

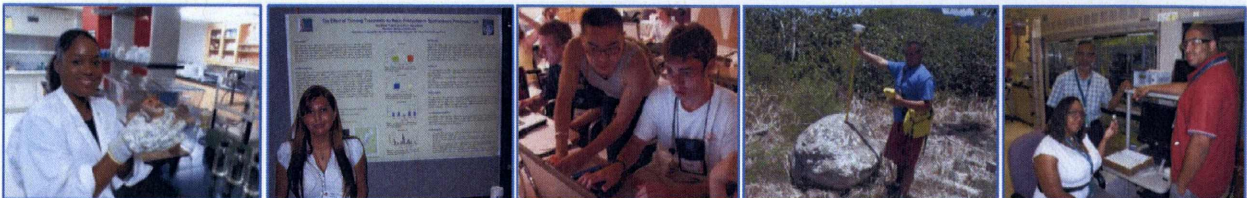


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## **National Science Foundation Directorate for Education and Human Resources Division for Human Resource Development (HRD)**

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The Division of Human Resource Development (HRD) serves as a focal point for NSF's agency-wide commitment to enhancing the quality and excellence of science, technology, engineering, and mathematics (STEM) education and research through broadening participation by underrepresented groups and institutions. The Division plays a central role in increasing opportunities in STEM education for individuals from historically underserved populations—minorities, women and persons with disabilities—and supports the development of the educators, researchers, and institutions dedicated to serving these populations. Priority is placed on investments that promise innovation and transformative strategies to eliminate barriers that limit the full participation of individuals regardless of race/ethnicity, gender and disability status. Programs within HRD have a strong focus on partnerships and collaborations in order to maximize the preparation of a well-trained scientific and instructional workforce for the new millennium.



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## **ADVANCE (Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers)**

The goal of the ADVANCE Program is to develop systemic approaches to increase the representation and advancement of women in academic STEM careers, thereby contributing to the development of a more diverse science and engineering workforce. Recent solicitations have encouraged proposals for three types of awards:

- **Institutional Transformation (IT)** awards are expected to include innovative systemic organizational approaches to transform institutions of higher education in ways that will increase the participation and advancement of women in STEM academic careers.
- **IT-Catalyst** awards are designed to support institutional self-assessment activities, such as basic data collection and analysis and policy review, in order to identify specific issues in the recruitment, retention and promotion of women faculty in STEM academics within an institution of higher education.
- **Partnerships for Adaptation, Implementation, and Dissemination (PAID)** awards may focus on one institution or organization, or they may be a partnership between several institutions and/or organizations.



### **Background**

- Since 2001, ADVANCE has supported 45 full IT awards, 21 Leadership awards (now part of PAID) to develop & train leaders, 42 PAID awards to disseminate promising practices and 21 IT-Catalyst awards.
- ADVANCE IT awardees disseminate information to the higher education community via publications, toolkits and resources. The IT institutions have become exemplars to their peer institutions and many ADVANCE IT activities have been adapted and used elsewhere. For example, material on unconscious bias to train faculty at the University of Michigan has been adapted by several divisions within NSF to train panelists.

### **Talking Points**

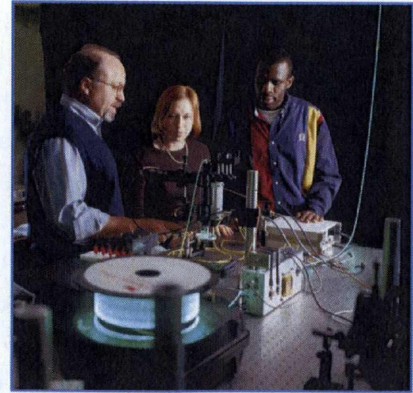
- The FY 2012 increase will support collaborations with other broadening participation efforts in the Division of Human Resource Development. Additionally, the FY 2012 increase will also fund efforts to more effectively broaden the participation of academic STEM women at community colleges, predominantly undergraduate institutions, minority serving institutions and women's colleges through targeted outreach and technical assistance efforts.
- Commencing in FY 2012, ADVANCE will provide support for a comprehensive and uniform data collection system to efficiently track its program accomplishments

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## Alliances for Graduate Education and the Professoriate (AGEP)

The AGEP Program is designed to **build administrative and academic infrastructure** that support the goals of **broadening participation** in the American scientific workforce.

