AC 2008-158: METRICS TO ASSESS BROADENING PARTICIPATION IN STEM

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Abstract

The National Science Foundation (NSF) has long advocated increased diversity among its grantees, in particular through the Broader Impacts Criterion for grant proposals that looks at the impact of NSF support for research on education and on NSF support for both research and education on such things as a) advancing public understanding of science and engineering b) advancing learning, c) increasing the participation in the science and engineering enterprise of underrepresented populations, and d) enhancing the infrastructure for research and education [1] Despite this philosophy, few metrics by which to gauge grantees' progress in broadening participation exist. Included within the suite of possible responses to the Broader Impacts Criterion of the NSF Merit Review Criteria are those activities that advance the goal of increasing the participation in Science, Technology, Engineering, and Mathematics (STEM) by those individuals who are traditionally underrepresented in NSF fields (e.g., women, minorities, and persons with disabilities) and/or institutions that are underrepresented as recipients of NSF grants (e.g., community colleges, minority serving institutions, baccalaureate colleges, and other non-research institutions). Although NSF provides examples of such activities, there is currently no method by which to gauge grantee attention to the Broader Impacts Criterion or the success of such efforts when they are asserted. To provide suggestions of possible metrics, The Center for the Advancement of Scholarship on Engineering Education (CASEE) at the National Academy of Engineering (NAE), with NSF support, convened a workshop consisting of individuals broadly representative of NSF's grantee communities. The group suggested that, at a minimum, grantee institutions should provide both their existing affirmative action plans as well as specific information on collaborations with underrepresented institutions. In addition, the working group provided a list of other metrics that PIs could voluntarily offer as support for claims of broadening participation of both individuals from underrepresented populations and individuals from institutions that have not traditionally participated in funded research. The deliberations and recommendations of the workshop attendees will be presented. It is hoped that these recommendations will lead to better defined NSF policies regarding the Broadening Participation criterion.

Background

Section 1885 of the National Science Foundation (NSF) chapter of the United States Code [2] states

> (a) The Congress finds that it is in the national interest to promote the full use of human resources in science and engineering and to insure the full development and use of the scientific and engineering talents and skills of men and women, equally, of all ethnic, racial, and economic backgrounds.
> (b) The Congress declares it is the policy of the United States to encourage men and women, equally, of all ethnic, racial, and economic backgrounds to acquire skills in science, engineering, and mathematics, to have equal opportunity in education, training, and employment in scientific and engineering fields, and thereby to

> promote scientific and engineering literacy and the full use of the human resources of the Nation in science and engineering. To this end, the Congress declares that the highest quality science and engineering over the long-term requires substantial support, from currently available research and educational funds, for increased participation in science and engineering by women and minorities. The Congress further declares that the impact on women and minorities which is produced by advances in science and engineering must be included as essential factors in national and international science, engineering, and economic policies.

Over time, Congress has also expressed concern about the concentration on federal support for research and education with respect to geographic distribution and institution type (research versus non-research universities).

NSF, which provides the bulk of the federal funding that supports basic STEM research, has as one stated goal to "cultivate a world-class, broadly inclusive science and engineering workforce" [3]. NSF further defines "broadly inclusive" in its strategic plan as "seeking and accommodating contributions from all sources while reaching out especially to groups that have been underrepresented; serving scientists, engineers, educators, students and the public across the nation; and exploring every opportunity for partnerships, both nationally and internationally" [1 p. 4]. However, NSF has had only limited success in reaching deeply within all elements of the US population and across the diversity of institutions of higher education.

Although the overall percentage of STEM workers compared to the general employed population increased from 4.4% in 1983 to a high of 5.6% in 2001 [4] and the STEM labor force grew faster than the general workforce in the second half of the 20th century [5], approximately one quarter of Science and Engineering (S & E) degree recipients and 40% of those with Ph.D. degrees in S & E fields are approaching retirement age [5]. As the overall number of STEM jobs is expected to increase over the next five years [5], it is imperative to recruit and retain enough students in the STEM fields to maintain a qualified applicant pool for available jobs.

