classrooms, and across programs by providing training, consultation, and professional development services.
- STEM education centers advocate for change in policy at the institutional, state, and national level that will lead to improved outcomes for STEM education.

While SECs have a variety of foci, NSEC has a particular focus on supporting the community of STEM education centers transforming undergraduate STEM education.

Major themes for centers include:

- Unify efforts to foster STEM identity and career awareness
- Striving to make STEM education accessible and equitable for ALL students K-16
- Making significant contributions through the scholarship of teaching and learning (SoTL) and discipline-based ed research

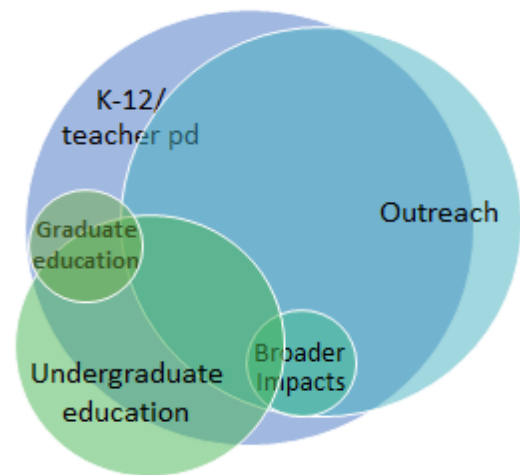


Figure 3. Centers have multiple, overlapping missions.

Analysis from 2016, of the 100 profiles at NSEC, 78% indicated a role in teacher preparation; 70% a role in outreach; 47% improving undergraduate STEM education; 20% graduate education; and 19% broader impacts.

Center Audiences Include

- Faculty, for professional development and instructional support
- Faculty and staff, for grant-seeking support
- Principal Investigators, for assistance with broader impact projects
- Teachers, for preparation and professional development
- K-12 students, teachers, and local citizens, as part of public outreach
- Research projects with faculty from different campus units
- Internal and external projects, through evaluation support

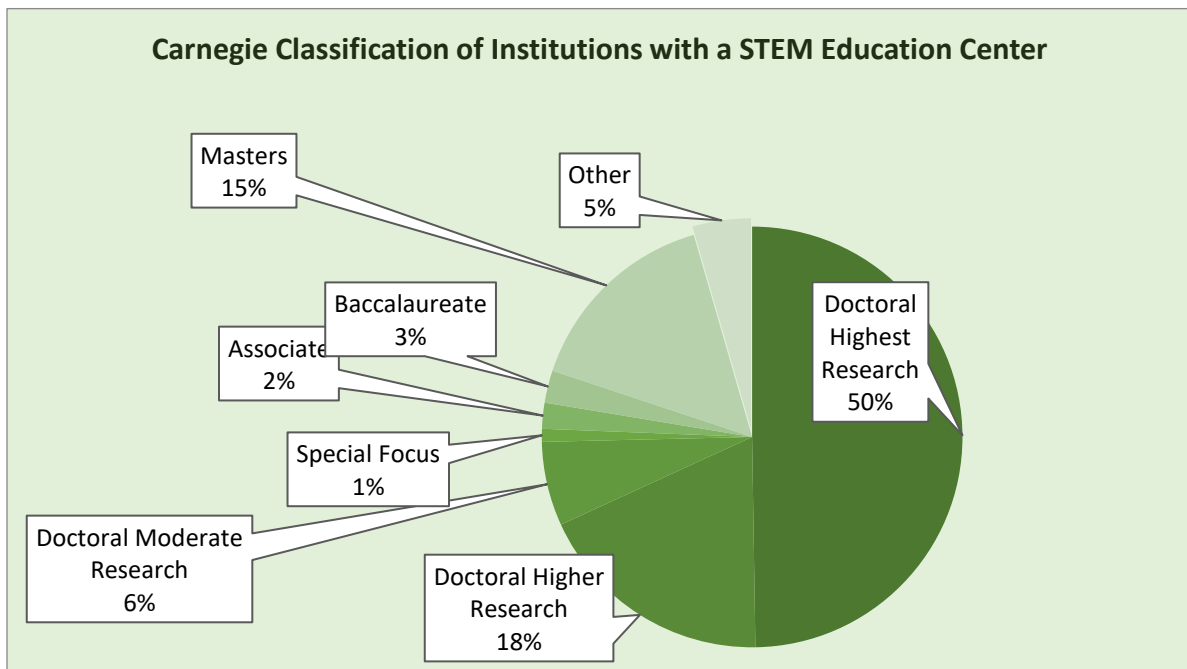
- Play an important role in sustaining national, regional, and local STEM education initiatives
- Emerging in a critical role that improves the cohesiveness of undergraduate STEM programs
- Link efforts and build partnerships/relationships.

Centers report to the following units (by % of center profiles in NSEC):

- Dean College of Science (CoS): 24%
- Dean College of Education (CoE): 19%
- Provost: 17%
- Vice Provost for Research: 11%
- Other: 10%
- Joint Deans of CoE and CoS: 10%
- Cross-institutional: 4%
- Engineering: 3%
- Unknown: 2%

STEM Education Centers are most often housed at Doctoral granting institution.

- 74% of centers are at doctoral granting institutions (50% highest, 18% higher, 6% moderate)
- 15% are at Master’s granting institutions
- 6% are at Bachelor’s, Associate’s, or Special-Focus schools
- 5% are university systems, national labs, or state-wide networks.



Building a learning, research, and implementation network for Centers

NSEC Conferences and Workshops – 5 national conferences with 99 centers

NSEC has held five national convenings with centers: in [2013](#); [2014](#); [2015](#); [2016](#); and [2017](#). In 2015, APLU and NSEC held a [Sloan-funded workshop](#) on engaging senior faculty in upper division course reform. We held a joint [workshop](#) with POD in November of 2015 with the purpose of exploring how Centers for Teaching and Learning and STEM Education Centers could more effectively collaborate. In 2017, we held a joint [workshop](#) with ASCN (Accelerating Systemic Change Network) on Diversity and Inclusion.

From 2015-2017, 99 centers have been represented at one of the national conferences. For the NSEC 2017 National Conference, attendees represented 60 institutions and 53 centers. More than 50% of the attendees in 2017 and 2016 had attended at least two of the NSEC conferences from 2015-2017.

Listserv of 300+ members from 149 institutions

NSEC has a listserv of 311 members (149 institutions, 176 centers). The listserv provides an avenue mostly for broadcasting information about NSEC (conferences, publications, etc.), national efforts and resources (National Academies, etc.), and resources from Centers (job postings, requests for information, etc).

Showcasing, celebrating, and understanding the work of centers that are transforming undergraduate STEM education

NSEC has a robust and growing web presence:

- The site has been visited by 6,649 unique visitors with 36,344 page views.
- There are 110 live [center profiles](#), with 2044 visitors, it is the second most viewed page on the site after the front page.
- NSEC has a [STEM Education Innovation Database](#) with 18 practices.
- The site also has news and job announcements and the ability to have private working spaces.

Understanding Centers – Research led by Gabriela Weaver and Deborah Carlise

Gabriela Weaver and Deborah Carlisle, University of Massachusetts, lead one of the major research foci of the NSF funded grant in NSEC, which is to study the nature of STEM Education Centers in higher education. The goal of this research study is to create a taxonomy of such centers, identify commonalities, unique features, as well as how they compare to teaching and learning centers and other forms of institutional response to higher education transformation in STEM (such as new associate vice chancellor positions).

For research area I, on center structure and function, interview and observation protocols have been finalized and **ten site visits** have been conducted. Analyses for individual centers are currently being completed and case studies are iteratively being constructed. Outcomes of these case studies will specifically illuminate areas where centers create, scaffold, and catalyze programmatic practices and/or utilize a set of best practices in STEM education among departments and across colleges, coordinate STEM activities, and act as a clearinghouse for information dissemination. Importantly, case studies will allow us to describe strategic areas where STEM Education Centers (SEC's) and Centers for Teaching and Learning (CTL's) are currently working together to increase efficiency and broaden adoption of evidence based practices to yield a greater impact and to sustain efforts directed toward the improved competency of undergraduate STEM students.

