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*The Thinning of the U.S. Technical
Talent Pool Starts Early*

Young women and minority youth are now the demographic majority in the United States, but represent only a small fraction of those studying to be scientists and engineers. Corporate and educational leaders say a dramatic increase in participation by under-represented groups is critical to maintain our science and engineering enterprise. Today, these professions remain overwhelmingly male and white.

Too few young Americans do well in mathematics and science, according to international comparisons. Interest in many of the careers based on these disciplines also has declined. Moreover, the United States cannot afford to rely on a narrow and now decreasing segment of the population in technical fields that are the foundation of our nation's security, prosperity and quality of life. Unequal access to educational opportunities, a persistent achievement gap in reading and mathematics, differential rates of high school graduation and lack of encouragement are all key contributing factors.

But there are a few bright spots. Some students from under-represented groups do acquire the foundational skills and confidence to move forward in technical disciplines.

**NEW REPORT IDENTIFIES PRE-K-12
PROGRAMS THAT HELP UNDER-
REPRESENTED GROUPS SUCCEED IN
MATHEMATICS AND SCIENCE**

*Building Engineering and Science Talent Tasked by
Congress to Find out "What Works" to Stop Thinning of
U.S. Technical Talent Pool*

(Capitol Hill, Washington, D.C.) – **Building Engineering and Science Talent (BEST)** today announced the results of its final assessment of best practices in pre-kindergarten through grade 12 math and science education to keep women, minorities and persons with disabilities on the educational path to careers in science and engineering.

The report, titled "*What it Takes: Pre-K-12 Design Principles to Broaden Participation in Science, Technology, Engineering and Mathematics*" showcases nine programs with significant evidence of effectiveness and eleven that warrant further research, based on an in-depth evaluation of research evidence programs by the BEST Blue Ribbon Panel on Pre-K-12 Education and the **American Institutes of Research (AIR)**.

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The BEST assessment is among the first to require independent evaluation to prove effectiveness. The BEST panel, chaired by Dr. Shirley Malcom, head director for Education and Human Resources at the **American Association for the Advancement of Science**, screened 200 programs and selected 34 for detailed examination. Other panel leaders included Carlos Rodriquez, principal research scientist with the American Institutes for Research, and Linda Rosen, president of Education and Management Innovations, Inc.

The results are as significant for what was *not* found as they are for what was ultimately discovered: not a single program earned the highest possible rating of **verified**, as defined by five studies of acceptable rigor, proving that such evidence is hard to find. Most programs concentrate their limited resources on providing services and recruiting participants rather than on rigorous and costly impact studies. The BEST Panel developed a protocol that defined a rigorous study as one that provides meaningful research evidence comparing the outcomes of students who experience a given intervention and those who do not. Other category ratings include: **probable**, **notable** and **meriting further research**.

The following programs were given the highest BEST assessment rating of **probable**: **Direct Instruction in Mathematics**, an instructional approach developed in the late 1960s at the University of Illinois, and **Project SEED (Special Elementary Education for the Disadvantaged)** a supplementary mathematics program also launched in the 1960s in Berkeley, California. (*For a complete list of rated programs, see page five.*)

The BEST Panel also identified a framework of design principles BEST that overlapped among effective programs:

- **Defined outcomes** drive the intervention and are successfully accomplished for the entire target population. Students and educational staff agree on goals and desired outcomes. Success is measured against intended results. Outcome data provide both quantitative and qualitative information. Disaggregated outcomes provide a basis for research and continuous improvement.
- **Sustained commitment** enables effective interventions to take hold, produce results and adapt to changing circumstances. Its components are proactive leadership, sufficient resources and steadfastness in the face of setbacks. The minimum conditions for assuring sustained commitment are continuity of funding and of support at the individual school and school district levels.

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- **Personalization** acknowledges that the goal of intervention is the development of students as individuals. Student-centered teaching and learning methods are core approaches. Mentoring, tutoring and peer interaction are integral parts of the learning environment. Individual differences, uniqueness and diversity are recognized and honored.
- **Challenging content** provides the foundation of knowledge and skills that students master. Curriculum is clearly defined and understood. Content is related to real-world applications, goes beyond minimum competencies, and reflects local, state and national standards. Students understand the link between the rigor of the content they study and the career opportunities which await them later in life. Appropriate academic remediation is readily available.
- **Engaged adults** who believe in the potential of all students provide support, stimulate interest and create expectations that are fundamental to the intervention. Educators play multiple roles as teachers, coaches, mentors, tutors and counselors. Teachers develop and maintain quality interactions with students and each other. Active family support is sought and established.

