

Making Science Make Sense

Bayer Facts Of Science Education Survey XIII

Fortune 1000 STEM Executives on STEM Education, STEM Diversity and U.S. Competitiveness

Introduction

This is the 13th in the series of Bayer Facts of Science Education surveys. An annual public opinion research project commissioned by Bayer Corporation since 1995, the Bayer Facts surveys examine various aspects of science, science education and science literacy issues from the perspective of different audiences.

This also is the third recent Bayer Facts survey to explore the dual issues of diversity and underrepresentation of women and minorities, including African Americans, Native Americans and Hispanic Americans, in science, technology, engineering and mathematics (STEM) fields and the impact of diversity/underrepresentation on U.S. competitiveness, as well as the competitiveness of STEM industries and individual companies.

Innovation, invention and discovery are engines that drive U.S. competitiveness, quality of life and national security. These engines, in turn, are driven by the scientific and technological advances made possible by the nation's STEM workforce.

Today, the quantity and quality of that workforce, according to many indications, is at risk. Many policy experts and business leaders find this troubling, particularly now at a time when other countries are making significant investment increases in their own STEM infrastructures, including STEM education.

In response to growing unease about America's ability to compete with India and China, Congress recently passed, and the President signed into law, the America COMPETES Act,¹ which is designed to deepen the future STEM occupational talent pool.

Women and underrepresented minorities are a significant portion of this talent pool. Together, they comprise roughly two-thirds of today's workforce. And, according to U.S. Census data, that share will continue to rise in the coming decades due to shifting demographics and growing populations.²

Yet, despite their sheer numbers and the increase in the number of STEM degrees awarded to them over the last 40 years, women, African Americans, Native Americans and Hispanic Americans have yet to achieve parity in the STEM workforce.

Data published by the Commission on Professionals in Science and Technology show that women comprise only 25 percent of the STEM workforce and minorities much less than that, a fact underscored by the National Action Committee for Minorities in Engineering (NACME) in its recent report, "Confronting the 'New' American Dilemma: Under-Represented Minorities in Engineering: A Data-Based Look at Diversity."

In this report, NACME looked solely at engineering trends among African Americans, Native Americans and Hispanic Americans and found that out of the more than 68,000 bachelor's degrees in engineering awarded to students in the U.S. in 2006, less than 8,500 were awarded to underrepresented minorities. Excluding Puerto Rico, these underrepresented students earned just 11 percent of undergraduate degrees in engineering.

This at a time when both India and China are now out-producing the United States in the production of engineers graduating with bachelor's and master's degrees.³

Taken together, these trends demonstrate a real and urgent need to more successfully harness the talent of women and minorities and bring them to the national STEM table.

This year's Bayer Facts survey looks at the issue of diversity/underrepresentation from the point of view of one of the country's most important and influential cohorts – Chief Executive Officers and other C-suite executives running the United States' largest Fortune 1000 STEM companies. These executives are responsible for a significant portion of the country's GNP, employ the lion's share of STEM talent in the United States, and oversee the research and development of America's advanced products, processes and technologies marketed globally throughout the world.

To remain competitive, they must have access to a vibrant pool of STEM workers who are well-trained, highly-skilled and available in requisite numbers – in other words, all of the country's STEM talent.

How do the executives rate the U.S. public education system when it comes to preparing today's students, particularly girls and minorities, for STEM careers? Is a diverse workforce important to their company's success? How is it beneficial? Does underrepresentation exist within their companies and industries? If so, is it a manpower issue? Do they believe Corporate America has a role to play to ensure these girls and minority students are prepared to become the next generation of inventors and innovators? If so, do their companies have programs in place at the pre-college level designed to foster a robust, diverse STEM pipeline?

These are just some of the questions this survey asks and answers.

In 2006, Bayer commissioned a similar survey, polling CEOs of America's emerging STEM companies about many of the same issues addressed here. Where appropriate, comparison data between these two distinct executive audiences are included.

For copies of previous Bayer Facts of Science Education surveys, please visit www.BayerUS.com/msms.