Cross-case analyses are also underway to identify patterns across centers, in different institutional contexts. These patterns will highlight the strengths of center work and how this pertains to the challenges these centers are addressing. The analyses will include the ways in which departments are engaging with centers and the perceived value of these centers by upper administrators.

The research team is completing case studies and developing a survey, which will be piloted in the Fall 2017 with full distribution to the NSEC community in Spring 2018.

Studying the formation of networks – Research led by Bruce Goldstein

Bruce Goldstein, University of Colorado Boulder, and his research team are studying how networks in STEM Education form and best practices for standing up and sustaining such networks. The Transformative Learning Networks report, which is being formatted for distribution on the project website, considers how learning networks build capacity for system transformation. Additionally, we are developing a netweaving toolkit, which was informed by the Network Leaders Workshop held in June 2017.

Serving as a resource and catalyst for centers, policy-makers, funders, administrators, and the public on what works in STEM education

Toolkit for Centers

NSEC has built a toolkit for centers, beginning with a workshop on building a toolkit for centers on June 10, 2016, with 29 participants. The topics include: Communicating Mission and Vision; Organizational Structures; Funding and Resources; Evaluation and Assessment; Building Partnerships. The toolkit is here: <https://serc.carleton.edu/StemEdCenters/toolkit/index.html>.

Workshop on effective collaborations with Centers for Teaching and Learning

The “[Collaborating at the Centers](#)” workshop brought together participants from two distinct types of higher education centers, which are emerging as important campus contributors to national undergraduate STEM education improvement efforts: **Centers for Teaching and Learning (CTLs)**, and **STEM Education Centers (SECs)**. Together, the POD Network and NSEC received funding from NSF (#1552540) to convene the workshop following the 2015 POD Network conference on November 8,

2015, near San Francisco, CA. The goal of the workshop was to introduce these communities and discuss areas of synergy.

From that workshop, the [Collaborating at the Centers](#) report is primarily intended for SEC and CTL directors and staff, university administrators who are interested in maximally leveraging the different kinds of centers on their campus, for network leaders in POD and NSEC, and for policymakers and funders interested in understanding how institutional structures/organizations are leading improved student success in STEM. Some of the key recommendations from the report include:

- Approach cross-unit collaborations by inviting everyone to the table, creating relevant leadership groups, and keeping stakeholders informed.
- Map the "territory of collaboration": identify common elements of mission, differentiated strategies, shared goals, strengths, stakeholders, expertise, resources, roles for each center, and benefits from participating in shared projects.
- Acknowledge stretched staffing and resources by articulating different possible modes of collaborating at various levels of commitment and normalizing different responses as helpful and not damaging to the centers' relationship.
- Record progress and make success visible.

Workshop on Diversity and Inclusion

NSEC co-hosted with ASCN the 2017 Workshop on Diversity and Inclusion on June 24-25, 2017, in New Orleans. The goal of the workshop was to advance a dialog on diversity and inclusion in undergraduate STEM education between practitioners transforming institutions (NSEC) and researchers who are studying systemic change at higher education institutions (ASCN). The Accelerating Systemic Change Network (ASCN) is a network of individuals and institutions, formed with the goal of more quickly advancing STEM education programs. ASCN brings together those who are researching systemic change at higher education institutions, with those who are making systemic change happen at their individual institutions.

The workshop featured five case studies of institutions that are making progress on increasing diversity and inclusion on their campuses. We used these case studies to stimulate discussion amongst all participants on what is working or not on their campuses. Short descriptions of the case studies are available here: https://ascnhighered.org/ASCN/SMTI_ASCN_2017/case_studies.html.

Inventory of Statewide STEM Networks/Partnerships

Susan G. Magliaro, VT-STEM-Virginia Tech, is leading a project to inventory STEM education statewide or regional networks or partnerships in the US. The inventory will include an analysis of features of each of these networks to determine the key elements (such as type of network, mission and goals, funding, staffing, evaluation plan, etc.); issues that impact successes and challenges; and, "lessons learned" from the field. The project will also create directory of STEM leaders in each state/territory who are willing to collaborate or consult with others regarding development of their own networks/partnerships. The project was funded as a Research Action Cluster in Fall 2016. Results are expected in Summer 2018. Read more here: <https://serc.carleton.edu/StemEdCenters/statewide-STEM>

Creating a coalition of actors that can address and engage in practices that are cross- and multi-institutional

Funded Research Action Clusters

Through the grant, NSEC funds 2-3 RACs each year. The purpose of the Research Actions Clusters is to seed work that has the potential to transform undergraduate STEM education by leveraging the unique capacities of centers or a network of centers. Proposals are sought that will lead to future work, such as collaborative proposals to NSF or other funders. Each selected RAC can apply for up to \$15,000 for the activities of the RAC for one year.

Applications for RACs must meet these criteria:

- span multiple campuses (university system/s) and includes evidence of institutional buy-in
- solve a problem that is hard to address as single campuses
- benefit the broader community (NSEC or nationally)
- focused enough that it can be conducted by a RAC
- leverages the unique capacities of centers or a network of centers
- come from participating NSEC institutions by [completing a center profile](#).

Results from the Collaborative Around Research Experiences for Teachers (CARET)

Eleven centers have formed a cross-institutional collaboration to understand and synthesize the research on teacher-researcher programs, to share goals and structures of their programs, and to develop collaborative research investigations on the impacts of these teacher-researcher programs. In Year 1 of funding, CARET developed a theory of change, logic model, common assessment framework, and common assessment instrument for teacher-researcher programs. In Year 2, CARET will submit for publication a 400-paper literature review, submit a NSF proposal, conduct preliminary analysis of shared metric data, and further refine the shared metric instruments. Read more about this RAC here:

<https://serc.carleton.edu/StemEdCenters/caret.html>

Results from the STEM DBER Alliance

In partnership with AAAS and with funding from the Helmsley Trust, we held a [meeting](#) of discipline-based education researchers (DBER) in November 2016. Our second meeting was hosted by HHMI in May 2017 with support from NSF (#1524832). Our third meeting was at the Transforming Research in Undergraduate STEM Education (TRUSE) Conference in July 2017. From these meetings, emerged a vision for a cross-disciplinary STEM DBER community that will advance and disseminate knowledge and theory that promote learning and success for all students across STEM fields. This community will address complex, cross-cutting research questions that can best be understood and addressed with theories that transcend disciplines. For example, how can STEM DBER scholars address issues of inclusion and diversity in their research and how can they help translate their research into pedagogical practices and curriculum that support learning for all students across disciplinary boundaries?

At its core, this STEM DBER Alliance will focus on undergraduate learning and teaching at 2- and 4-year colleges and universities, with links to K-12 and graduate education. STEM is broadly defined to include social and behavioral sciences. We currently have about 300 DBER scholars who have joined the STEM DBER Alliance (<http://www.trelliscience.com/DBER-A/>). We are exploring having AAAS be an umbrella organization for this community.

STEM DBER Alliance resources are here:

- Henderson, Charles, Mark Connolly, Erin L. Dolan, Noah Finkelstein, Scott Franklin, Shirley Malcom, Chris Rasmussen, Kacy Redd, and Kristen St John. "Towards the STEM DBER Alliance: Why we Need a Discipline-Based STEM Education Research Community." *International Journal of Research in Undergraduate Mathematics Education* (2017): 1-8. Available at <http://doi.org/10.1007/s40753-017-0056-3>
- Henderson, C., Connolly, M., Dolan, E. L., Finkelstein, N., Franklin, S., Malcom, S., Rasmussen, C., Redd, K. and John, K. St. (2017), Towards the STEM DBER Alliance: Why We Need a Discipline-Based STEM Education Research Community. *J. Eng. Educ.*, 106: 349–355. <doi:10.1002/jee.20168>
- Two-page flyer on STEM DBER Alliance: <goo.gl/2vJR28>
- More about this effort here: <https://serc.carleton.edu/StemEdCenters/Cross-DBER>
- We have added STEM DBER Resources to the STEM Education Center Toolkit: https://serc.carleton.edu/StemEdCenters/toolkit/DBER_resources/index.html . We asked the DBER community to share resources from within their discipline that may be of interest to education researchers outside of their discipline.