Despite the recent growth in the S & E fields overall, women, African-Americans, Hispanics, Native Americans, and persons with disabilities remain underrepresented compared to their percentage in both the overall population and the general workforce. Although women are approximately half of the general US population and (depending upon the baseline numbers used) constitute between 42% and 47% of the overall workforce, they constitute only 27% of the S & E workforce [6]. African-Americans, who make up 12.3% of the general population [7], are underrepresented in both the general workforce (5.8%) and the S & E workforce (4.4%) [6]. Similarly, Hispanic individuals comprise 12.5% of the general population [7] but only 5.2% of the overall workforce and 4.3% of the S & E workforce [6]. Native Americans make up 0.9% of the general population [7] but only 0.4% of both the general and S & E workforces [6]. Persons with disabilities are 12.3% of the population between 16 and 64 years, and 41% of the population over the age of 65 [8], yet are 5.5% of the total workforce and 5.1% of the S & E workforce [6]. Given the disparity in workforce representation for women, underrepresented minorities, and

persons with disabilities combined with the increasing need for domestic S & E workers, it is critical to include these historically excluded populations in the field.

There are approximately 3500 institutions of higher education in the United States spanning the various Carnegie classifications. However, NSF funding has historically been concentrated within the top 100 research universities, with only limited participation by other types of institutions (i.e., doctoral and master's level universities as well as baccalaureate and community colleges). Traditionally, the top 100 institutions in terms of money received from grants have dominated the federal funding budget, and in 2006 those institutions accepted 80% of the funds awarded. In that year, the top 20 institutions collected 30% of the academic research and development funding [5]. Various arguments have been offered that the full panoply of institution types merit NSF support with attention given not only to their research productivity, but their actual or potential contribution to the national science and engineering workforce.

One strategy NSF has employed to make progress toward its goal of reaching "all sources" has been the requirement of each individual who applies for an NSF grant to address a Broader Impacts Criterion in their proposal's project summary. Inspired by a 2004 report by the Committee on Equal Opportunities in Science and Engineering (CEOSE) that encouraged NSF to both improve its methods of holding grantees accountable for their actions related to the broader impacts criterion and provide guidelines for the Principal Investigators (PIs) to better address the broadening participation aspect of this criterion [9], CASEE sought to operationalize such guidelines and metrics for use by NSF and its grantee community.

CASEE convened a workshop group of individuals representative of a wide variety of NSF disciplines and institutions (members of the workshop group are listed in Appendix A) to develop metrics that could be used by NSF and its grantees to judge the success of efforts to broaden participation of underrepresented populations and institutions in grant activities. The group members developed the list of potential metrics (see Appendix B) in groups of two, and the final overarching metrics were refined in a two-day workshop. The group was careful to include metrics that would encourage compliance with the Broadening Participation criteria without imposing undue work on the individuals or institutions submitting grant proposals. The goals and procedures of the workshop group are described elsewhere [10].

Recommendations

Although individuals write the funding proposals for their projects, it is their home institutions that must account for the education and research activities of their faculty and staff, institutions that develop policies that support or impede diversification efforts, and institutions that are more likely to have (and be able to track over time periods that exceed those of individual grants more easily than would an individual PI) data on the demographic characteristics of those involved in funded projects. This led to the development of two core metrics, both centered on institutionally held data, by which to assess broadening participation. The first metric will describe the progress of women and underrepresented minorities in academic science and engineering, while the second describes the progress made by institutions that have not traditionally received NSF funding.

The first metric aims to gauge the impact of NSF funding on the status of individuals from underrepresented populations who are employed in a STEM field in an academic setting. Every other year, academic institutions must provide detailed information to the Higher Education Reporting Committee [which consists of the Department of Education/Office of Civil Rights (OCR), the Office of Federal Contract Compliance Programs (OFCCP), and the Equal Employment Opportunity Commission (EEOC)] regarding the gender, racial, and ethnic makeup of faculty and staff, including a breakdown by job category and salary. This report, *The Equal Employment Opportunity Higher Education Staff Information Report (EEO-6)*, remains off-line in the Integrated Postsecondary Education Data System (IPEDS) that is maintained by the National Center for Educational Statistics (NCES). According to the NCES website, the reports are filed by

> postsecondary institutions that have 15 or more full-time employees. Data were reported on 1) the number of faculty, and other employee categories by full-time and part-time status, sex and racial ethnic categories; 2) full-time faculty by rank and tenure; and 3) new hires by full-time and part-time status, sex and racial ethnic categories [11].

