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Methods for Evaluation of the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR): Qualitative Analyses/Enhanced Research Base

Rachel A. Parker
Brian L. Zuckerman

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POLICY INSTITUTE
1899 Pennsylvania Ave., Suite 520
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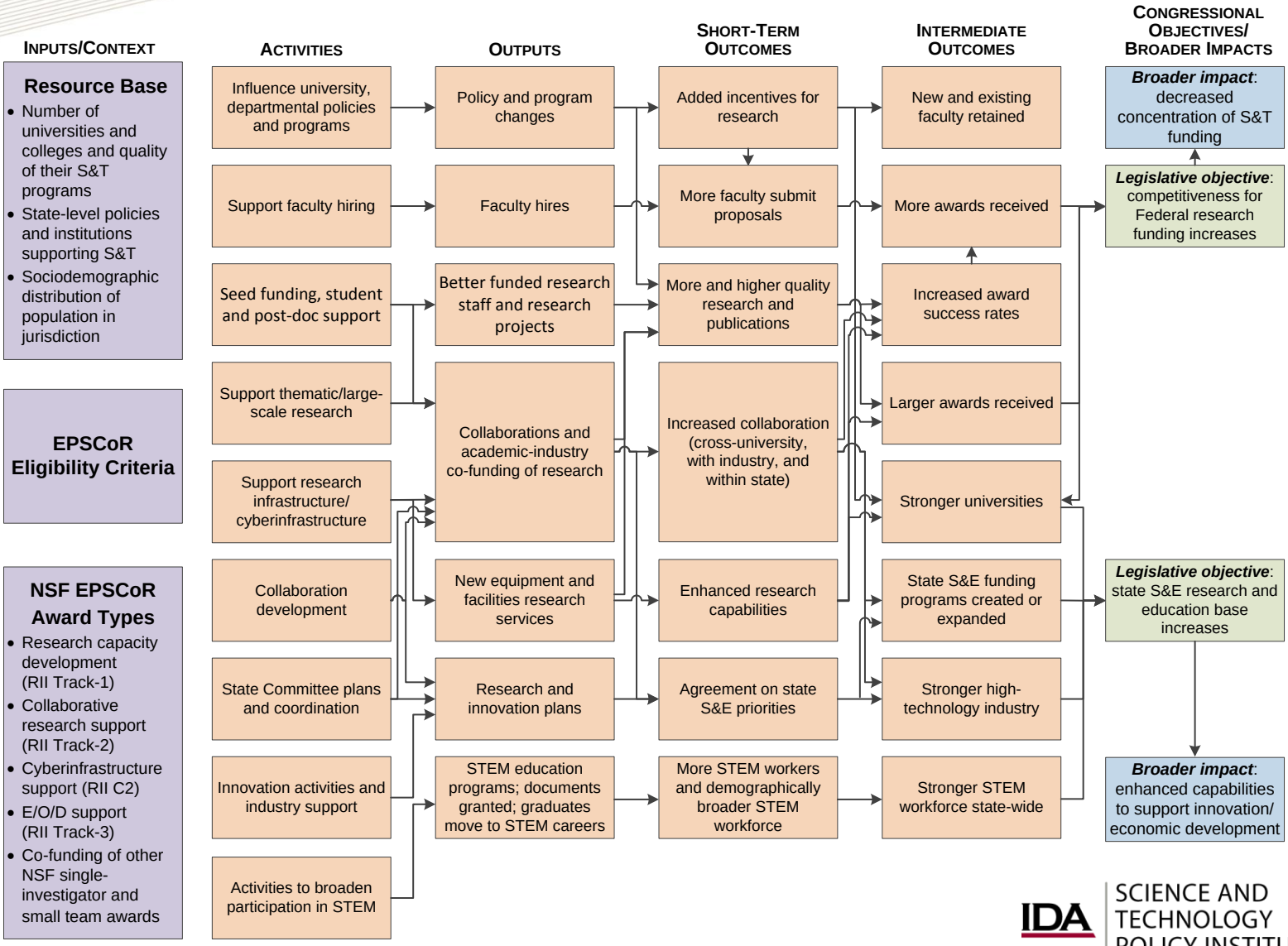
Methods for Evaluation of the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR): Qualitative Analyses/Enhanced Research Base

American Evaluation Association
Session 616, October 17, 2014

Rachel Parker
Brian Zuckerman

EPSCoR Logic Model



Analysis of Enhanced Research Base: Topics

- Institution-Building
- EPSCoR State Committees
- Education, Outreach, and Diversity (E/O/D)
- Academic Development
- Innovation

