

Expanding Global Scientific Aspirations and Capabilities through Educational Policies of Diversity and Inclusion

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Fostering Global Scientific Awareness and Leadership

- **Science is a critically important shared perspective and language for understanding and action in an interdependent and imperiled world.**
- **Hands-on, inquiry-based learning is key to fostering scientific awareness and nurturing a new generation of scientific leaders.**
- **We must bring into science, technology, engineering and mathematics (STEM) disciplines and careers women and individuals from populations that have not traditionally participated in them.**
- **We must adopt a systems approach to the STEM education challenge, engaging all educational stakeholders.**

Science as Global Enterprise

Discovery is no longer the purview of one scientist, one institution, or one nation. It is increasingly the result of connections that criss-cross the globe. Thanks to our enhanced communications technologies, the science and engineering community is now global in scope.

Arden L. Bement, "International Cooperation, The Future of Science and Engineering," National Natural Science Foundation of China, 20th Anniversary Celebration, Beijing, China, May 25, 2006

Science as Global Enterprise

International science and engineering collaboration is increasingly important because many of the challenges that confront us today are inherently global. We all have a stake in the results of research in climate change, emerging diseases, the health of oceans, biodiversity, sustainable energy, and improved earthquake engineering, to name only a few.

Arden L. Bement, "Global Connections: National Science Foundation International Programs and Activities," Global Conference of Environment, Science, Technology and Health Officers. U.S. Department of State, Washington, D.C. June 22, 2005

Examples of International Scientific Collaboration are Proliferating

- **Large-Scale Science Facilities, e.g. Large Hadron Collider at CERN**
- **International Polar Research**
- **International Scientific Education and Training Programs**

Hands-on, Inquiry-based Learning: Cal Poly's Learn-by-Doing Polytechnic Education

Cal Poly Undergraduate Education Examples:

- **Studio Classroom Teaching and Learning**
- **Agriculture operations, enterprise projects and research**
- **Project Based Learning Institute**
- **Marine Science Research**
- **Teacher-Scientist Program**

Hands-on, Inquiry-based Learning: National Science Resources Center Model

National Science Resources Center Support for:

- **Planning and development of science education programs.**
- **Professional development for teachers .**
- **Research-based inquiry-centered educational curricula and resources .**

Hands-on, Inquiry-based Learning: Evidence of Effectiveness

Students in Imperial Valley public schools who have been taught using inquiry methods significantly outperform their classmates who have had traditional (textbook-based) science instruction. Stanford Achievement Test results indicate that the longer students are enrolled in research-based science programs, the better they perform on nationally normed science, writing, and mathematics tests.

NSRC Web Site:

http://www.nsrconline.org/about_the_nsrc/impact.html#CA

Hands-on, Inquiry-based Learning: The Challenge of Providing Broad Access

We must make it a top priority to provide broad access to hands-on, inquiry based learning.

We will then be able to expand the global STEM workforce and . . .

. . . achieve a 21st century citizenry with the “scientific temper” critical to a positive future for the world.

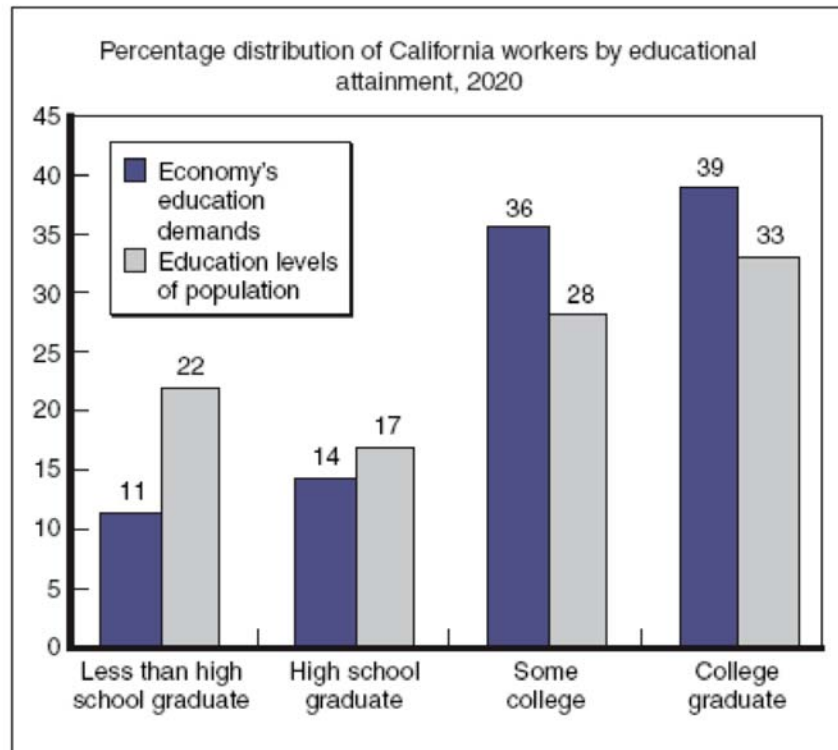
Achieving Greater Diversity in STEM Fields: Challenges and Opportunities

- Mature, predominantly white, male science and engineering workforce.
- Diverse, predominantly Hispanic K-12 student population with . . .
- . . . low rates of participation in STEM disciplines and low overall rates of educational completion.

Delta Change in California S & E Degrees, 1990 – 2000

Source: “Critical Path Analysis of
California's S&T Education System.”
California Council on Science and
Technology, 2002, p. 66.

California Education/Workforce Gap



Source: "Getting to 2025: Can California Meet the Challenge," Research Brief, Public Policy Institute of California, Issue #100, June 2005.

If current patterns persist, the California economy will require more highly educated workers than the state may be able to provide.

Achieving Greater Diversity in STEM Fields: Cal Poly Pacesetters and Role Models

- **Kathleen Holmgren**, VP, Sun Microsystems.
- **Ernesto Vasquez**, President, MV&P, international architecture firm.
- **Ron Smith**, VP, Northrop Grumman Corporation.

Seeking Solutions to the STEM Educational Challenge

The STEM educational challenge is fundamentally a systems problem involving the complex interaction over time of multiple agents (students, parents, communities, schools, colleges and universities, government, industry, etc.).

Seeking Solutions to the STEM Educational Challenge

- P-16 educational councils
- Earlier parent involvement and student engagement
- Inquiry-based science education in the elementary grades
- Qualified and inspiring science and math teachers
- Alignment of high school and college curricula
- Increased college participation and retention to STEM university degrees

Seeking Solutions to the STEM Educational Challenge

With everyone working together, we can educate a new generation imbued with a “scientific temper” and “a cultural identity that engenders pride in [the] past and [a] proactive [approach to] the future.”