



# THE EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH (2013)

## Background

The talent necessary to succeed in science and engineering resides in all states, and the long-term health of the U.S. research enterprise depends on providing opportunities for young people to develop their talents no matter where they may live or attend college. Participation in research is an essential component in science and engineering education.

Consequently, students in all parts of the country must have the chance to participate in high-quality research, and it is in the national interest that federal funding be provided to universities in every state to ensure that these research opportunities are available. The nation needs a robust supply of researchers to keep expanding the frontiers of knowledge, and all states need citizens capable of understanding and applying new developments in science and engineering to their work, whether in industry, health care, education, environmental protection, or other fields of endeavor critical to the nation's well-being.

The primary federal programs designed to ensure that all states are capable of participating in the nation's research enterprise fall under the general rubric of the Experimental Program to Stimulate Competitive Research (EPSCoR). The first EPSCoR program began more than three decades ago at the National Science Foundation, which is mandated in its founding legislation not only to promote national excellence in science but also to avoid its "undue concentration." Currently, the National Science Foundation (NSF), Department of Energy (DOE), Department of Agriculture (USDA), and National Aeronautics and Space Administration (NASA) have active EPSCoR programs. The National Institutes of Health (NIH) have a related program called Institutional Development Awards (IDeA).

As directed by Congress, the National Science Foundation (NSF) asked the National Academies to assess the effectiveness of NSF's EPSCoR program and similar programs administered by other the federal agencies, including the extent to which these programs achieved their respective goals and states used these awards to improve their science and engineering research, education, and infrastructure. Due to data limitations and the broadening of the mission of EPSCoR programs over time, the study committee could not assess the effectiveness of EPSCoR with the necessary rigor needed to fully address Congress's charge within the time frame of the study. Therefore, the committee focused on better understanding the extent to which the underlying structure and policies have affected the program's ability to achieve its overall mission and major goals.

## Eligibility

Although the EPSCoR program started with just 7 states in 1979, eligibility for the NSF program has spread across 32 jurisdictions, including 29 states and 3 territories (Puerto Rico, Guam, and the Virgin Islands). DOE and NASA follow the NSF's eligibility. The NIH and USDA have different eligibility criteria, and a slightly different group of states participate in these programs. The reason for the growth in the number of participating states is that the criterion for eligibility has been relaxed over time.

Currently, NSF EPSCoR admits any state that receives less than 0.75 percent of total NSF funding. However, sixteen states have less than 0.75 percent of the U.S. population. To lose their eligibility and graduate from the program, each of these states would have to receive a percentage of research funding that exceeds its share of the nation's population.

If one is aiming for equity among all the states, it might therefore make more sense to consider per capita federal research spending in each state. Indeed, the ranking of states by per capita funding differs significantly from the ranking by total funding, and several current EPSCoR states appear in the top 10 on this list. Although the committee is not recommending that per capita research funding be the sole criterion, it does believe that per capita funding should be a primary consideration.

A state's commitment to research—expressed in visible and concrete terms—should be one of the main criteria for competitive federal support. Unless a state invests its own energy and resources in improving its research capacity, the federal commitment will not have the desired effect of creating an enduring foundation for excellence. As a result all EPSCoR funding should require some level of state matching funds and the level of state commitment should be a key criterion in awarding competitive grants.

## An Expanding Mission

In addition to pursuing the original mission of enabling universities in every state to be able to compete for federal research funding, EPSCoR programs have over the years added other goals, such as enhancing innovation to stimulate economic development and entrepreneurship and expanding the diversity of the science and engineering workforce. The addition of broader social goals to the EPSCoR mission—as compelling and justified as these broader social goals may be—dilutes the program's ability to advance its primary goal of strengthening research capability and providing research opportunities for postsecondary students. The EPSCoR programs should refocus on the core elements of enhancing research capacity and providing opportunities for research-based postsecondary training in science, technology, engineering, and mathematics.

## Assessing Past Performance

The breadth and increasing complexity of the EPSCoR program objectives have made it difficult to develop a rigorous assessment system with quantitative metrics to evaluate short-term and, more important, long-term progress.

Several million dollars of funding and five years of effort are clearly not going to transform a state's research capacity or make it competitive with other states that have invested and/or received tens of millions of dollars over decades to build their research capacities, but that was the goal laid out in 1979. Indeed, EPSCoR has been in operation for more than 30 years, and over this period, the program has invested several billion dollars in capacity-building activities, yet the same 10 states that received the highest level of research funding in 1977 still top the list. Moreover, more than half of all states now receive EPSCoR funds, and no state that has participated in the program has permanently "graduated" from it. In retrospect, the initial NSF EPSCoR goal seems politically astute but unrealistic.

Sizable differences in population, geography, history, and culture present daunting challenges to any effort to attain uniform results nationwide. Also, there has not been a rigorous quantitative assessment of the EPSCoR programs that would document their value.

