EPSCoR: Excellence Catalyzed by Diversity and Inclusion

Personal Perspectives

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A core strategy in support of NSF’s mission is broadening opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.
EPSCoR in Transition

• EPSCoR’s move to OIA in the Director’s Office raised its visibility and underlined the need for
  - Sharper research focus
  - Stronger integration across the Foundation

• Increased EPSCoR competitiveness through
  - Sustain co-funding
  - EPSCoR participation in NSF initiatives
  - Alignment of RII-supported S&E with discovery frontiers in Directorates and Offices across NSF
  - Catalyzing new, effective interactions
EPSCoR Goals

• Catalyze research capability across and among jurisdictions
• Establish STEM professional development pathways
• Broaden participation of diverse groups/institutions in STEM
• Effect engagement in STEM at national and global levels
• Impact jurisdictional economic development
Interdependent/Integrative Perspectives

• The creative engagement of diverse ideas and perspectives is essential to enabling transformative research.

• Infusing science and engineering excellence into varied individual, institutional, and geographic networks promotes opportunities for discovery and nurturing of talent wherever it may be found.
Strategies that Work

• **Improvement of Institutional Structures**
  – Institutional data collection systems; Creating expectations for public reporting of data; Establish processes for using data in decision making; Review and revision of policies, practices, and processes (hiring, tenure, promotion and others) for transparency, clarity, and consistency

• **Career Support for Individuals**
  – Formal mentoring programs; Faculty leadership development; Research network development; Policies to support faculty during life events and critical junctures

• **Work Life Support Policies**
  – Dual career offices and policies; flexible academic career policies; dependent care policies; other work-life balance programs; training for leadership on the implementation of these policies and programs

• **Empowerment of Individuals and Leaders**
  – Training and awareness building of gender equity issues (implicit bias, micro-aggressions, stereotype threat, etc.); Creating tools and resources for faculty and leadership to use in decision making; Creating accountability measures for leadership and decision makers; combating isolation and creating networks for women in STEM
# EPSCoR RII Development

<table>
<thead>
<tr>
<th>RII Track</th>
<th>Goal</th>
<th>Developed in Response to:</th>
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<tbody>
<tr>
<td>Track-1</td>
<td>State-wide infrastructure capacity enhancement to improve academic research competitiveness</td>
<td>NSB 78-12</td>
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<tr>
<td>Track-2</td>
<td>Facilitate collaborations; Catalyze engagement in NSF priorities</td>
<td>EPSCoR 2020/2030 America COMPETES, Educause</td>
</tr>
<tr>
<td>Track-3</td>
<td>Build Diverse Communities</td>
<td>EPSCoR 2030</td>
</tr>
<tr>
<td>Track-4</td>
<td>EPSCoR Research Fellows: Foundation for research collaboration</td>
<td>NAS</td>
</tr>
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</table>
EPSCoR Impacts

• EPSCoR support contributed to:
  – Numerous Centers, Facilities, and large awards
  – Institutional policy changes
  – Sustainable faculty hiring and retention
  – Economic development
  – Building and strengthening research infrastructure
  – Engaging education, outreach, and diversity
Centers & Facilities

• 10 of 11 STC/ERC/MRSEC awards to jurisdictions in 1980–1992 cohorts are attributed to EPSCoR support by EPSCoR principal investigators (PIs).

• 17 other large awards (e.g., IGERT, I/UCRC) are attributed to EPSCoR support by EPSCoR PIs.

• EPSCoR supported development of 66 currently active research centers.

• EPSCoR supported creation/upgrading of 83 currently active research facilities.
Institutional Policy

- EPSCoR catalyzed the creation of Vice President for Research (VPR) positions and Offices of Sponsored Programs in many jurisdictions.
- Many jurisdictions attributed positive changes in faculty tenure and promotion policies to EPSCoR.
Workforce Development

- Of the 1,346 faculty hired through EPSCoR-supported positions, 78% are still active in their respective jurisdictions.

- 5,874 graduate students and 984 postdoctoral researchers supported over the course of the NSF EPSCoR program.

- EPSCoR supported the creation of more than 100 degree programs (including 64 PhD programs), 6 departments, and 2 schools.
Economic Development

- EPSCoR catalyzed Small Business Innovation Research (SBIR) Phase 0 programs in 14 jurisdictions.
- As of FY17, there are 200 EPSCoR-associated patents and 52 EPSCoR-associated startup companies.
Figure 9a. Co-Author map of iUTAH Researchers Before, Separated by Institution and Discipline
Figure 9b. Co-Author map of iUTAH Researchers After, Separated by Institution and Discipline
Percentage of NSF Research Funding, Utah
Wesley College: PUI Engagement

- Private – Minority Serving PUI
- 1478 undergraduates (<40% Caucasian)
- >95% receive Federal Financial Aid
- >40% First-in-their-Families to go to College
- >50% freshmen are placed in remedial Math and English
- Prior to EPSCoR, Student Retention Rate <40%
- Prior to EPSCoR, <10 Faculty Publications in 131 years
- Prior to EPSCoR, <$15K in Federal Awards (SRO non-existent)
Provides Support for High-Impact Initiatives