It furthers the graduate education of underrepresented STEM students through the doctorate level, preparing them for fulfilling opportunities and productive careers as STEM faculty and research professionals. AGEP also supports the **transformation of institutional culture** to attract and retain STEM doctoral students into the professoriate.



### Background

- AGEP has focused on the establishment of multi-institution alliances to develop pathways for underrepresented minority students into strong graduate programs and academic careers in STEM.
- AGEP projects provide mentoring and encouragement to pursue academic careers as well as the skills and training to succeed in academic careers. AGEP alliances also support graduate students through critical junctures in their graduate training to increase graduation rates.
- Since 1998, AGEP has supported 23 alliances among 112 public and private doctoral granting and undergraduate institutions. 23% of alliance institutions are Minority-Serving Institutions.

### Talking Points

- AGEP institutions represent only 39% of all the institutions producing underrepresented minority STEM PhDs, yet between 2002 and 2006 they produced a majority of the underrepresented minority STEM PhDs:
  - 56% (2239) of the underrepresented minorities earning all STEM PhDs.
  - 64% (646) of the underrepresented minorities earning Engineering PhDs.
  - 63% (508) of the underrepresented minorities earning Physical Sciences PhDs.
  - 64% (125) of the underrepresented minorities earning Math and Statistics PhDs.
- AGEP's priorities in FY 2012 will support:
  - Disciplinary and interdisciplinary consortium projects that include the participation of universities and colleges, possibly including non-profit organizations and industry.
  - Innovative models to improve the quality of graduate education and postdoctoral training to provide the teaching and research skills needed for success in academia.
  - Research to better understand the factors impacting minority participation and success in graduate education, postdoctoral training, and academic careers.

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## Centers of Research Excellence in Science and Technology (CREST)

The CREST Program makes resources available to enhance the research capabilities of minority-serving institutions through the establishment of centers that effectively integrate education and research. CREST promotes the development of new knowledge, enhancements of the research productivity of individual faculty, and an expanded presence of students historically underrepresented in STEM disciplines. Recent solicitations have encouraged proposals for the following types of awards:



- CREST centers;
- Supplements for partnerships applied to existing CREST awards;
- HBCU Research Infrastructure for Science & Engineering (HBCU-RISE) projects; and
- Supplements for diversity collaboration for projects co-funded with NSF's Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) programs.

### **Background**

- Established to strengthen research and education in minority-serving institutions (MSI) and increase student matriculation in STEM disciplines.
- Currently there are 25 CREST centers at MSIs and 12 HBCU-RISE sites at STEM doctoral degree granting Historically Black Colleges and Universities.
- Priority areas for FY 2012 include an emphasis on energy, computer science and information technology, support for engineering disciplines and expanded collaboration with the NSF R&RA directorates. A comprehensive, summative external program evaluation is underway, for completion in FY 2012.

### **Talking Points**

- During FY09, CREST Centers worked with more than 855 students, 285 faculty members and postdocs, and 103 PIs and co-PIs. More than 676 publications and 603 research presentations were produced by the 21 CRESTs active at that time.
- North Carolina A&T University graduated from the CREST program and received an NSF Engineering Research Center award to conduct research on metallic biomaterials.
- The Florida International University CREST TerraFly project has received extensive national media coverage. TerraFly has a uniquely precise algorithm for converting an address to geographic coordinates online.