Newly funded RAC - The FEW-Nexus

This RAC was funded in Year 2 and will convene an invited workshop focused on DBER in the Food Energy Water (FEW)-Nexus. The purpose of this transdisciplinary 2-day workshop will be to develop a blueprint for systemic, high-impact DBER in the FEW-Nexus. The anticipated deliverables from this RAC are:

- Nationwide survey of FEW educators
- National Collaborative for Food Energy Water Education (NC-FEW) organizational summary document that has the mission/vision statement, 3 and 5-year workplans (including NC-FEW national conference, DBER projects), and recruitment plan
- Anticipated publication of a synthesis report of survey findings and the conference, preferably in a peer-reviewed STEM education journal, that reflects the current state of NC-FEW.

Collectively working to improve institutional and national policies which strengthen undergraduate STEM education

Webinar for National Academies committee on Developing Indicators for Undergraduate STEM Education

NSEC and ASCN held a joint webinar on September 29, 2016, to solicit feedback for the National Academies on this [Preliminary Draft on Developing Indicators for Undergraduate STEM Education](#). At the

time, the committee had not begun developing indicators, but rather sought public comments and suggestions on the draft framework. The purpose of the webinar was to seek this input from NSEC and ASCN members on an indicator system that would provide meaningful and useful information for the undergraduate STEM community.

Engagement with professional societies

NSEC continues to engage with other professional societies, both around member benefits and national policy issues. NSEC is currently seeking to establish closer ties with POD (though cross platform communication, joint programming, and exploring aligning of governance). In these discussions, one area of focus is common national policy interests. NSEC and the POD Network have previously collaborated to produce an NSF-funded workshop and report on strategies and methods of collaboration among SECs and CTLs (<http://podnetwork.org/connecting-centers-for-teaching-learning-with-stem-education-centers/>). Leaders from both organizations believe there are benefits for a longer-term partnership and have outlined proposed principles, goals, and actions for the two networks.

NSEC has also partnered with AAAS to develop the STEM DBER Alliance and to build on the NAS report on *Barriers and Opportunities for 2-Year and 4-Year STEM Degrees*.

We have strong alliances and regular communication with related national networks and organizations as well: Accelerating Systemic Change Network (ASCN), National Alliance for Broader Impacts (NABI), and the AAU STEM Education Initiative.

APPENDIX 1 – NSF GRANT # 1524832 – LEADERSHIP AND DELIVERABLES

Following seed-funding from the Alfred P. Sloan Foundation and building on 9 years of the Science Mathematics Teaching Imperative of APLU, the formation of NSEC is supported under grant #1524832 from the Improving Undergraduate STEM Education (IUSE) program of the National Science Foundation, and with support from the Association of Public and Land-grant Universities (APLU). There are three components of the grant:

- Build a network of centers – leads are Noah Finkelstein and Kacy Redd.
- Understand the roles of centers – leads are Gabriela Weaver and Deborah Carlisle.
- Study the formation of the network – lead is Bruce Goldstein.

Leadership

NSEC Management Team

Kacy Redd (PI and NSEC co-director)

Noah Finkelstein (co-PI and NSEC co-director)

Gabriela C. Weaver (co-PI)

Bruce Goldstein (co-PI)

Deborah Carlisle

Steering Committee

Steven Case

Laird Kramer

Marco Molinaro

Cailin Huyck Orr

Martin Storksdieck

External Evaluator

Nancy Shapiro

Advisory Board

Kenneth Furton

Charles Henderson

Cathy Manduca

Emily Miller

Mathew Ouellett

Susan Renoe

Linda Slakey

Pratibha Varma-Nelson

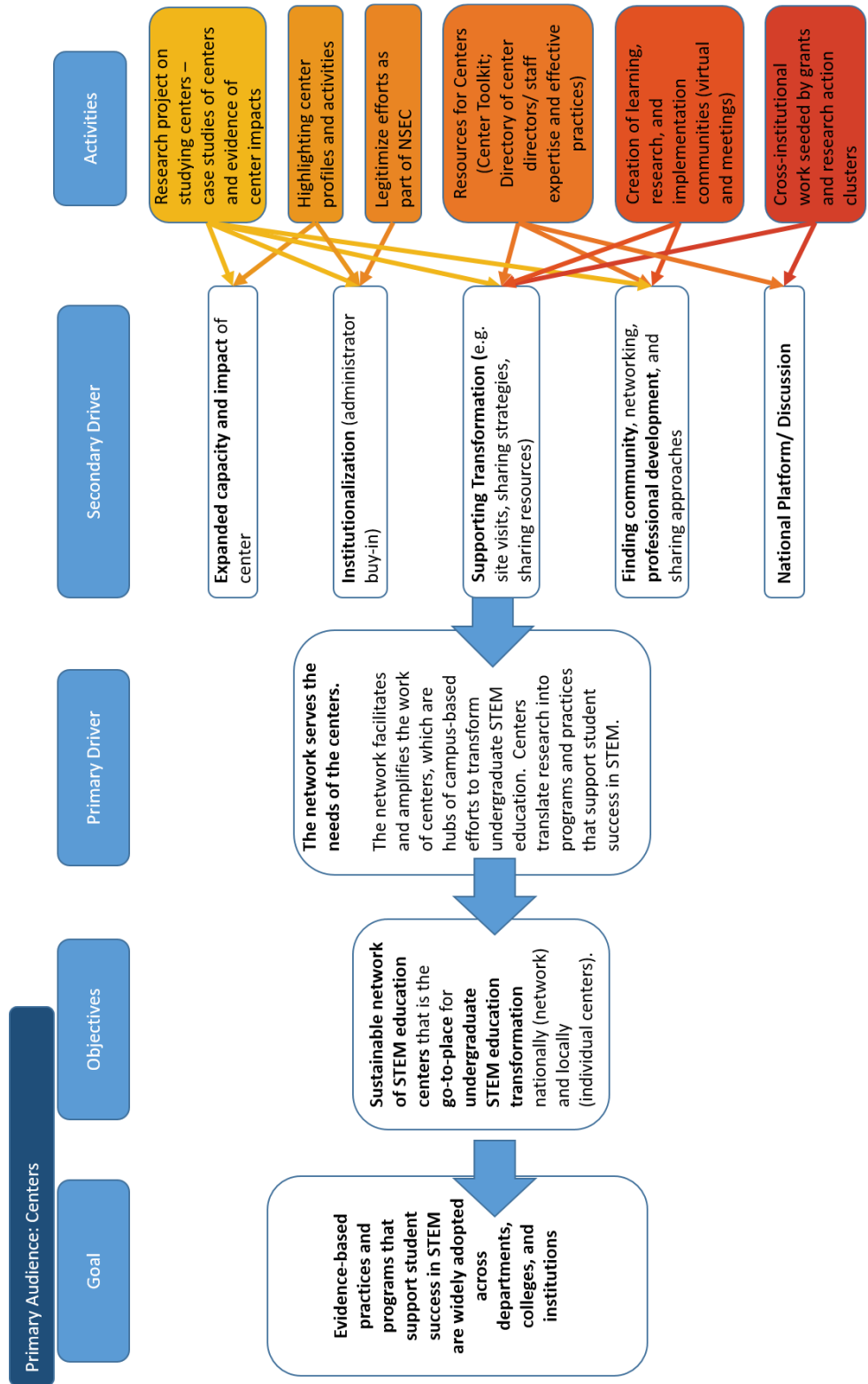
Deliverables (excerpted from the grant proposal)