Most academic institutions must also develop Affirmative Action plans that include classifying those positions likely to underutilize women and minorities, to describe likely career paths for those categories, and to develop a plan to employ women and minorities in those positions in numbers commensurate with both the local population diversity as well as the diversity of the field as a whole.

With these sources of information, it would be possible and desirable to encourage institutions receiving NSF funding to submit both their Affirmative Action reports and their Equal Employment Opportunity Higher Education Staff Information Reports to be publicly displayed as part of the information on the *Award Summary: Top 200 Institutions* page [12].

The second metric involves examines the institutional diversity of NSF grants. Specifically, institutions receiving grants should submit information regarding how many grants they have and whether any include underrepresented institutions that will eventually have, if not all, at least a large portion of fiscal responsibility for the grant. As with the first metric, it is possible that making this information public will induce institutions to attempt more collaboration with non-research institutions.

Policy Implications

The recommendations made by the workshop group would serve as a tool for the NSF to track the progress made by its grant recipients in increasing diversity in the science and engineering workforce. The two recommended metrics explained here would provide a reporting scheme that is quantified in terms of the number and responsibility level of women and minorities employed at the grantee institutions. The documents requested are already required of the institutions, although have not been publically displayed in the past. The NSF would experience some increased work in posting these documents, but it is likely that professional societies with a stake in improving diversity in science and engineering would voluntarily examine the information and

bring potential violations to the attention of the NSF. For example, if one of the top grant-receiving institutions is underutilizing women faculty despite having a high proportion of women both in the local population and in the academic field, a professional society might notice the discrepancy and notify the NSF of potential violations of both law (Title IX) and policy (Broader Impacts). Armed with that knowledge, the NSF could conduct reviews of potential violators rather than institutions picked at random, which would make efficient use the time and money of the agency's employees.

Institutional Implications

These recommendations may be met with resistance from the institutions who are required to follow them. Although institutions currently must create the EEO-6 and an Affirmative Action plan, the lack of public acknowledgement of them may have led to lower quality than would be expected if the authors know the documents will be examined. Institutions may not currently calculate the underutilization of women, minorities, and persons with disabilities across departments, and doing so will use employee resources that administrators may feel could be better used elsewhere. Administrators may also feel that their local or institutional environments do not naturally attract individuals from underrepresented populations, and may wish to provide further information in order to explain possible inadequacies in these required reports. In light of this, the workshop group also defined a list of metrics that could be submitted voluntarily by either individual grantees or their home institutions that would explicate the context of their efforts towards diversity. These metrics are presented in Appendix B.

However, there is a clear need to encourage and support the entry and retention of individuals from underrepresented populations into the STEM fields, and institutions who publicize their progress towards equity will benefit from the increased interest in studying or working at an institution that obviously provides a supportive environment. Thus, in addition to avoiding possible repercussions from NSF in their enforcement of the Broader Impacts criterion, institutions who act on these recommendations will gain respect as well as recruit more scientists and engineers.

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Appendix A: List of workshop group members.

Fitzgerald Bramwell is professor of chemistry and former vice-president for research and graduate studies at the University of Kentucky.

Elizabeth Cady is an associate program officer in the Center for the Advancement of Scholarship on Engineering Education of the National Academy of Engineering. Her doctorate is in cognitive psychology.

Beatriz Clewell, whose doctorate is in education policy, planning, and analysis, serves as director of the Program for Evaluation and Equity Research (PEER) at the Urban Institute. She has conducted evaluations of pre-college, undergraduate, and graduate programs in the NSF Directorate for Education and Human Resources.