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## Historically Black Colleges and Universities Undergraduate Program (HBCU-UP)

Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) provides awards to enhance the quality of undergraduate science, technology, engineering, and mathematics (STEM) education and research at Historically Black Colleges and Universities (HBCUs) as a means to broaden participation in the Nation's STEM workforce. Support is available for:

- Implementation Projects (including Achieving Competitive Excellence);
- Education Research Projects;
- Targeted Infusion Projects;
- Research Initiation Awards; and
- Planning Grants.



### **Background**

- HBCU-UP provides funding to develop, implement, and study innovative models and approaches to make dramatic improvements in the preparation and success of underrepresented minority students to participate in the S&E enterprise.
- Since initiated, HBCU-UP has supported the development of STEM programs at 79% of HBCUs (82 of 104) since its inception. This includes 7 of the 13 (54%) two-year HBCUs and 75 of the 91 (82%) four-year public and private HBCUs.

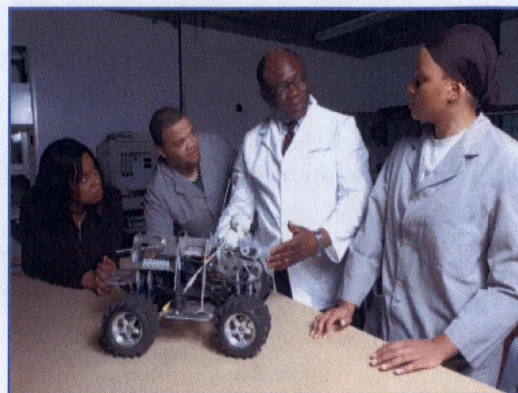
### **Talking Points**

- A 2010 program evaluation of HBCU-UP by the Urban Institute found that graduates from grantee institutions outperform national samples of STEM baccalaureate degree holders in degree completion and in participation in the STEM workforce with an advanced degree where 71% of HBCU-UP graduates pursued additional coursework after completing the undergraduate degree, 59% enrolled in a graduate degree program, and 35% completed a graduate degree.
- HBCU-UP has identified for FY 2012, the following priorities: innovation in instruction and curriculum development; providing access to exciting STEM research experiences for undergraduate students; focus on recruitment and retention, especially retention after the freshman year; critical transitions from K-12 to undergraduate, 2-year college to 4-year college, and undergraduate to graduate experiences; continued focus on mathematics education and STEM teacher preparation to increase the numbers and high-quality preparation of teachers; continued attention on challenges face by disadvantaged males for successful participation in STEM; and focus on recruiting returning veterans to STEM degree programs.

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## **Louis Stokes Alliances for Minority Participation (LSAMP)**

The NSF's Louis Stokes Alliances for Minority Participation (LSAMP) Program supports sustained and comprehensive approaches to broadening participation at the baccalaureate level. These approaches facilitate the production of historically-underrepresented students who are well prepared in science, technology, engineering, and mathematics (STEM) and motivated to pursue graduate education.



In addition, expectations are placed on institutionalizing, disseminating and promoting the replication of strategies and collaborative approaches that have shown success in the transition of targeted undergraduate STEM students (e.g., African Americans, Hispanics, Native Americans, and Pacific Americans) to graduate STEM programs and the workforce. At the post-baccalaureate level, the LSAMP Bridge to the Doctorate (BD) Activity provides support for LSAMP (undergraduate) alumni for two years of graduate study in STEM disciplines.

### **Background**

- The LSAMP program emphasizes development of broad-based regional and national alliances of academic institutions, school districts, state and local governments, and the private sector in order to increase the diversity and quality of the STEM workforce, including prospective K-12 teachers. Over 600 academic institutions (majority, minority-serving and community colleges) participate in the program.
- There are 41 active LSAMP alliances engaged in STEM recruitment and retention activities such as **summer and academic year research experiences, mentoring, learning communities, STEM student research conferences** and **STEM doctoral degree preparation** at the undergraduate and post-baccalaureate levels.