The deliverables for the NSF grant include:

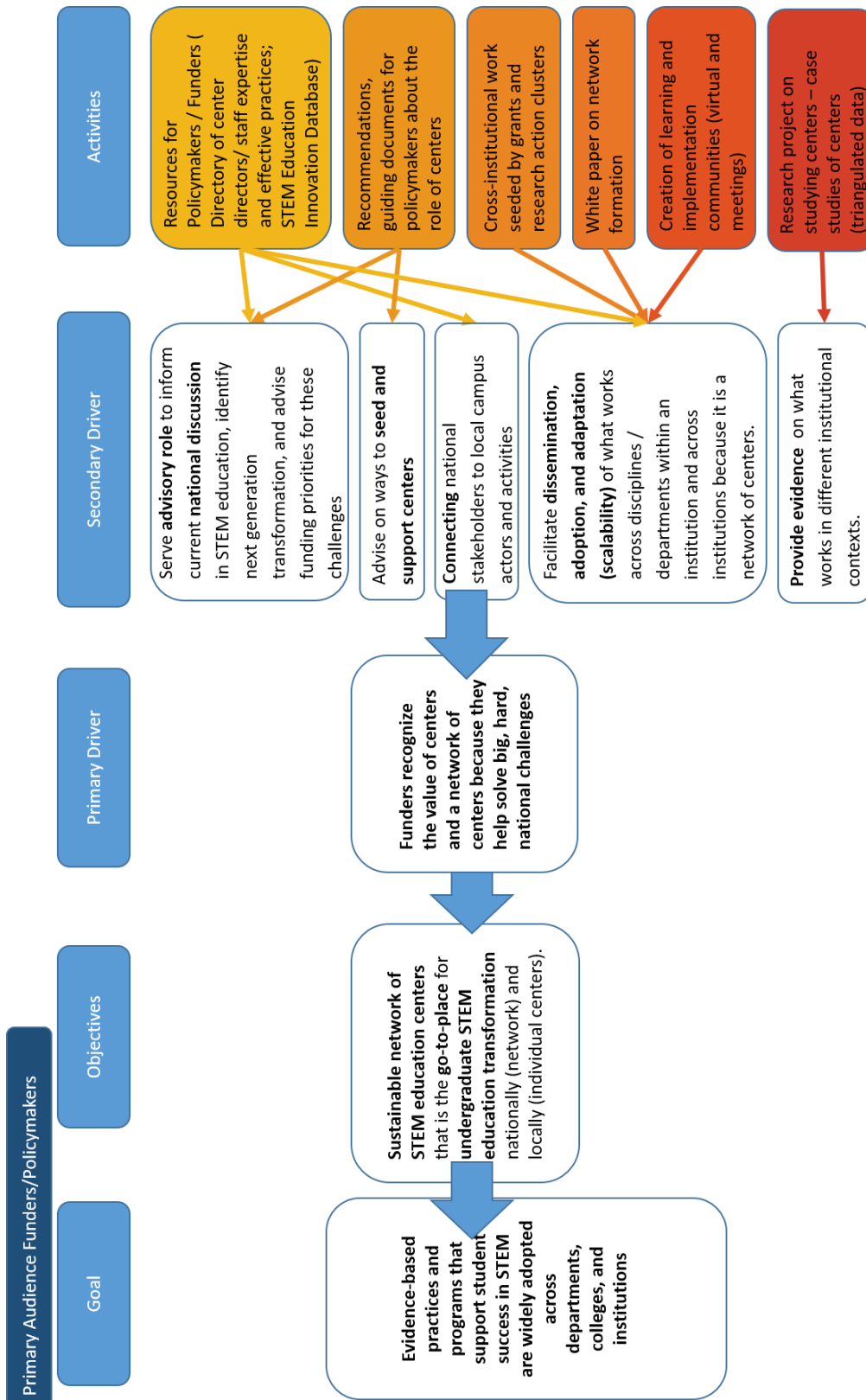
- A **robust and sustained STEM education center network** with a governance structure, financial plan, and management plan. NSEC will begin with the Advisory Board and Leadership team. Over years 1 and 2 this model will evolve to include community leadership and models of financial sustainability (e.g. through a modest dues-based membership model). By year 4, NSEC will externalize a stable model of operations for this network.
- A **toolkit for centers** that might include key resources of interest to and common among many centers. Such a toolkit will be useful for newly forming centers and those centers seeking to extend / expand their capacities. The resources provided in the toolkit might include: models of organizational structures (organization charts) of centers, an analysis of where centers are housed institutionally and to what ends, various models of operational budgets for centers, promotional and communication materials of centers, and templates of common activities such as human subjects research, donor engagement, and faculty participation.
- A **taxonomy of center types and approaches**, noting the variation among centers and how they do or do not productively intersect with centers for teaching and learning at member institutions.

- A descriptive model of the links between Center types and research challenges.
- An inventory of types of center activities mapped onto national priorities.
- Identification of gaps in research undertaken by individual centers.
- **Seeding of research action clusters (RACs)** in years 1-3 on cross- institutional work or efforts that advance the goals of the STEM education center network. In year 3, the goal for action research groups will be to have made enough progress to pursue their own funding (such as the Sloan funding secured to conduct a workshop on upper division course transformation, or the Bay View Alliance research action cluster effort on Deep Roots, IUSE proposal #1525775).
- An **online presence** and national network for community building both internally and externally (with appropriate access) that will provide a mechanism for center directors / administrators to share common successes, challenges, and failures; a mechanism for university administrators to identify various models of centers; and a resource for policy makers and funders to reach into and coordinate with the STEM education community at the member institutions.
- A **white paper on what is known about creating effective STEM education networks**. It will include a synthesis of a set of network case studies (from other efforts) that highlight the opportunities and challenges of learning networks and identify ways that other network initiatives can inform the design and implementation of a STEM education network.
- A **summative evaluation report** with policy recommendations from Nancy Shapiro in year 4.
- The **final report** will include what NSEC learned about creating this network, which will be of interest to other national networks such as NABI, the AAU STEM Undergraduate Initiative, PKal, and the BVA. The report will also include what NSEC learned about centers from the work led by Gabriela Weaver, which will be of interest to nascent and established centers. APLU will publish this report internally and may consider journal publications (*Change Magazine*, *IJSE*, etc.) as appropriate.