Methodology

Results of this survey are based on a telephone poll of 100 C-level executives at Fortune 1000 STEM companies.

While Fortune defines its companies in terms of industry (pharmaceutical, telecommunications, etc.), it does not necessarily characterize them as STEM companies. In order to create such a list, Fortune 1000 companies with high R&D employment and expenditure were identified by matching companies on the 2007 Fortune list with a list of the 1,000 top non-European Union R&D intensive companies prepared by the European Commission. Companies appearing on both lists were included in the sample. The sample was then expanded to include other Fortune 1000 companies in each industry category in which at least half of the companies were listed in the EU listing. This was done in order to establish high R&D industry categories within the Fortune 1000 list, and thus define them as STEM companies. The two data sources used for the selection were:

- Fortune Datastore 2007 Fortune 1000 database; Fortune Datastore, NY, NY 2007.
- 2007 EU R&D Investment Scoreboard; Luxembourg: Office for Official Publications of the European Communities, October 2007.

Prior to being called, CEOs received a personalized letter from Bayer Corporation President and CEO Dr. Attila Molnar. The letter explained the background and objectives of the research and was instrumental in increasing cooperation among the busy executives.

Once the Fortune 1000 list was filtered to select STEM companies, the number of companies eligible to participate was much reduced (n = 311). To enhance the sample volume the survey invitation letter was copied to up to nine additional C-level executives within each company. In order to ensure ICR reached the goal of speaking with 100 C-level executives, more than one executive from a company was allowed to participate in the survey. In total, 75 interviews were completed with a single executive from a company and 25 (12 companies - 2 executives/1 company - 3 executives) interviews were completed with multiple executives from a single company.

Fortune 1000 STEM Executive Demographic Profile

- **The following summarizes the profile of all the C-level executives (n=100) interviewed.**
 - The C-level executives interviewed included a variety of senior level titles such as CEO, CFO, CIO, EVP, VP and senior level director. The executives interviewed also covered a wide area of responsibility, including communication executives (19%), IT executives (18%), HR executives (18%), marketing executives (14%), CEO/CFO overall management executives (12%), operations (11%), among others.
 - Nearly nine-in-ten of those surveyed are male (82%) or Caucasian (89%).
 - The average age of the executives surveyed is 51 years old.
 - Just about eight-in-ten (77%) have a graduate degree, while just over four-in-ten (43%) have a degree in a STEM field.
- **The following summarizes the workforce composition of the CEOs'/Executives' companies.**
 - The average number of employees is 34,000, while the average number of employees with STEM expertise is 8,800 (or 26%).
 - The average percentage of STEM employees who are women is 20%.
 - The average percentage of STEM employees who are African American, Native American, or Hispanic American is 8%.
 - The average percentage of STEM employees who are Asian, including Japanese, Chinese, Indian, Korean, etc. is 18%.
- **The average 2007 total revenue is \$14.6 billion.**
- **The statistical reliability achieved conducting the 100 interviews is a maximum +/- 9.8% margin of error at a 95% confidence level.**

The Need: Current and Imminent STEM Workforce Challenges

U.S. Competitiveness and the Country's STEM Workforce

Fortune 1000 STEM executives are concerned that a shortage of America's STEM talent threatens the competitiveness of the country and that of individual businesses.

- Almost all of the executives surveyed (95%) are concerned that the United States is in danger of losing its global leadership position in science and technology because of a shortage of STEM manpower.
- More than half (55%) say their companies are already experiencing such a shortage.
- Two-thirds (68%) are concerned that other countries' increasing access to STEM talent is giving their global competitors a competitive advantage over them. One-fifth (20%) are very concerned.

Should the U.S. Presidential Candidates be Concerned about the State of the STEM Workforce?

The state of the country's STEM workforce vis-à-vis its continued competitiveness should be a major issue for the U.S. presidential candidates, according to the Fortune 1000 STEM executives.

- Nearly all executives (98%) believe the U.S. presidential candidates should be concerned with the country's ability to attract and retain STEM talent in order to maintain its global leadership in science and technology.
- Two-in-three (68%) say they should be very concerned.