### **Talking Points**

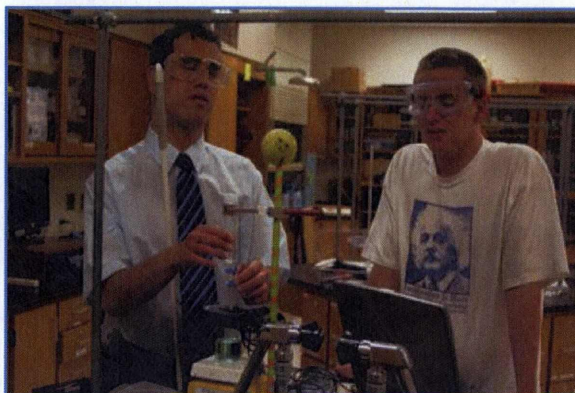
- Since 1991, over 380,000 STEM baccalaureate degrees have been awarded to underrepresented minority students through LSAMP alliances. In the past decade, an average of 225,000 historically underrepresented minority undergraduate students have been impacted by the LSAMP program annually.
- In 2010, approximately 28,000 students from underrepresented populations graduated with baccalaureate degrees in STEM fields from LSAMP institutions. Since 2003, LSAMP has supported nearly 1,500 Bridge to the Doctorate (BD) program participants.
- The 2006 Urban Institute evaluation has shown that graduates of institutions with LSAMP activities have a higher propensity for STEM graduate degree completion compared to both white and Asian-American students. Evaluation findings recommend increased replication and dissemination of the LSAMP model. Evaluation of the LSAMP BD Activity is in progress.

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## **Research in Disabilities Education (RDE)**

The *Research in Disabilities Education (RDE)* program seeks to broaden the participation and achievement of people with disabilities in all fields of science, technology, engineering, and mathematics (STEM) education and associated professional careers.

Particular emphasis is placed on contributing to the knowledge base by addressing disability related differences in secondary and post-secondary STEM learning and in the educational, social and pre-professional experiences that influence student interest, academic performance, and retention in STEM degree programs, STEM degree completion, and career choices.



### **Background**

- The RDE program seeks to broaden the participation of people with disabilities in STEM education and careers by supporting 3 types of awards:
  - Demonstration, Enrichment and Information Dissemination awards demonstrate and disseminate information about disability education products and practices in STEM.
  - Focused Research Initiatives conduct disability education research or develop and implement the use of technology for accessible STEM education and professional work.
  - Regional Alliances for Persons with Disabilities in STEM Education increase the number of students completing post-secondary degrees and entering the STEM workforce.
- There are currently 9 demonstration, 25 research and 6 alliance projects.

### **Talking Points**

- The alliances, located at the University of Washington, New Mexico State University, the University of Wisconsin-Madison, CUNY, Ohio State University and the University of Southern Maine have reached more than 8,000 students and 2,600 educators in STEM across 17 states.
- The AccessSTEM alliance, located at the University of Washington, helped 99% of the program's high school students attend post-secondary programs and 54% of the students at 4-year schools major in STEM.
- Innovative technology developed by research project teams is making STEM education and industry experiences accessible to students who are blind and studying Chemistry, Chemical Engineering and Geography.
- FY 2010 priorities include funding CAREER awards and supporting additional alliances focused on underrepresented minority undergraduate students with disabilities.

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## Research on Gender in Science and Engineering (GSE)

The Research on Gender in Science and Engineering program supports efforts to understand and address gender-based differences in science, technology, engineering, and mathematics (STEM) education and workforce participation through research, the diffusion of research-based innovations, and extension services in education that will lead to a larger and more diverse domestic science and engineering workforce.



Typical projects will contribute to the knowledge base addressing gender-related differences in learning and in the educational experiences that affect student interest, performance, and choice of careers; how pedagogical approaches and teaching styles, curriculum, student services, and institutional culture contribute to causing or closing gender gaps that persist in certain fields.