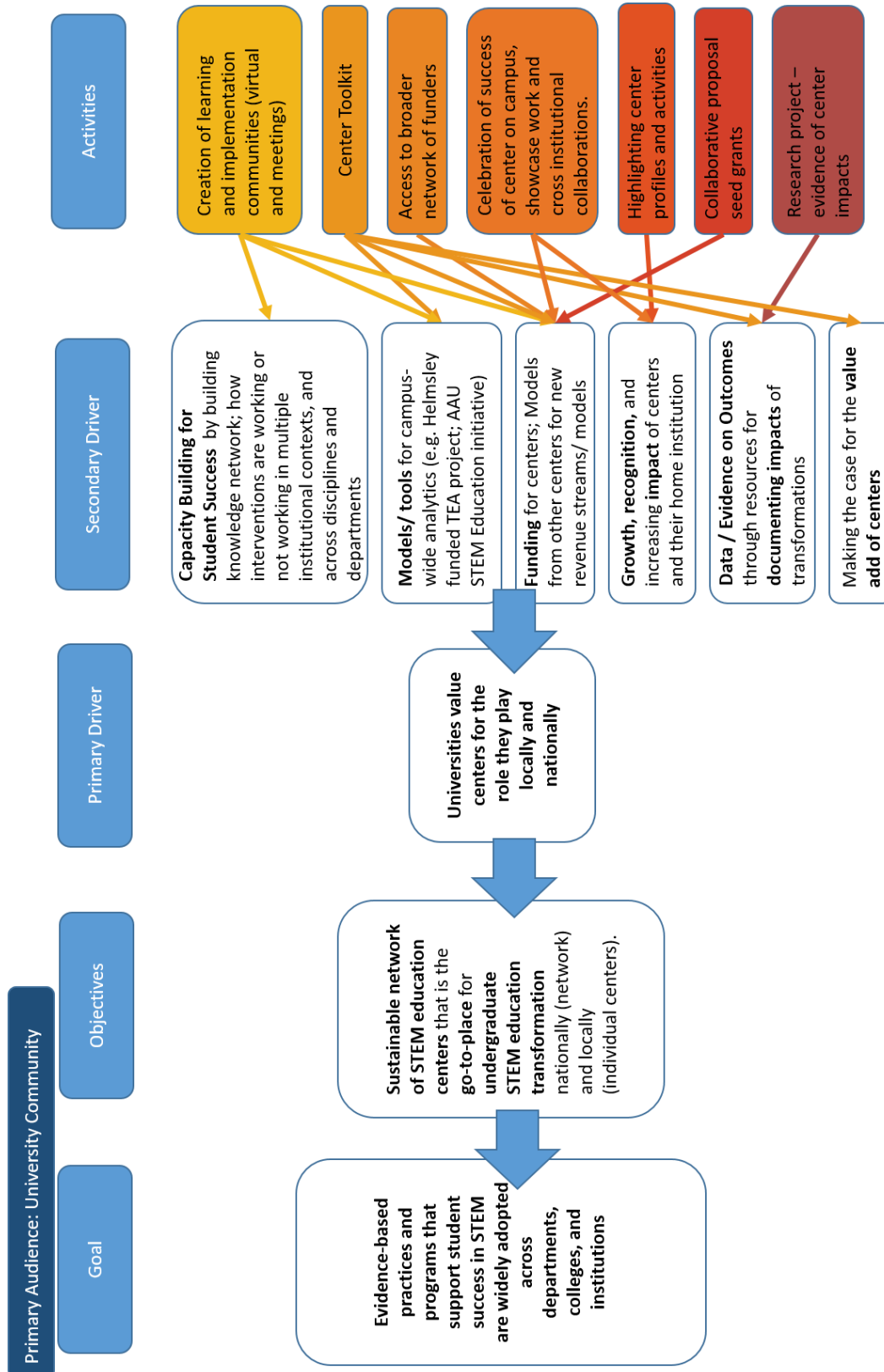
APPENDIX 2 – LOGIC MODELS



Logic Model for How the Network Supports Centers



Logic Model for How the Network Provides Value to the Public



Logic Model for How the Network Provides Value to University Leadership

APPENDIX 3 - INSTITUTIONAL AND ORGANIZATIONAL PARTNERS/COLLABORATORS

The Advisory Board and Steering Committee members' institutions/organizations

1. University of Kansas Main Campus
2. Florida International University
3. Western Michigan University
4. Association of American Universities
5. University of California, Davis
6. Wayne State University; POD network
7. University of Missouri; National Alliance of Broader Impacts
8. Oregon State University
9. Indiana University-Purdue University Indianapolis

NSEC programming

We had 190 institutions and organizations/associations who are involved in NSEC programming. Another 25 organizations were involved in co-sponsored meetings. The unique counts for each activity are below, while the final tally across activities is also below.

- 20 institutions in a RAC for Round 1 (2016);
- 21 institutions in a RAC for Round 2 (proposed for 2017); 8 of which are new institutions to a RAC.
- 110 institutions/organizations have center profiles at NSEC;
- 12 institutions have agreed to have us do a site visit; and
- 149 institutions on the listserv
- 62 institutions attended the SMTI NSEC 2016 National Conference;
- 52 institutions attended the NSEC 2017 National Conference.
- 25 institutions participated in the NSEC 2016 Toolkit Workshop
- 6 institutions submitted a practice to the STEM Education Innovation Database in 2017; 8 institutions in 2016 for a total of 14 institutions

NSEC co-sponsored programming

- 36 institutions were represented at the POD/NSEC 2015 workshop;
- 42 institutions and 5 associations/organizations participated in the APLU/ASCN Workshop on Diversity and Inclusion
- 34 institutions and 7 associations/organizations participated in the STEM DBER Alliance Meeting held at HHMI on May 8-10, 2017
- 19 institutions and 6 associations/organizations were represented at the STEM DBER Alliance Meeting at AAAS on November 18-19, 2016.

NSEC programming participants

1. Appalachian State University
2. Arizona State University
3. Auburn University
4. Berea College
5. Berry College
6. Black Hills State University
7. Boise State University
8. Bowling Green State University
9. Bradley University
10. Brown University
11. California Polytechnic State University-San Luis Obispo

Appendix 3 – Institutional and Organizational Partners/Collaborators

12. California State University San Marcos
13. California State University, Chico
14. California State University, East Bay
15. California State University, Fresno
16. California State University, Fullerton
17. California State University-San Marcos
18. California University of Pennsylvania
19. CalTech
20. Carleton College
21. Carnegie Mellon University
22. Case Western Reserve University
23. Central Michigan University
24. Cleveland State University
25. Colorado State University
26. East Arkansas Community College
27. East Carolina University
28. Eastern Washington University
29. Fitchburg State University
30. Florida Atlantic University
31. Florida Gulf Coast University
32. Florida International University
33. Fort Hays State University
34. George Mason University
35. Georgia Gwinnett College
36. Georgia Institute of Technology
37. Georgia Southern University
38. Georgia State University
39. Georgia State University
40. Harding University
41. Henderson State University
42. Illinois State University
43. Indiana University Purdue University
Indianapolis
44. Iowa State University
45. James Madison University
46. Kansas State University
47. Kennesaw State University
48. Kent State University
49. Le Moyne College
50. Louisiana State University
51. Madison Area Technical College
52. Massachusetts Institute of Technology
53. Mercer University
54. Michigan State University
55. Michigan Technological University
56. Middle Tennessee State University
57. Missouri S&T
58. Montana State University
59. North Carolina State University
60. North Dakota State University
61. Northeastern University
62. Northern Arizona University
63. Northern Kentucky University
64. Northwestern University
65. Oberlin College
66. Ohio State University
67. Ohio University
68. Olin College of Engineering
69. Oregon State University
70. Otterbein University
71. Portland State University
72. Princeton University
73. Purdue University
74. Queensland University of Technology
75. Rhode Island College
76. Roanoke-Chowan Community College
77. Rochester Institute of Technology
78. Rollins College
79. Rutgers, The State University of New Jersey
80. Saint Xavier University
81. San Diego State University
82. San Francisco State University
83. Seattle Pacific University
84. Southern Illinois University Edwardsville
85. Stanford University
86. Stevens Institute of Technology
87. Texas A & M University
88. Texas Tech University
89. The Citadel
90. The College of New Jersey
91. The Florida State University
92. The Pennsylvania State University
93. The University of Texas Medical Branch
94. The University System of Maryland Office
95. Towson University
96. Tufts University