Separate database developed for each topic

Focused on activities and outputs—outcome data rarely available

DATA COLLECTION METHODS

Analysis of Enhanced Research Base: Methods

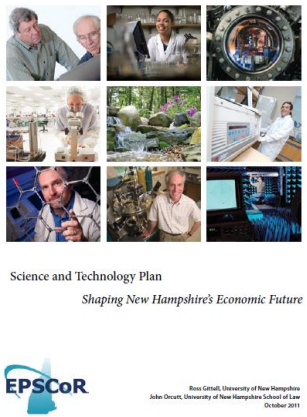
- Literature review on EPSCoR and research capacity development
- Developed EPSCoR logic model
- *Qualitative data*
  - *Survey of EPSCoR jurisdictions*
  - *Interviews of EPSCoR State Committee members*
  - *Analysis of EPSCoR RII proposals and annual reports*
- Quantitative data
  - Analysis of National Science Foundation (NSF) awards data
  - Analysis of National Center for Science and Engineering Statistics (NCSES) survey data
  - Information from journal articles with U.S. authors, as identified through the Thomson Reuters Web of Knowledge
  - Analysis of EPSCoR eligibility criteria and NSF eligibility determinations

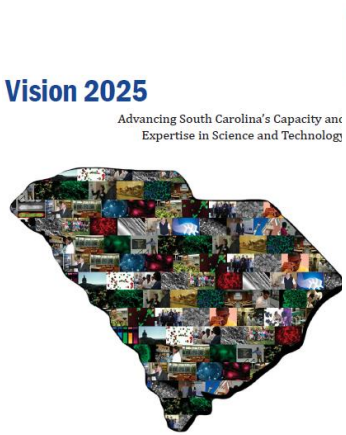
Jurisdiction Survey

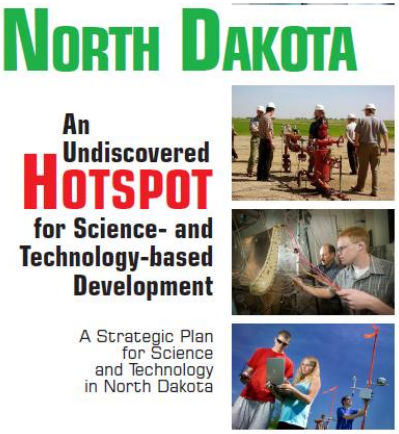
- Two-pror -6/2013
  - Life-of- diction, all years).
    - Facul
    - Gradu d by EPSCoR;
    - Equip ;
    - EPSC
    - EPSC startup companies;
    - Degre
  - Web-ba trument (1/awar
    - Aspe outcomes

State Committee Interviews

- OMB-cleared protocol conducted with the leaderships of State Committees between August and November 2013
- Covered State Committee composition, organization, roles, and activities and how these elements have evolved over time.







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Analysis of Proposals and Annual Reports

- In fall 2011, NSF provided access to EPSCoR proposals and annual reports for RII awards 1997-2011 from its FastLane data system.
  - New RII awards made in FY 2012 and beyond were not included.
- Older awards: STPI researchers traveled to the National Archives repository in Kansas City, Missouri, to copy records from NSF's historical EPSCoR files.
  - Documents were photographed and then compiled into PDF for analysis.
- To extract information from the documents, STPI researchers developed a coding framework that was implemented using the NVivo qualitative research analysis software package.

nVivo Snapshots

Nodes

Name	Sources	References
EOD A Higher Degrees in STEM	7	9
EOD A Hiring and Recruitment	60	85
EOD A Institutionalization	2	2
EOD A K-12 skills	21	38
EOD A K-12 Teacher Training	96	193
EOD A LSAMP AGEP	57	90
EOD A Mentorship	90	239
EOD A Outreach and Interest	121	373
EOD A Research	122	326
EOD A Science Camp	60	127
EOD A STEM Planning	24	42
EOD A Undergraduate Research	150	331
EOD L Community College	70	142
EOD L Faculty	105	239
EOD L Graduate Student	76	122
EOD L K-12 Students	147	631
EOD L K-12 Teachers	112	265
EOD L Post Doc	17	22
EOD L Public	14	17
EOD L Undergraduate	164	510
EOD P Community College	29	48
EOD P Disabled	8	9
EOD P HBCU	42	76
EOD P Immigrant Community	1	1
EOD P Low Income	55	91

AD codes with split out

	A : AD A New ...	B : community...	C : graduate	D : undergrad...
1 : Alabama fi...	2	0	1	1
2 : Alabama fi...	0	0	0	0
3 : Alabama fi...	9	0	9	0
4 : Alabama fi...	0	0	0	0
5 : Alabama fi...	0	0	0	0
6 : Alabama pr...	1	0	0	1
7 : Alabama pr...	1	0	1	0
8 : Alabama pr...	2	0	0	1
9 : Alabama pr...	0	0	0	0
10 : Alaska An...	0	0	0	0
11 : Alaska fin...	0	0	0	0
12 : Alaska fin...	0	0	0	0
13 : Alaska fin...	1	0	1	0
14 : Alaska pr...	0	0	0	0
15 : Alaska pr...	0	0	0	0
16 : Alaska pr...	0	0	0	0
17 : Alaska pr...	0	0	0	0