- Directed Research/Internship Programs Launched, 2003 *Includes* Ethics Training
- STEM Program Capstone Thesis Requirement, EPSCoR Sponsored, 2005
- Scholars Day – Launched, 2007
- Academic Support Structures - Redesigned for Student Success, 2009
- NSF S-STEM Learning Communities (LC), Launched, 2014
- (All) STEM courses – Discovery-based, 2014
- STEM research requirement for *all* majors, 2014
Federal Programs... Catalyze Wesley’s STEM Majors

- Sponsored Research Office established, 2010
- 104 national & regional student awards
- 65 students co-author 57 peer-reviewed articles
- $8.5 M in Federal & State grants
- Host annual K-8 STEM outreach programs
- For conservation, host annual Beekeeping Workshop

- **Commercial Impact:**
  - Developed ADME/Tox Database - Bio-Rad
  - Developed Smart-Phone Fertilizer App
  - Provided evidence to FDA for Tox-interactions

- **Economic Impact:**
  - 95% LC retention rate, College-wide – 54%
  - 100% STEM graduates enter STEM fields
  - Develop skill-sets that drive innovation

- **Research Focus:**
  - Big Data Analytics (Informatics, a core req.)
  - Solvolysis, Adsorption, Small-Molecule Synthesis
  - Dendroecology
  - Ecology
  - Environmental Microbiology

American Chemical Society (ACS) Meeting, San Diego, CA, March 2016
Collaborative Publications: Jurisdictions

Aggregate number of collaborative publications by T-2 award year involving T-2 researchers within (intra) and between (inter) award jurisdictions.
Collaborative Publications: Researchers

Aggregate percentage of T-2 researchers who published—all researchers, early-career researchers, and senior researchers—by T-2 award year.
Education, Outreach, & Diversity

EPSCoR supported more than 1,200 distinct education/ outreach/diversity activities in K-12 through jurisdiction-level STEM planning.

• 40% target particular socio-demographic populations.
# EPSCoR Workforce Development

<table>
<thead>
<tr>
<th></th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty Supported</td>
<td>1461</td>
<td>1535</td>
<td>1581</td>
<td>1602</td>
<td>1552</td>
<td>N/A*</td>
</tr>
<tr>
<td>Post-Docs Supported</td>
<td>211</td>
<td>211</td>
<td>215</td>
<td>231</td>
<td>200</td>
<td>N/A*</td>
</tr>
<tr>
<td>Graduate Students Supported</td>
<td>1443</td>
<td>1383</td>
<td>1346</td>
<td>1361</td>
<td>1332</td>
<td>N/A*</td>
</tr>
<tr>
<td>Undergraduates Supported</td>
<td>1769</td>
<td>1955</td>
<td>1867</td>
<td>1965</td>
<td>1861</td>
<td>N/A*</td>
</tr>
<tr>
<td>New Faculty Hired</td>
<td>79</td>
<td>60</td>
<td>73</td>
<td>89</td>
<td>84</td>
<td>385</td>
</tr>
<tr>
<td>Graduate Degrees Conferred</td>
<td>233</td>
<td>305</td>
<td>326</td>
<td>245</td>
<td>258</td>
<td>1367</td>
</tr>
<tr>
<td>Undergraduate Degrees Conferred</td>
<td>425</td>
<td>376</td>
<td>380</td>
<td>408</td>
<td>404</td>
<td>1993</td>
</tr>
</tbody>
</table>

* The number of faculty and students supported are not summed because many of them remain tied to their respective projects for the duration of the award and would, therefore, be double-counted over time.
Key Elements of RII Track-3

- Novel systems approaches and collaborative change strategies
- New research, models, networks and partnerships to scale collaborative change
- Leverage the current Broadening Participation Portfolio
- Collaborations span education levels, public and private sectors
### RII Track-3 Award Summary