Vicki Flaris is an assistant professor of chemistry at Bronx Community College and president of the Society of Plastics Engineers.

Norman Fortenberry is director of the Center for the Advancement of Scholarship on Engineering Education of the National Academy of Engineering. His doctorate is in mechanical engineering. His is a former senior advisor and division director in the NSF Directorate for Education and Human Resources.

Eric Jolly, who possesses a doctorate in psychology, is president of the Science Museum of Minnesota and former vice-president and senior scientist of the Educational Development Center.

Dianne Martin is professor of computer science and director of the Cyber Security Research and Policy Institute at George Washington University and is currently serving as dean of the College of Information Technology at Zayed University in Dubai, United Arab Emirates. She is a former program officer in the NSF Directorate for Education and Human Resources.

Heather Macdonald is professor and chair of the Department of Geology at the College of William and Mary; one of her current projects focuses on the professional development of geoscience faculty.

Muriel Poston, whose training is as a biologist and who also possesses a law degree, is dean of faculty at Skidmore College and a member of the Congressionally-chartered Committee on Equal Opportunity in Science and Engineering. She is a former program officer in the NSF Directorate of Biological Sciences.

Armando Rodriguez is an associate professor in the Department of Electrical Engineering at Arizona State University and a past winner of the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring.

Roberta Spalter-Roth is director of research for the American Sociological Association.

Appendix B

Sample Metrics of Broadening Participation that Grantee Institutions May Choose to Use to show Science and Engineering Workforce Preparation, Utilization, and Advancement of Individuals from Underrepresented Populations or Underparticipating Institutions

1 ***Comparisons over time of the compositions of various populations*** *(with data reported by gender, race/ethnicity, disability status, and institution type), for example:*

- **Institutions of Higher Education (institution types include Carnegie classification, public or private, non-profit or for-profit, etc.)**
  - Recruitment: data on applicants for faculty/post doc/graduate/undergraduate positions, offers, acceptances (by department/discipline)
  - Administrative appointments
  - Number, percentage, rank, and tenure status of faculty in department/college/ institution administrative leadership positions
  - New hires (job title, nationality, citizenship)
  - Overall faculty composition*:* Composition of STEM faculty by department, institution by rank, tenure status
  - Percentage of faculty with discipline specific terminal degree
  - Percentage of full-time faculty
  - Promotion Tracking: Number and % of faculty who submit tenure or promotion applications with outcome – assistant to associate, associate to full
  - Number of years in each faculty rank (time to promotion)
  - Sabbatical year per years teaching by rank, percentage and tenure status
  - Number, discipline, and institution of faculty serving on inter-institutional graduate thesis committees
  - Number, rank, and tenure status of faculty that participated in an NSF review process, advisory committees, or Committee of Visitors
  - Number, rank, tenure status of faculty participating in professional development symposia/workshops and amount/% of support money awarded
  - Self-funded faculty attending conferences
  - Staff education credits by rank, percentage and tenure status
  - Number of invited speakers
  - Presenters/Attendees at scientific seminars
  - Number, rank, and tenure status and dollar amount for faculty receiving research funding
  - Number, rank, and status of research workforce (number sabbatical leave faculty, visiting faculty, research faculty, and technicians)
  - Internal vs. external grants
  - Pairing faculty at different institution types (research/non-research) on grant proposals
  - Co-PIs from different type of institution (research/non-research)
  - Subawards from different type of institution (research/non-research)
  - Extent of access to research facilities (e.g., library, laboratories, computational facilities, communications facilities)
  - Rates of Research U library usage (on-line and in-person) by students and faculty at consortia within geographic region or non-research institution