Appendix 3 – Institutional and Organizational Partners/Collaborators

97. UC San Diego
98. Universities at Shady Grove
99. University of Arizona
100. University of Arkansas
101. University of Arkansas Fort Smith
102. University of British Columbia
103. University of California Berkeley
104. University of California Los Angeles
105. University of California, Davis
106. University of California, Irvine
107. University of Central Arkansas
108. University of Central Florida
109. University of Chicago
110. University of Cincinnati
111. University of Colorado at Boulder
112. University of Colorado Denver
113. University of Delaware/Environmental Institute
114. University of Florida
115. University of Georgia
116. University of Hawaii System
117. University of Houston
118. University of Idaho
119. University of Illinois at Urbana-Champaign
120. University of Iowa
121. University of Kansas
122. University of Kentucky
123. University of Maryland
124. University of Massachusetts - Boston
125. University of Massachusetts Amherst
126. University of Memphis
127. University of Michigan
128. University of Minnesota-Twin Cities
129. University of Mississippi
130. University of Missouri
131. University of Nebraska at Omaha
132. University of Nebraska System
133. University of Nebraska-Lincoln
134. University of Nevada, Las Vegas
135. University of New Hampshire-Manchester
136. University of New Mexico
137. University of North Carolina at Charlotte
138. University of North Dakota
139. University of Northern Colorado
140. University of Northern Iowa
141. University of Oregon
142. University of Pittsburgh
143. University of Rhode Island
144. University of South Alabama
145. University of South Florida
146. University of Southern California
147. University of Southern Indiana
148. University of Tennessee Martin
149. University of Tennessee, Knoxville
150. University of Texas at Austin
151. University of Texas at San Antonio
152. University of Texas at Tyler
153. University of the Virgin Islands
154. University of Utah
155. University of Vermont
156. University of Virginia
157. University of Wisconsin-Madison
158. University of Wisconsin-Milwaukee
159. University of Wyoming
160. University System of Georgia Office
161. UT Arlington/UTeach
162. Utah State University
163. Vanderbilt University
164. Virginia Tech
165. Washington State University
166. Washington State University Spokane
167. Washington University, St. Louis
168. Wayne State University
169. West Virginia University
170. Western Michigan University
171. Western Washington University
172. Wichita State University
173. Worcester State University
174. Xavier University of Louisiana
175. Yale University
176. American Association for the Advancement of Science
177. American Society for Engineering Education
178. Association of American Universities

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|---|------------------------------|
| 179. Association of Public and Land-grant Universities | 184. Samueli Foundation |
| 180. Center for the Integration of Research, Teaching, and Learning (CIRTL) | 185. The Lemelson Foundation |
| 181. Dakota Science Center | 186. Arkansas NSF EPSCoR |
| 182. Ecological Society of America | 187. Iowa Governor's Office |
| 183. Idaho National Laboratory | 188. Utah Governor's Office |
| | 189. Biloxi School District |
| | 190. Gresham Middle School |

NSEC co-sponsored programming representatives

These organizations attended a STEM DBER Alliance Meeting or the Workshop on Diversity and Inclusion co-hosted by ASCN.

- | | |
|--|--|
| 1. American Chemical Society | 14. National Research Council |
| 2. American Educational Research Association | 15. North Carolina Agricultural and Technical State University |
| 3. American Physical Society | 16. Oklahoma State University |
| 4. Association of American Colleges and Universities | 17. Old Dominion University |
| 5. Clemson University | 18. Saint Louis University |
| 6. Columbia University | 19. St Mary's College of Maryland |
| 7. De Anza College | 20. State University of New York at Stony Brook |
| 8. Elon University | 21. Temple University |
| 9. Howard Hughes Medical Institute | 22. Trinity University |
| 10. Loyola Marymount University | 23. University of Notre Dame |
| 11. Macalester College | 24. University of Oklahoma |
| 12. Mathematical Association of America | 25. University of Wisconsin - Whitewater |
| 13. Miami University | |

APPENDIX 4 - SUMMARY OF WHAT CENTERS WANT FROM NEXT STEPS FOR NSEC DISCUSSION

The summary below was generated from discussions at the NSEC 2017 National Conference.

Identify a set of core activities that STEM Education Centers do, and use this to **provide a context** for the specific activities of a Center. As an example, a center may be dealing with lower division gateway courses, and the reason may be because the mission of the institution is increasing STEM diversity and retention in major versus teacher prep. The lower division courses could be key for to fulfilling this institutional mission. Knowing context can help centers find other centers to learn from. Some of the contextual information may exist within some Center profiles, but it would be good to elicit this information from a wider set of centers.

Revisit the toolkit to see if the section about making partnerships with outside organizations is sufficient and comprehensive or if there are things that are missing. For example, how to support a Center of one staff person by using partners, or building a steering committee and/or an advisory board to expand capacity and reach of a center, especially if a center is small.

Build a database of STEM Center activities, which would allow individuals to search for what other STEM center activities are doing with given resources and whether or not these things worked or didn't (e.g. level of validation). We would like to have a meta-analysis of what is or isn't working in centers. An example in the physics world is PhysPort (<https://www.physport.org/methods/>),

A benchmarking database could be used by people starting a new center OR those that would like to benchmark their institute. NSEC already shares center profiles but not all centers are represented and some are missing information. One recommendation is to have a working group transfer publicly available data to the NSEC profiles for those centers do not have a profile or have an incomplete profile. Another recommendation is to improve the center profile survey to include drop down boxes to facilitate completion of the profile.

The original center profile survey could be updated to elicit additional information such as :

- budget or source of funding,
- reporting structure,
- Staff size,
- institution information (size, demographics, ect.)
- Activities that centers engage in with data about outcomes.
- Information from centers that have grants from the same funding source. For example have a S-STEM, who else does and what can we learn from each other.

The database should allow for ways to sort centers by the overall goals and mission of the centers. For example which centers are 80% STEM reform 20% K12 outreach; or have a primary focus on outreach,

research, pedagogy/teaching; or are centers that focus on faculty development vs K-12 teacher training vs grant-writing.

Centers are interested in analysis that elucidates:

- Set of activities that Centers are doing
- Where similar work is situated on campuses, but NOT on centers
- How Centers are the most efficient, the most cost-benefit aligned, and use that data to recommend ‘best practices’ for STEM Centers
- Cost of programmatic revisioning - can we quantify, in dollars, how expensive that is to a Center/school, vs. continuing successful, established programming?
- Multiple STEM focused centers at one institution - how to navigate the local politics, structures, etc.

Some analysis of the existing profiles to think about who is doing what at our own campuses

- 15 things covered by STEM centers generally
- Then we could ask, “Our center these 8 things, other people do the other 7, Who are they?”

Ways to keep database updated

A collection of these activities could be somewhat automated if anyone who submits a roundtable/rapid talk/etc. needs to fill out the database fields. Use the conference pre-work to prompt people to put information about their activity in along with their abstract to populate a database. Have center profiles be linked to prework for meetings and other activities to require updates and additions as a part of registration etc. Build off the work of research action clusters such as CARET to add to what we know is working.

Priority item:

- Database design - building out the profiles to make them more useful. Guide this work by a working group. If done well it will solve some of the other issues such as who to call, how to benchmark, and how to categorize different center types.

Professional Development for Centers

People growing into the Center leader positions are coming out of a faculty perspective and need facilitated help getting the perspective of upper administration that will help them plan and **advocate for Center missions**. How can the NSEC help people who are coming out of a STEM faculty background gain access to PD to help them become more effective directors? One example, might be a boot camp that includes management aspects (**planning, financial, logic model vs business plan**) not just the visioning and making change happen type activities.

How do centers **operationalize funding plans**? The community needs deep thinking about when to put in grants, what type of work can be funded through grants, and how to apportion work across what can be funded through grants vs what the institution can/will pay. The community needs more examples of how these issues are resolved at different institutions or at different centers, which would be helpful when people are thinking about solving the same issues at their own campus.

Center directors are netweavers at their campuses or across their partner institutions. There are best practices for **building partnerships** that can be shared with this community. This would include things like what does it mean to have a grant go through the STEM Education Center, how do people deal with indirect costs, who gets credit etc.

For centers **with few staff** (as few as one or two people), how do activities get sustained when there are few people to drive initiatives. What should people who are starting new centers, or have a small program, do first to **demonstrate impact** in a way that will allow a program to grow?