These design principles provide tools that will enable communities across the country to assess and strengthen pre-K-12 math and science programs. BEST's next phase will focus on creating a test bed of communities that are committed to implementing the design principles of best practice.

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About Building Engineering and Science Talent, (BEST)

BEST, an initiative of the Council on Competitiveness, was established as an independent, 501(c)3 in September 2001 at the recommendation of the Congressional Commission on the Advancement of Women in Science, Engineering and Technology. The nation's scientists, engineers, mathematicians and technologists comprise an indispensable strategic asset. Despite decades of effort, however, this pool of talent remains about 3/4 male and 4/5 white. BEST's mission is to build a foundation for action through a two-year net assessment of best practices in pre-K-12, higher education and the workplace to increase the participation of women, African Americans, Hispanics, Native Americans and persons with disabilities in the science, engineering and technology professions. Three blue-ribbon panels worked in parallel across the whole continuum of education and workforce development. Based on available research evidence and the professional judgment of 120 nationally recognized practitioners and researchers, the higher education assessment:

- Makes the case for national action to meet the U.S. talent imperative;
- Rates pre-K-12 programs that have research evidence of effectiveness or are worthy of investment in further research;
- Analyzes higher education and workplace exemplars;
- Distills the design principles that underpin effective programs, and
- Proposes an action agenda at the national and community levels engaging employers, educators, policy makers, professional societies and nonprofit organizations.

About the American Association for the Advancement of Science

The American Association for the Advancement of Science (AAAS) is the world's largest general scientific society, and publisher of the journal, *Science* (www.sciencemag.org). AAAS was founded in 1848, and serves some 265 affiliated societies and academies of science, serving 10 million individuals. *Science* has the largest paid circulation of any peer-reviewed general science journal in the world, with an estimated total readership of one million. The non-profit AAAS (www.aaas.org) is open to all and fulfills its mission to "advance science and serve society" through initiatives in science policy; international programs; science education; and more. For the latest research news, log onto EurekAlert!, www.eurekalert.org, the premier science-news Web site, a service of AAAS. AAAS seeks to "advance science and innovation throughout the world for the benefit of all people."

About the American Institutes for Research (AIR)

Founded in 1946, the **American Institutes for Research (AIR)** is a not-for-profit corporation with a long history of accomplishment. AIR's staff of more than 850 professionals performs basic and applied research, provides technical support, and conducts analyses based on methods of the behavioral and social sciences. Our program areas focus on education, health, individual and organizational performance, and quality of life. AIR helps its clients, throughout the United States and abroad, respond to human problems with effective policies, products, and services. Our goal is to make a difference — by addressing a broad range of social problems and by ensuring that the results of our research are useful. AIR is committed to remaining strictly independent and non-partisan in all matters. Objective, science-based research and analysis ensure we better serve our clients' and the community's needs. (www.air.org)

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Research-Based Evidence: Probable

Direct Instruction (in Mathematics)
Project SEED (Special Education for the Disadvantaged)

Research-Based Evidence: Notable

Advancement Via Individual Determination (AVID)
The Algebra Project
Foundational Approaches in Science Teaching (FAST)
Gateway to Higher Education
Project GRAD (Graduation Really Achieves Dreams)
Puente High School Program
Yup'ik Mathematics

Descriptive Evidence: Programs that Would Benefit from Further Research

American Chemical Society (ACS) Project SEED
Detroit Area Pre-College Engineering Program (DAPCEP)
Disabilities, Opportunities, Internetworking and Technology (Do-It)
El Paso Collaborative for Academic Excellence (EPCAE)
Family Math
MATHCOUNTS
Mathematics, Engineering, Science Achievement (MESA)
Operation SMART– Girls, Inc.
Texas Prefreshman Engineering Program (TexPREP)
University of North Carolina Mathematics and Science Education Network (MSEN) Xavier University
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