- Lab / office space allocation*:* amount of space allocated by dept. in tenured/ tenure track positions by rank; location, available resources
- Undergraduate recruitment, matriculation, retention (also by nationality)
- Students transferring schools (research/non-research; average over last five years)
- Graduate student recruitment, matriculation, retention
- Number and status (full-time, part-time, year in graduate program) of graduate student matriculants in interdisciplinary, cross-disciplinary, and cross-institutional degree programs
- Postdoctoral student recruitment
- Percentage of students on scholarship by status (full-time, part-time, year in college)
- Number of remedial classes per student body
- Pre-college and undergraduate research participation
- Number students working as RAs by institution type
- Number of student internships, externships, and co-op experiences by status (full-time, part-time, year in college)
- Number of graduate students participating in and attending a local, regional, or national disciplinary meeting
- Students to state, regional, national disciplinary meetings
- Average percent of bachelors graduates from department who were transfers from a different type of institution
- Average number of students employed in STEM workforce over the last five years
- Average number of baccalaureates on to graduate school/PhD programs over the last five years
- Average number of baccalaureates on to K-12 teacher programs over last the five years

▪ **Institutions of Elementary/Secondary Education (institution types include public or private)**

- Number and % of applicants for principal positions; job offers; acceptances in elementary/middle/high schools in district.
- Number, rank, percentage and status of new hires for principal positions by elementary/middle/high school levels
- Number and % principals in elementary/middle/high schools in district and state.
- Number/percent of applicants for teaching positions; job offers; acceptances (by elementary/middle/high school)
- Number/percent of teachers by elementary/middle/high school
- Number, rank, percentage and status of teachers with discipline specific Ph. D. or terminal degree
- Number, rank, percentage and status of teachers with discipline specific M.A./M.S.
- Number, rank, percentage and status of teachers with discipline specific B.A./B.S.
- Number, rank, percentage of K-12 teachers taking National Board exams
- Number, rank, percentage of K-12 teachers becoming National Board certified
- Teaching Honors (productivity recognition international, national, regional, local)
- Percent and extent of participation

▪ **Non-academic Institutions (institution types include museum/science center, research organization, service provider, etc.)**

- Recruitment: data on applicants for exempt (executive, managerial, professional salaried staff) and non-exempt (technical and support hourly staff), offers, acceptances by department;
- New hires (job title, nationality, citizenship)
- Promotion Tracking: Number and % of staff (by type) who apply for promotion, and number and % who are granted promotion

2 ***Comparisons over time of institutional support to various populations*** *(with data reported by gender, race/ethnicity, disability status, and institution type), for example:*

- **Institutions of Higher Education**
  - Conference travel fund awards by number, rank, and tenure status of faculty
  - Amount of department/school/university funds for professional development/technical training workshops
  - Number of externally supported professional development workshops
  - Number of inter-institutional professional development workshops
  - Number of internally supported professional development workshops
  - Amount of institutional resources allocated to proposal writing for each rank in each discipline
  - Incentive funding (e.g., summer salary, released time) awarded for proposal submission by number, rank, and tenure status of faculty
  - Amount of internal funding used as institutional commitment (letters of support in grant submissions)
  - Institutional support for grant submission (e.g., institutional office of research FTE, research foundation FTE, SRO available or PI/subaward contact doing work on own?)
  - Amount/percent of research initiative funds allocated in each discipline
  - Institutional support (start up packages, seed funds, undergrad research programs)
  - Research Incentive Funding: amount and % of university funds allocated for research incentive to new faculty or to match funded grants
  - Institutional "cost-share" funds allocated to match funded grants awarded by number, rank, and tenure status of faculty
  - Infrastructure support (lab creation, reusable supplies)
  - Department incentives for faculty hires (family leave policies, tenure clock extension, dual career provisions, childcare)
  - Salary offers and start-up packages for new hires (dept/rank/citizenship status)
  - Salaries in each rank
  - Amount of funds allocated to support mentoring of new faculty and UI faculty
  - Number and frequency of tuition grants for faculty to retool by rank and tenure status of faculty
- **Institutions of Elementary/Secondary Education**
  - Amount and percent of time spent on professional development
  - Amount of funding for career ladder opportunities
  - Amount of school funding spent for PD of upper-level school staff (department chairs, math and science coordinators)
  - Amount of state or district funding spent for asst. principal and principal PD (state and district workshops, principal academies, etc.)