Diversity and Underrepresentation in the STEM Workforce

Fortune 1000 STEM executives are fully aware of the problem of the underrepresentation of women, African Americans, Native Americans and Hispanic Americans in STEM fields and many recognize it for the manpower problem it is. *This awareness is in marked contrast to that of the emerging STEM company CEOs polled in 2006.*

- Almost nine-in-ten Fortune 1000 STEM executives (89%) say underrepresentation exists in their industry, with a similar number (82%) reporting it exists in their own companies. Of those who acknowledge it is a reality for them, 83% say the lack of women, African Americans, Native Americans and Hispanic Americans is a manpower concern for their companies.
- *Only six-in-ten (65%) emerging STEM company CEOs said underrepresentation exists in their industry. Four-in-ten (45%) reported underrepresentation in their companies, and, of those, only three-in-ten (36%) said this underrepresentation is a manpower concern for them.*

Most Fortune 1000 STEM executives advocate diversifying the STEM talent pool to help solve the country's STEM workforce issues.

- Roughly nine-in-ten (89%) agree that bringing more women and minorities into STEM fields will help solve U.S. manpower shortages.
- Fortune 1000 STEM executives see significant company benefits in a diverse workforce, namely increased innovation and the ability to better compete globally.

How Does Diversity Contribute To A Fortune 1000 STEM Company's Success?*	
Allows/increases different ideas/perspectives/skills	41%
Improves ability to compete in global market	39%
Allows for greater creativity/more innovation/new ideas	26%
Results in better solutions/decision making due to a wider pool of ideas	14%
Broadens/expands resource pool	12%
Enables company to attract a diverse workforce/shows company is open to minorities and women	11%
Fosters healthy work atmosphere/workplace reflects American demographics	10%
Results in better/different products	8%
Other	8%

**NOTE: Executives could offer more than one response.*

Science Literacy: Important for All STEM Company Employees?

Science literacy is a basic requirement for all employees according to the Fortune 1000 STEM executives.

- Nearly all executives surveyed (93%) consider it important that all of their employees have a baseline level of science literacy, with more than half (54%) considering it very important.

The Seed: Growing a Diverse American STEM Pipeline

Is the U.S. Education System Building a Diverse STEM Pipeline?

When it comes to building a diverse STEM pipeline, the U.S. education system is falling short, as reflected in the grades given by the Fortune 1000 STEM executives surveyed. In particular, the executives are most critical of pre-college education and its ability to interest girls and minorities in STEM.

	Average Grade Assigned
U.S. Education System Overall Providing Diverse, Talented and Skilled STEM Workers	C
U.S. Higher Education System Preparing Women and Minorities for STEM Careers	C+
U.S. Pre-College Education System Nurturing Girls and Minorities to Pursue STEM Careers	D

What is the Most Effective Way to Teach Science in the Elementary School Classroom?

Science should be the “fourth R” in elementary school classrooms and the best way to teach science is using a hands-on, inquiry-based approach, say Fortune 1000 STEM executives.

- More than four-in-five executives (85%) believe that science should be given the same emphasis in elementary school as reading, writing and math.
- About nine-in-ten (87%) say the most effective way for students to learn science is by conducting experiments, forming opinions, and discussing and defending their conclusions with others, rather than by reading textbooks, listening to lectures and memorizing scientific information.

Do STEM Companies Have a Role in Improving Education and Building a Diverse STEM Pipeline?

Overwhelmingly the Fortune 1000 STEM executives acknowledge the responsibility that they and their companies have in building a diverse STEM pipeline.

- Nearly all executives (97%) say that STEM companies have a role to play in ensuring women and minorities succeed in science and engineering fields.
- Almost all (98%) consider it important for STEM companies to support pre-college science education programs that help create the next generation of inventors, innovators and discoverers; two-thirds (66%) say it is very important.

- Almost all (98%) say it is important for girls and minorities to receive a strong science and math education beginning in elementary school in order to reduce their underrepresentation in STEM fields; nine-in-ten (90%) say it is very important.