- Building a steering committee and tasking them with helpful ongoing tasks (notetaking)
- Regular meeting with dean or whoever is helpful as a PD activity - not just someone to report to, but someone to get help from while learning how to be impactful as a center.
- Elect faculty to the steering committee, it is a position that gains currency and recognition so they want to do it, then task these people with productive activities
- An advisory board also can help make connections outside the center/institutions
- How to work with Institutional research
- How to integrate programming with the Centers for Teaching and Learning
- How to support faculty scholarship
- Assessment - What to measure and how
- Building Infrastructure for Broader impacts
- Conducting and catalyzing STEM Ed research (grant writing, BI, connections of DBER to cognitive scientists)

Centers need help using the limited resources and time available from a Center in the most strategic way to be impactful. Can NSEC help find good examples of activities to leverage initiatives on the campus when the center itself has few staff and low resources?

In summary, center directors need advice, feedback, support, professional development on:

- Managerial skills – how to organize and manage staff and resources
- How to best communicate with upper admin and faculty (messaging priorities and how to gain access to these audiences)
- How to build partnerships with faculty, staff, and other centers
- Guidance on “Managing up” and how to get support from the administration
- Aligning stakeholders w/center mission
- General leadership skills
- Demonstrating impact of center work
- Institutionalizing center work

Recommendations for NSEC

Provide Professional Development activities for center directors to expand across the landscape of skills they need to have. Maybe a ‘boot camp; for directors who come from STEM fields and/or faculty positions to learn about organizational skills and **practical management**. Also, someone who comes with

strong organization development skills learning how to access important content/ideas/needs from specific STEM fields and/or DBER.

Coordinate mentoring sessions (office hours) where individuals with “expertise” offer a chance for people to sign up/or have a round table to come and discuss how to start/run a Center. This matchmaking can be facilitated by better understanding the “center types” in the network.

Develop exchange of expertise. There is a general need for community members to get input and feedback when trying something new, especially from colleagues who have tried it. How can NSEC facilitate these kinds of exchanges? The community could potentially use the Listserv, discussion board, and/or twitter feed to facilitate a quick response to questions. Consider having an archive so that someone could search and develop a FAQ. This requires having a process to drive enough traffic to the ‘questions to the field’ location so that the questions get answered. It also requires thought and activity leaders.

Share useful information in more dynamic ways through links out /highlighting/posting of center activities that are available and useful to people from other centers. An example is the PD MOOCs from CIRTL. Web-based material seems static right now. How can we make it more dynamic? For example, there are tool kit elements on funding, how can we also get training for center directors on managing center budgets in real time? Could we have center webinars?

Facilitate site visits to meet each other at their own centers. Maybe as a consultant to help a group on a campus or stakeholders from a center to talk about new programming or change. They can also meet with administrative stakeholders who might be difficult for a director to gain access to. The activity could be PD both for the host center and also for the visiting ‘consultant’ who will deeply understand what the host institution is doing and also have the title of consultant. There is a model for this type of work from the National Association of Geoscience Teachers Traveling workshop program.

<http://nagt.org/nagt/profdev/twp/index.html>

Regional Meetings for Centers

Consider building regional/conceptual smaller networks for people to interact with more frequently. Sometime geographic, regional is the most important so people can visit each other regularly or because they are serving similar populations. Sometimes institution type or common goals would be the organizing principle because sharing approaches to common goals or problems would be the better longer-term discussion. Maybe some combination of mini-networks that are regional or by institutional type with some mechanism for them to interact more frequently than annual meetings. Need matchmakers and maybe some funding for travel, time.

Relationship with POD

Build intentional relationship between POD and NSEC. POD is a community of Centers for Teaching and Learning. Both POD and NSEC have a community of centers that do faculty development and that need management help. Centers that are CTL are good at organizational development, but need more help in

the specific disciplines. Their needs are different, but possibly complementary. Ways that NSEC could strengthen its relationship with POD, include:

- Partnering with the [POD SIG on STEM](#)
- Sharing approaches, skills, organizational structures that are common to both POD participants and the STEM education centers.
- Sharing approaches for navigating the space between CTLs and SECs and leveraging these relationships on campus.
- Reciprocal sharing of discipline-specific (STEM) methods and principles approaches. For example, how to engage with STEM faculty.
- Possibility of a more open workshop for STEM interest ahead of POD to try out how that interaction might work.

Better Define the Community

Be explicit about the “categories” of STEM Centers that we have. There is a diversity of STEM centers. The main areas of work often depends nature of individual campus. Are they primarily faculty development, research, K-12 teacher prep, direct student support, research on STEM education/teaching, or a combination of these. Are there categories missing? How does their STEM Center connect with other Centers on Campus with similar or different goals? Teaching and Learning Centers cover all disciplines generally. Should CTLs they be part of this network, and how would that work?

Ideas for the Next Meeting

Help participants find out who is in the room with clickers, with flags on people’s name tags, or color coded on the participation list. Help the community understand who comes to this meeting. Some are CTLs, some are STEM centers for K-12, some are comprehensive centers, others are just here outside centers looking for ideas.

Talk about Failures (what didn’t work) with cocktails. Have a session where centers talk about their biggest failure. One attendee indicated that this was one of the best sessions at another conference. Learn about what didn’t work so centers can avoid those hazards.

Always have a **STATE OF THE STATE session** to bring awareness of where we are in this space, what are the current issues, where do we go from here, etc. Have representation from national groups update conference attendees.

Provide Professional Development for STEM Centers. Attendees benefit from sessions like the one by Angela Bell on presenting data; consider all levels of expertise - from how to talk with program officers about grants to the most complex. The round tables and the discussions of how people and centers get things done was VERY beneficial, and the community wants more! Participants requested sessions on “HOW to do x”:

- How to find grants
- How to work with big agencies about getting funding
- How to communicate (communication strategies)

These sessions could be separated into tracks, such as introduction to centers, how to's, those who are already deep in the trenches. We could have Birds of a Feather session that considers the different roles of the SECs that are represented at the conference.

Advocacy for Centers

Create a task-force to move forward advocacy. Define the charge of the task force. A possibility is to create tools for center to advocate for selves and for NSEC to advocate for centers, itself and policies nationally. These tools could include:

- creating repository of communication pieces from centers,
- developing common communication template for a variety of audiences
- sharing communication strategies (more time-consuming)
- webinars on developing communication strategies
- develop tools for NSEC-central to say “Thank you” to members
- key talking points for public presentations (state-of affairs, positive outcomes etc.)

Participatory Governance

- **Build a Fellows Program.** Put a call out to the community for 2-3 center directors/staff to serve for a 2 year, rotating model. APLU and NSEC could provide recognition of their role as a fellow. Each Fellow could run a RAC, but also have responsibility for moving the network forward. Each Fellow would be supported by a centralized hub role at APLU but would also need to have enough resources at the home institution.
- Better articulate to the community how to become involved in the Steering Committee. **Be transparent.**
- Consider a model like the Mathematics Teacher Education Participation. Ask every center to join a working group or research action cluster. Appoint a RAC leader. Articulate the purpose of these communities of practice. Hold virtual meetings and provide a space for sharing of annual reports. Have a virtual space such as Trellis with discussion board. Hold regular planning calls every 8 times for 2 hour. Could choose the working groups through a voting mechanism.
- Create metrics to **track the health of the network** such as number of participants over time. Are we shrinking or growing in terms of number of centers and staff?

**Annual Report: Evaluation Report Year 2: National STEM Education Center (NSEC)
Improving Undergraduate STEM Education (IUSE) program of the National Science Foundation
(#1524832)
August 2017**

Introduction

This report is a progress evaluation (formative evaluation) of the activities of the IUSE NSEC project in the second year (2016-17). The report is structured around the revised goals of the project as described in the Second Annual Report, with observations and evidence derived from source documents, including the 2017 annual report draft, conference reports, minutes and notes from conference call meetings, and interviews with the principal investigators. The report addresses progress to date, emerging issues and questions, and suggestions for next steps.