The states that have been the nation's traditional leaders have invested in their research capacity—deriving considerable funds from both public and private sources. As a result, historically successful

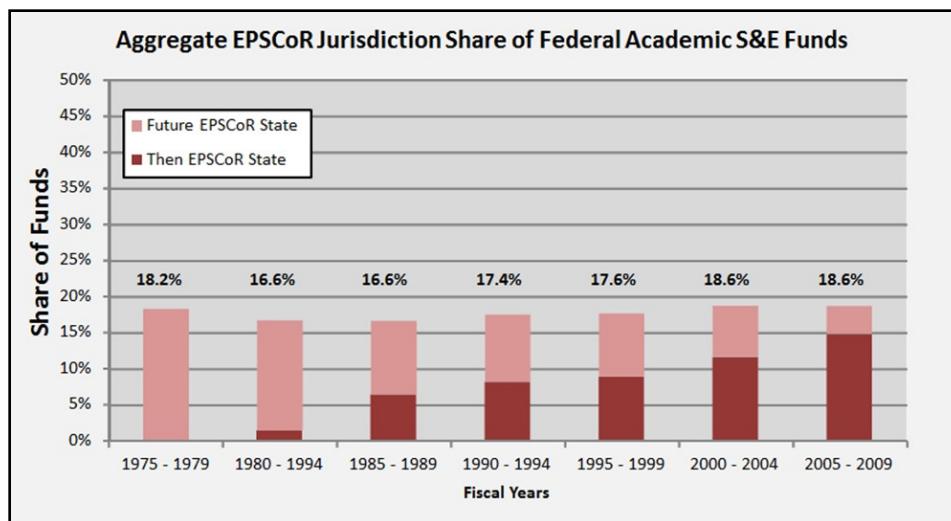
states continue to do well in competing for research support. It should also be noted, however, that the EPSCoR states have not lost ground, and it is clear that virtually all have improved their research capacity in absolute, if not relative, terms. The aggregate share of federal R&D to eligible states has not changed significantly over the course of the program. (See figure 1). However, because EPSCoR funding constitutes a relatively small percentage of each EPSCoR state's total research funding, the precise role that the programs have played in this effort is difficult to determine. There is a need for evidence-based assessment of federal agency program management and of state implementation and such assessments should be rigorously conducted.

### Build on What Works

At the same time, there is evidence that the EPSCoR programs have provided significant benefits to participating states—and thus to the nation. EPSCoR programs and EPSCoR states have devoted considerable time and resources to building research capacity. Nearly all participating states report positive cultural changes in attitudes toward science and engineering as a consequence, at least in part, of EPSCoR programs. Similarly, they also report positive organizational, policy, and program changes that have enhanced their research environment. Further, there is evidence that research capacity in eligible states has increased. The committee learned of many individuals from EPSCoR states who have produced important research results and many institutions in those states that have graduated successful scientists and engineers.

All decisions about where to invest research resources are difficult, and all involve trade-offs. Given the ambiguity over common factors such as eligibility and mission among agencies, and the scarcity of rigorous data and scholarly assessment literature, the committee focused on evaluating core concerns, including what the program could realistically hope to achieve, how it aligned with the larger national goals of nurturing and enhancing research capacity, and the criteria for eligibility.

Reaching understanding and agreement on these underlying questions is a prerequisite for developing a coherent program with achievable goals that can be rigorously evaluated and improved. With this report, the committee aims to establish the foundation on which such assessments and future programs must be built.



**Figure 1.** The share of federal academic science and engineering funds received by EPSCoR states has remained largely the same since the inception of the EPSCoR program. [SOURCE: NSF Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions via WebCASPAR]

The committee recommends that the federal government continue to promote the development of research capacity in every state so that all citizens across the nation have the opportunity to acquire the postsecondary education, skills, and experience they need to pursue productive and successful careers in science, technology, engineering, and mathematics (STEM) fields and to contribute fully to the nation's research enterprise.

- The EPSCoR programs, working through the EPSCoR Interagency Coordinating Committee (EICC), should develop and enforce a realistic framework for state eligibility and graduation from the program.
- EPSCoR programs should concentrate on the programs' core elements:
  - To enhance research excellence through competitive processes.
  - To enhance capacity for postsecondary training in STEM fields.
- EPSCoR programs should be restructured to combine beneficial aspects of current programs:
  - The NIH and NSF EPSCoR programs should pursue a "blended" funding strategy with two tracks:
    - A competitive-grant track that provides fewer and larger grants.
    - A smaller-scale, infrastructure investment or statewide investment track.
- The evaluation process conducted during and after an EPSCoR project's implementation should be made more rigorous.

In conclusion, the committee recommends that the newly refocused federal programs be renamed to better reflect their mission and to remove "experimental," which is now a misnomer.

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