### **Background**

- The GSE program seeks to broaden the participation of girls and women in all fields of STEM education by supporting research, diffusion of research-based innovation, and extension services in K-16 education.
- GSE funds research informing educational practice in STEM fields.
- Diffusion of Research-Based Innovation and Extension Service projects make known research findings to national audiences and give practitioners the support and tools they need to adopt gender-inclusive policies and practices.

### **Talking Points**

- *New Formulas for America's Workforce 2: Girls in Science and Engineering*, a follow-up to the very successful 2003 *New Formulas* NSF publication, was published in FY2007. This second volume highlights projects funded by the GSE Program between FY2003 and FY2005, including significant research findings. A companion publication, *New Tools for America's Workforce* catalogues a wide variety of products available from GSE-funded projects to help teachers, employers, and parents foster gender diversity in STEM.
- FY 2010 priorities include support for gender related curriculum development with a focus on the effective use of cyber tools.



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## **Tribal Colleges and Universities Program (TCUP)**

This program provides awards to enhance the quality of science, technology, engineering and mathematics (STEM) instructional and outreach programs at Tribal Colleges and Universities, Alaska Native-serving Institutions and Native Hawaiian-serving institutions. Support is available for the implementation of comprehensive institutional approaches to strengthen STEM teaching and learning in ways that improve access to, retention within, and graduation from STEM programs through Planning Grants and Implementation tracks:



- Initiation projects;
- STEM Teachers of Education Excellence Projects (STEEP); and
- TCUP Pre-Engineering Education Collaboratives (PEEC).

### **Background**

- TCUP was initiated in FY 2001 to strengthen Tribal Colleges and Universities by improving the quality of their undergraduate educational infrastructure and linkages for community outreach and development via:
  - Faculty support,
  - Curriculum development and expansion,
  - Scientific instrumentation,
  - Research opportunities for undergraduates,
  - Enhancement of teacher preparation and professional development,
  - Increased professional capacity via technical assistance,
  - Summer and weekend academic bridge programs for high school students,
  - Access to research and education resources.

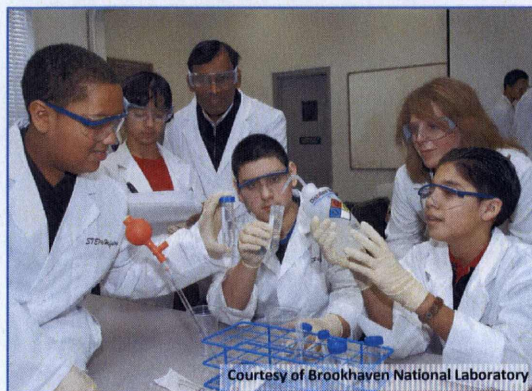
### **Talking Points**

- TCUP awards benefit up to 14,000 students each year.
- Approximately 1,500 students at participating tribal colleges, Alaska-Native-, or Native-Hawaiian-serving institutions have received STEM degrees since the beginning of the program in 2001.
- Building upon the successful collaboration with ENG, TCUP plans to pursue similar partnerships with, for example, GEO and MPS in FY 2011.

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## **Cooperative Activity with Department of Energy Programs for Education and Human Resource Development (Request for Supplement)**

A cooperative effort between NSF and the Department of Energy (DoE) Office of Science, this activity supports the continued leadership of the United States in science, technology, engineering, and mathematics (STEM) and the continued development of a competitive, diverse STEM workforce. NSF and DoE are implementing collaboration between the agencies' programs for the development of human resources in STEM. NSF and DoE support students and faculty from eligible NSF projects (based on competitive Merit Review and availability of funds) who are accepted as participants in one of four DoE initiatives that provide hands-on research opportunities in DoE national laboratories during the summer:



- Science Undergraduate Laboratory Internships (SULI);
- Faculty-Student Teams (FaST);
- Community College Institutes (CCI); and
- Pre-Service Teacher (PST) Internships.

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