<table>
<thead>
<tr>
<th>Target education level</th>
<th>Target URM group</th>
<th>Brief project description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High school</td>
<td>Female, Native American, African American, rural schools</td>
<td>Engineering edu.- storm water management</td>
</tr>
<tr>
<td>STEM teachers</td>
<td>Women, URM, rural/low-income regions</td>
<td>Computing curriculum and teacher professional development</td>
</tr>
<tr>
<td>Grades 5-8</td>
<td>Girls and students of color</td>
<td>Informal learning thru Blue STEM camp and Blue STEM Club activities (Sci. &amp; Eng.)</td>
</tr>
<tr>
<td>Undergraduate (CC,TC)</td>
<td>Native Americans</td>
<td>Development of two-semester Chemistry Course sequence</td>
</tr>
<tr>
<td>Middle school</td>
<td>Hispanic, urban and rural</td>
<td>Cyber-enabled instructional methods</td>
</tr>
<tr>
<td>High school</td>
<td>Alaskan Natives, rural</td>
<td>Use of unmanned vehicle to understand environment-partners with the Upward Bound Program</td>
</tr>
<tr>
<td>HS teachers and students</td>
<td>Female, African American</td>
<td>Engineering Design related curricular dev</td>
</tr>
<tr>
<td>Undergraduate, graduate</td>
<td>Female, African American, rural areas</td>
<td>Undergrad-to-masters-doctoral bridge programs in Env. Sci, Molecular Biosciences, and Aquaculture and Fisheries</td>
</tr>
<tr>
<td>Middle and high school teachers, students</td>
<td>African American, Hispanic, &quot;high need&quot; schools</td>
<td>Engage students and teachers in science fair projects (S&amp;E)</td>
</tr>
<tr>
<td>Graduate</td>
<td>Native Americans</td>
<td>Interdisciplinary courses and program combining traditional knowledge and western science</td>
</tr>
</tbody>
</table>
Paige Brown, a high school student involved in Maine EPSCoR’s Stormwater Management Research Team (SMART), has won numerous awards based on her research and subsequent invention to protect Maine’s streams and waterways. Brown created a way to pull harmful phosphorus from her local streams — an idea that won her the 2015 Stockholm Junior Water Prize and the Intel Science prize for Global Good (including a $150k scholarship). Brown’s winning design, a scaffold made from just $3 worth of materials plays two important roles: it acts first as a filter for local water supplies and second as a replacement for phosphorus-based fertilizers. That’s right; the scaffold is biodegradable and can be planted in the ground, allowing it to act as a slow-release capsule that lets phosphorus re-enter the soil and fertilize crops.
Change in NSF Research Funding over Time: First 3 Years in EPSCoR Vs. Most Recent 3 Years

Jurisdictional Cohort Year of Entry into EPSCoR

<table>
<thead>
<tr>
<th>Cohort Year</th>
<th>Initial 3 Years in EPSCoR</th>
<th>Most Recent 3 Year Period (FY13-15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980 Cohort</td>
<td>0.19%</td>
<td>0.37%</td>
</tr>
<tr>
<td>Arkansas</td>
<td>0.09%</td>
<td>Kansas 0.33%</td>
</tr>
<tr>
<td>Maine</td>
<td>0.28%</td>
<td>Nebraska 0.22%</td>
</tr>
<tr>
<td>Montana</td>
<td>0.12%</td>
<td>2000+ Cohort 0.44%</td>
</tr>
<tr>
<td>South Carolina</td>
<td>0.41%</td>
<td>Alaska 0.56%</td>
</tr>
<tr>
<td>West Virginia</td>
<td>0.06%</td>
<td>Delaware 0.38%</td>
</tr>
<tr>
<td>1985 Cohort</td>
<td>0.16%</td>
<td>Guam 0.01%</td>
</tr>
<tr>
<td>Alabama</td>
<td>0.26%</td>
<td>Hawaii 0.54%</td>
</tr>
<tr>
<td>Kentucky</td>
<td>0.21%</td>
<td>Missouri 0.75%</td>
</tr>
<tr>
<td>Nevada</td>
<td>0.12%</td>
<td>New Hampshire 0.45%</td>
</tr>
<tr>
<td>North Dakota</td>
<td>0.05%</td>
<td>New Mexico 0.58%</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>0.29%</td>
<td>Rhode Island 0.70%</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>0.11%</td>
<td>Virgin Islands 0.02%</td>
</tr>
<tr>
<td>Vermont</td>
<td>0.08%</td>
<td></td>
</tr>
<tr>
<td>Wyoming</td>
<td>0.17%</td>
<td></td>
</tr>
<tr>
<td>1987 Cohort</td>
<td>0.16%</td>
<td>0.35%</td>
</tr>
<tr>
<td>Idaho</td>
<td>0.07%</td>
<td></td>
</tr>
<tr>
<td>Louisiana</td>
<td>0.36%</td>
<td></td>
</tr>
<tr>
<td>Mississippi</td>
<td>0.11%</td>
<td></td>
</tr>
<tr>
<td>South Dakota</td>
<td>0.09%</td>
<td></td>
</tr>
</tbody>
</table>

Initial 3 Years in EPSCoR vs. Most Recent 3 Year Period (FY13-15)
Personal Testimonial

Mr. Casey Ryan, The Confederated Salish and Kootenai Tribes.
Back-ups
Change in NSF Research Funding over Time:
First 3 Years in EPSCoR Vs. Most Recent 3 Years

Percentage of NSF Research Funds

- ≥ 0.1%
- 0.11 - 0.3%
- 0.31 - 0.5%
- 0.51 - 0.75%
- ≤ 0.75%
Research Infrastructure

• 9,184 EPSCoR research articles mapped to Thomson Reuters Web of Knowledge.

• EPSCoR supported purchase of more than 2,400 individual pieces of equipment.