THEMATIC CODING OF DATA

Institution-Building: Definition

- Activities coded as “institution building” are those intended to create capacity at the level of the institution, rather than at the level of the individual department (which is captured under “Academic Development”)

Institution-Building: Categories

- Faculty research and teaching policy
- Student and faculty recruitment/educational capabilities
- Creation of research-supporting offices and sustaining administrative workforce
- Technology transfer organizations
- Institutional structures for promoting diversity
- Laboratory management
- Renovation and new construction

Institution-Building: Supplementary/Comparative Analyses

- Internet searches of 47 lead universities in EPSCoR jurisdictions:
  - Whether the institution had a Vice President for Research (or equivalent),
  - Research was included in tenure and promotion criteria for faculty
  - Faculty policies provided for a percentage of tenure-track or tenured faculty time to be devoted to research
  - Number of credit hours of teaching expected of faculty members.
- Total laboratory space available at institutions ranked by the Carnegie Foundation as “Very High” or “High” Research Universities, using the results of the 2011 NSF Survey of Science and Engineering Facilities

EPSCoR State Committees: Questions

- Roles and Practices
  - Composition
  - Representation
  - Coordination (across universities, with private sector)
  - Development of State Science and Technology (S&T) Plan
- Themes in State S&T Plans
- State Research and Development (R&D)/S&T Programs

Education, Outreach, and Diversity: Definition

- Set of activities undertaken to expand participation in STEM, whether at K-12 or university level
- Four primary aspects analyzed
  - Activities undertaken
  - Level of education system influenced
  - Special populations
  - Leveraged funds

Education, Outreach, and Diversity: Activity Types and Levels

- Increased K–12 student motivation/interest in STEM.
- Enhanced science, mathematics, and engineering skills and knowledge for K–12 students.
- Community college/transition to four-year college.
- Undergraduates.
- Graduate student and postdoctoral researchers.
- Faculty.
- Capacity development at community colleges, tribal colleges, HBCUs, and PUIs.
- STEM planning activities.

Specific E/O/D Activities: K-12 Example

- Student Research
- Science Camps
- Outreach
  - Classroom Kits/Visits
  - Museum Exhibits/Museum Visits
  - University/Laboratory Tours
  - Workshops/Meetings
  - Science Fairs
- Mentorship/Retention
- Teacher Research
- Teacher Training
- Support for Afterschool Programs

Education, Outreach, and Diversity: Sociodemographic Populations

- Underrepresented groups/generic.
  - Not feasible to code for African-American, Hispanic or Latino
- Women/girls.
- Native American/Native Hawaiian/Alaska Native/Pacific Islander
- Low income/first-generation college.
- Rural.
- People with disabilities.
- Immigrants.

Academic Development: Definition

- EPSCoR activities with departmental-level influences:
  - New courses/course modules
  - New minors or certification programs
  - New degree programs (Master's, PhD)
  - New departments or schools

Innovation-Related Activities

- Collaborative research between EPSCoR-funded academics and industry
- Development or use of business incubators.
- Student internships/innovation training.
- SBIR Phase 0 programs.

Innovation-Related Outputs

- Patents
  - Match to USPTO data
- Startup Companies
- Results of SBIR Phase 0 Programs (where available)

Comparison of EPSCoR to non-EPSCoR Jurisdictions on Innovation Indicators

- Patenting (2012 USPTO data, number of utility patents)
- STEM workforce (NSF 13-330 analysis of Census data, percentage of workforce in STEM occupations)
- Receipt of SBIR/STTR awards (SBIR.gov database, 2012 data).
- Venture capital (National Venture Capital Association 2013 Yearbook, 2012 data)

Conclusions

- Analysis daunting, but feasible
  - Coding effort taxed capabilities of qualitative analysis software
- Required manual effort
  - Unstructured/messy text
  - Jurisdictions use different words for similar concepts and similar terminology for different contexts, making text mining infeasible
- Comparison between self-reported outputs/outcomes from EPSCoR jurisdictions and data from national surveys added context to analysis

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13. SUPPLEMENTARY NOTES

14. ABSTRACT

This presentation was prepared for a meeting of the American Evaluation Association in October 2014. As the Experimental Program to Stimulate Competitive Research (EPSCoR) evaluation was a life-of-program assessment, STPI researchers needed to collect and analyze data from years of program documentation, including solicitations, proposals, and annual reports. This presentation describes the coding approach taken and its implementation using the software package nVivo, focusing on EPSCoR education, outreach, and diversity activities, institution-building activities, and innovation-promoting activities. The presentation also describes the design and implementation of a survey of EPSCoR jurisdictions to collect quantifiable as well as qualitative data regarding program activities, outputs, and outcomes. In addition, it examines approaches taken to assess capacity development with respect both to competitiveness for funding and States' science and engineering research bases.

15. SUBJECT TERMS

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