The Annual Report is structured around five strategies designed to support and amplify the work that STEM Centers are doing to improve undergraduate education:

1. Building a learning, research, and implementation network for centers via conferences, workshops, communications, staff interactions, and an online platform.
2. Showcasing, celebrating, and understanding the work of centers that are transforming undergraduate STEM education via case studies, research on center impacts, and center profiles.
3. Serving as a resource and catalyst for centers, policy-makers, funders, administrators, and the public on what works in STEM education via a national online platform of effective practices and programs, directory of experts in STEM education, and research on effective center and institutional practices, and center impacts.
4. Creating a coalition of actors that can address and engage in practices that are cross- and multi-institutional via seed grants for collaborative research and implementation proposals.
5. Collectively working to improve institutional and national policies which strengthen undergraduate STEM education through guiding documents, participation in national dialogues, and policy statements.

Progress to date (selected examples)

While the NSEC project has made progress in all five of these dimensions, the growth of the network (focusing on strategies one and two) is perhaps the most significant accomplishment of the first two years. Between 2015 and 2017, 99 centers have been represented in at least one national conference, and half of the attendees have attended more than one conference. In addition to conference participation, the NSEC “brand” is recognized by an increasing number of institutions around the country. NSEC can also claim penetration among many different types of higher education institutions—

public, private, research and comprehensive, with some beginning outreach to community colleges, as well.

The reputation and recognition of NSEC is evident from a growing web presence: 110 center profiles, a STEM Education innovation database, and a web-based toolkit,” for Centers and Center Directors. In addition to the web-resources, NSEC has been intentional about developing workshops, webinars and conferences that engage STEM Center faculty and staff in dialogue, discussion and collaboration on a wide range of topics. The workshops and conferences are built around SEC leadership development, project development, and effective center and institutional practices.

In addition to progress on the NSEC “brand,” the project has seeded significant work in the form of RACs (Research Action Clusters). The small grants that are awarded by NSEC (\$15,000) have resulted in some potentially high impact outcomes. CARET (Collaborative Around Research Experiences for Teachers) addresses one of the most critical issues facing educators in the United States: preparing highly skilled STEM teachers, by giving them research experiences. The CARET work will address the effect of teacher-research on student achievement, closing the achievement gap and the classroom practice of current and future teachers. A second RAC, the STEM/DBER Alliance appears to be laying the foundation for a new and important collaboration between STEM Teaching/Learning Centers and STEM disciplinary faculty—something that apparently cannot be taken for granted. Investments such as these are an important part of NSEC’s contribution to the broader STEM education community, and expands the reach of NSEC beyond STEM Centers.

Strategies three and four are being addressed in several different ways, one that stands out is the continuing collaboration with the POD Network, connecting centers for teaching and learning with STEM Education Centers. The two organizations continue to explore ways to collaborate and enrich each other’s missions and stakeholder groups. The proposed partnership actions (MOU’s linking websites, workshops, and NSF proposals) have great potential as they mature over the next several years.

Strategy five, influencing policies in both institutional and national contexts is also a work in progress. The case studies research, conducted by Co-PIs Gabriela Weaver and Deborah Carlisle, have already revealed some important and surprising insights that have expanded the PI’s thinking about the “flavors” of STEM Education Centers on different campuses: the undergraduate focus leads, in some cases, to K-12 focus; which leads, in some cases to teacher preparation; which leads, in some cases, to links between teaching and learning centers and STEM centers; which leads to questions about leadership; which leads to necessary (but perhaps not sufficient) content expertise; which leads to... .

This is extremely promising research, and, together with the work of the other PI, Bruce Goldstein, who is working on situating the Network of STEM Education Centers in a broader network of “networks,” will continue to inform the project and the policy and practice outcomes of the project.

Emerging Issues and Questions

The first emerging issue appears to be a reconsideration of how NSEC can maximize the value of the Network, the national meetings, and the websites of Center Profiles and toolkits. Having spent close to

two years generating content, connections and leadership models, NSEC is ready to take a closer look at what they can do with the tools and leadership they have developed. This issue was raised in the evaluation feedback from the 2017 National Conference in New Orleans. The evaluation comments were thoughtful and candid, and many participants made suggestions about both structure (more time for networking; explicit “onboarding” for new participants, etc.) and content (creating a database of STEM Center activities, share budgets and budget structures, develop communication tools for advocacy and branding, etc.). The feedback from the attendees suggest that the participants are ready for a new level of engagement—they have their “sealegs” and want to use the network to go deeper, learning what they can that will help them back on their campuses to build, expand, and sustain their centers.

NSEC leadership is excited and responsive to this next level engagement, but it does pose some challenges about how to organize the next workshops, webinars, and conferences.

A second emerging issue is related to the first, and was raised to the Steering Committee at the July meeting: How should NSEC leadership prioritize their time and resources: emphasize programming (what kind?); emphasize resources (toolkit, communications?); emphasize funding (support more site visits, apply for more grants); or research (network analysis)? This is a “growing pains” kind of issue. In some ways, it is an embarrassment of riches situation. Because of the success of the initial work, there are many possible directions. This may be a time to reach out to the network with a survey or some calls to get a sense of priorities from the stakeholders.

This last point leads to a third emerging issue: STEM centers can be sliced and diced in many different ways—and how they are classified or categorized will influence what support and resources they will find most useful. Those STEM Centers at large research universities have different resources and different challenges than STEM centers at small private institutions. Funding, faculty time, reporting structures are different for different kinds of institutions, and NSEC is challenged to find some common approaches. There are also those Centers that are tied to/connected to Teaching and Learning Centers, which may lead to easier sustainable funding, but may dilute the undergraduate STEM support that is the heart of NSEC’s work. And then, there are those centers that are situated in colleges of education rather than science or liberal arts colleges, and the focus is strengthening the STEM content knowledge and pedagogical expertise of the next generation of teachers—still an undergraduate focus, but different, too. Any survey of STEM centers would need include some “thick description” to make sure the feedback was useful. A question NSEC will have to address is how wide to open the gates—what counts as a STEM Education Center, and what doesn’t?

Next Steps:

Network building requires some pretty heavy lifting around communication on many levels. And communication needs to be in two directions (at least). It is not just a matter of creating the material and the websites, etc. The campus Center directors need to tap into the resources that are being collected and disseminated, and they also need to be able to reach each other with questions, ideas, suggestions. NSEC is working on raising the visibility of the tools they have created—and it is clear that the more people who use those tools, the richer and more valuable they will become. It is also a challenge to get “air time” with so many groups and interests competing for Center directors’ attention.

It might be possible to get an institutional leader (or high profile faculty member of scientist) to write about the NSEC work for a broad audience (Change magazine, or other broadly read academic publications) as part of the advocacy goal of the project.

Two of the RACs are poised to produce some important studies: CARET has set up a study of teacher-researcher programs which promises to be an important contribution to both STEM Center studies, and teacher preparation/professional development studies. The NSEC DBER Alliance RAC is also poised to make some important next steps. NSEC will want to share the work of these two Research Action Clusters broadly. NSEC is poised to fund two or three additional RACs in the coming year.

Distinguishing between providing services, resources, and projects will continue to be a balancing act. NSEC is looking to add value to its members. In addition to disseminating the research that is coming out of the NSEC grant, there may be additional opportunities for NSEC to target pragmatic professional development to campus STEM Center leaders, who rise to their administrative positions through the faculty. Budgets, personnel, activities and programs, and outreach are not necessarily skills in their wheelhouse. Giving Center directors a forum for gaining those competencies could be a contribution to the NSEC community.

NSEC defines itself as a “forward-looking” organization. In this respect, the NSEC/POD alliance and the NSEC/DBER alliance are different pathways to sustainability. What will the undergraduate STEM community need in five years? In ten years? The NSEC Steering Committee, together with NSEC’s input into the National Academies Round Table will continue to inform and guide NSEC through the duration of the grant period, and potentially beyond.

The project is going strong, with purposeful leadership that is not afraid to ask questions about progress and outcomes while continuing to learn while doing.