- Amount of state or district funding spent for asst. principal and principal postsecondary courses (i.e., summer principal training sessions, coursework for advanced degrees)
- Amount of funding for principal courses/development
- Amount of state or district funding for district and school-based teacher professional development
- Amount of funding spent for postsecondary coursework for credentialing or upgrading teacher credentials
- Amount of state or district funding spent for PD for teaching assistants (including postsecondary courses for credentialing purposes)
- Amount of state or district funding spent for career ladder opportunities for teaching assistants (to assist them to qualify for teaching positions)

▪ **Non-academic Institutions**
- Conference travel fund awards by number, rank, and tenure status of faculty
- Amount of funds for professional development/technical training workshops
- Number of externally supported professional development workshops
- Number of inter-institutional professional development workshops
- Number of internally supported professional development workshops
- Institutional support (start up packages and seed funds)
- Infrastructure support (lab creation, reusable supplies)
- Organizational incentives for professional staff hires (family leave policies, tenure clock extension, dual career provisions, childcare)
- Salary offers and start-up packages for new hires (by rank and citizenship status)
- Salaries in each rank
- Number and frequency of tuition grants for staff (by level) to retool

3 ***Comparative measures of individual "productivity" at a given point in time for various populations*** *(with data reported by gender, race/ethnicity, disability status, and institution type), for example:*

▪ **Institutions of Higher Education**
- Average number of hours student advising/counseling
- Letters of recommendation written last year for UI students/ those outside home institution
- Mentoring of grads by junior and senior faculty (hours, instances, etc.)
- Mentoring of undergrads by junior and senior faculty (hours, instances, etc.)
- Undergraduate thesis or project supervision
- Graduate thesis, collaboration, mentoring)
- Postdoc work supervision, collaboration, mentoring
- Time from BS to MS
- Time from MS to PhD
- Time from PhD to postdoctoral
- Number of proposals submitted to regular programs
- Contributions by grant participants (paid time, actual time, level of technological responsibility from 1 – 10)
- Number of authored or co-authored papers, journal publications, monographs by faculty (each rank), graduate students, and undergraduate students in each discipline (if this applies to those involved in the grant); (Other elements to consider: author order, journal quality, citations, scientific responsibility level)

- Number of scientific collaborations with researchers of different gender/race/ institution type resulting in formal presentation (national meeting, professional seminar)
- Impact of research (number of students trained and better prepared for workforce), number of confidential disclosure agreements, number of industry sponsored research agreements, number of technology transfer agreements, number of workshops for dissemination of products developed, number of option agreements, number of papers with industrial coauthors, number of papers with nonaffiliated coauthors, number of patents assigned/Number of patent filings, number of citations and impact rankings, research publicity (journals, professional magazines, newspaper articles, web sites), number of licenses granted /Number of license applications, number of materials transfer agreements, software copyright, distribution (trade secret or license), number of spin-off companies and stage (early, developing, mature), workshops for dissemination of products developed (and associated demographics of participants), royalty income from STEM efforts (not patent reassignment or licensing), royalty income from patent reassignment and licensing, number of Research Centers and Institutes (Internally and Externally Supported)

▪ **Institutions of Elementary/Secondary Education**

- Size and type of grants submitted/funded and trends over time
- Academic Honors (productivity [National Board for Professional Teaching Standards certification], recognition, international, national, regional, local)
- Amount and percent spent on coursework
- Research awards
- Research Honors (productivity recognition international, national, regional, local)
- Research publicity (professional magazines, other magazines, newspaper articles, web sites)
- Service Awards (productivity recognition international, national, regional, local)