Are STEM Companies Fulfilling that Role?

Yes. Almost all Fortune 1000 STEM executives report that either their companies and/or their employees are involved in pre-college STEM education programs aimed at girls and minorities, such as “Scientists in the Schools,” internships and school-to-career programs, and scholarships. *Fortune 1000 STEM companies’ level of participation is significantly higher than the participation of their smaller STEM company counterparts.*

- Nearly nine-in-ten executives (87%) indicate their company or employees participate in pre-college education programs that attract, encourage and sustain girls’ and minority students’ interest in math and science.
- In particular, the executives see value in “Scientists in the Schools” programs, with nearly all (96%) agreeing that “direct contact with scientists and engineers is an effective way to help students better appreciate careers in science and engineering.”
- *While roughly the same number of emerging STEM company CEOs (98%) acknowledge the benefits of these programs, only one-third (37%) said their companies or employees participate in such programs.*

When it comes to communicating the myriad STEM job opportunities available to today’s students, the Fortune 1000 STEM executives acknowledge they still have work to do.

- Only half of executives (54%) consider their companies effective communicators when it comes to telling today’s students about the significant job opportunities in STEM fields. *Even fewer of the smaller STEM company CEOs (32%) say they are effectively communicating this message.*

The Feed: Nurturing Women and Minority STEM Employees in the Workplace

Are Fortune 1000 STEM Companies Actively Recruiting Women and Minorities for STEM Positions?

The vast majority of Fortune 1000 STEM executives say their companies actively recruit female and minority STEM workers, a far larger percentage than emerging STEM companies.

- Seven-in-ten executives (71%) say their companies have specific programs in place to recruit women and minority STEM workers, *compared with less than two-in-ten (18%) of the emerging STEM company CEOs who said their companies have such programs.*
- Among Fortune 1000 STEM executives with such programs in place, more than half (58%) recruit from colleges and universities that traditionally serve women and minorities, such as the historically black colleges and universities or the Seven Sister schools.

Once Hired, do these Companies Support Women and Minority Employees with Programs, Mentors and Role Models?

While the Fortune 1000 STEM executives recognize the importance of female and minority role models in senior management positions, they are split over how well their companies do in providing such role models to younger workers.

- Nearly all executives (96%) consider it important for women and minorities to hold senior management positions within STEM companies to ensure younger female and minority employees have role models.
- While executives give their companies an average grade of B in providing female and minority mentors, they are fairly split about the job they are doing, with 55% assigning themselves an A/B grade and 45% a C/D.

Most Fortune 1000 STEM executives have company-sponsored programs aimed at developing women and minority STEM workers.

- Nearly two-thirds of executives (63%) report their companies have specific programs designed to nurture and retain women and minority STEM workers once they've been hired.

Challenges and Frustrations: The Reality of Hiring Women and Minority STEM Workers

Hiring women and minority STEM workers can be challenging and frustrating, according to the Fortune 1000 STEM executives.

- Four-in-five executives (80%) report their companies face challenges in hiring adequate numbers of women and minorities for STEM positions. Of those facing challenges, half (50%) say they are frustrated by their companies' inability to hire adequate numbers of women and minority STEM workers.

Challenges In Hiring Women and Underrepresented Minorities*	
Limited number of women/minorities qualified for positions	44%
Identifying/locating/recruiting qualified candidates	29%
Relocation - difficulty attracting/retaining them due to our location	19%
Competition - large companies/competitors offer better pay/benefits	13%
Limited number of minorities/women applying for positions	4%
Retaining hires once they are here	3%
Other	7%

**NOTE: Executives could offer more than one response.*

Footnotes

- 1) "Policy and the STEM Workforce System," *STEM Workforce Data Project: Report No. 9, Commission on Professionals in Science and Technology, October 2007.*
- 2) *Ibid.*
- 3) "Getting the Numbers Right: International Engineering Education in the United States, China and India," *Journal of Engineering Education, January 2008.*