▪ **Non-academic Institutions**

- Number of proposals as principal investigator
- Number of authored or co-authored papers, journal publications, monographs by faculty (each rank), graduate students, and undergraduate students in each discipline (if this applies to those involved in the grant); (Other elements to consider: author order, journal quality, citations, scientific responsibility level)
- Number of scientific collaborations with researchers of different gender/race/ institution type resulting in formal presentation (national meeting, professional seminar)
- Number of confidential disclosure agreements, number of industry sponsored research agreements, number of technology transfer agreements, number of workshops for dissemination of products developed, number of option agreements, number of papers with industrial coauthors, number of papers with nonaffiliated coauthors, number of patents assigned/Number of patent filings, number of citations and impact rankings, research publicity (journals, professional magazines, newspaper articles, web sites), number of licenses granted /Number of license applications, number of materials transfer agreements, software copyright, distribution (trade secret or license), number of spin-off companies and stage (early, developing, mature), workshops for dissemination of products developed (and associated demographics of participants), royalty income from STEM efforts (not patent reassignment or licensing), royalty income from patent reassignment and licensing

4 ***Measures of institutional "productivity,"*** *for example:*

▪ **Institutions of Higher Education**

- Number of inter-institutional grants
- Levels of Internal vs. external grants devoted to inter-institutional collaboration
- Level of academic leadership participating as PIs on grants (Provosts, Deans, etc.)- measure of institutional commitment to enhanced research or educational capacity
- Number of scientific collaborations with researchers of different gender/race/ institution type resulting in peer reviewed publication
- Number of scientific collaborations with researchers of different gender/race/ institution type resulting in formal presentation (national meeting, professional seminar)
- Team taught courses by faculty and different types of institutions (research/non)
- Courses and advanced courses taught at different types of institutions (faculty from either research or non-research)
- Number/ratio of students taught via consortia courses
- Number, discipline, faculty for consortia courses
- Developing/number of interdisciplinary, cross-disciplinary, and cross-institutional majors and degree programs between research intensive and underrepresented institutions

▪ **Institutions of Elementary/Secondary Education**
- Number of inter-district grants
- Levels of Internal vs. external grants devoted to inter-institutional collaboration
- Level of academic leadership participating as PIs on grants (Superintendents, District Specialists, Principals, etc.)- measure of institutional commitment to enhanced educational capacity
- Courses and advanced courses taught at different districts
- Number/ratio of students taught via consortia courses
- Number and discipline of teachers for consortia courses

▪ **Non-academic Institutions**
- Number of inter-institutional grants
- Number of scientific collaborations with researchers of different gender/race/ institution type resulting in peer reviewed publication

5 ***The presence/absence of specific "best practices,"*** *for example:*

▪ **Institutions of Higher Education**
- Developing grant rather than loan programs to fund students
- School-wide mentoring program (yes/no and level of participation)
- Cross-institutional mentoring programs
- Developed alumni tracking program
- Location of recruiting ads and recruiting plan to include UIs and MSIs
- Training of recruitment and promotion/tenure committee members on equity issues
- Development of transparent and consistent promotion and hiring criteria
- Building consortium between 2-yr., 4-yr., MSI, Research U's (yes/no and changes in funds and other resource distributions among partners over time)
- Collaborating capacity between Research and Non-Research Institutions
- Extracurricular activities including participants from underrepresented schools
- Cooperation among EPSCoR groups (summer internships, research efforts, shared teaching, mentoring/PhD committees, external examiner)
- Are there strategic plan commitments/declarations? If so, how are they operationalized? How are such plans institutionalized?

- Benchmarking (discipline/department ranking as context for other responses)

- **Institutions of Elementary/Secondary Education**
  - School-wide or cross-institutional mentoring program (yes/no and level of participation)
  - Developed alumni tracking program
  - Location of recruiting ads and recruiting plan
  - Training of recruitment and promotion committee members on equity issues
  - Development of transparent and consistent promotion and hiring criteria
  - Building consortium between schools/districts (yes/no and changes in dollars and other resource distributions among partners over time)
  - Extracurricular activities
  - Are there strategic plan commitments/declarations? If so, how are they operationalized? How are such plans institutionalized?
  - Benchmarking
- **Non-academic Institutions**
  - Development of transparent and consistent promotion and hiring criteria
  - Location of recruiting ads and recruiting plan
  - Training of recruitment and promotion committee members on equity issues
  - Are there strategic plan commitments/declarations? If so, how are they operationalized? How are such plans institutionalized?