



Science For A Better Life

Building a Diverse United States STEM Workforce:

Perspectives on Creating Successful Business Education Partnerships

2 0 1 2 E D I T I O N

S C I E N C E • T E C H N O L O G Y • E N G I N E E R I N G • M A T H

“ There’s a West African proverb that says: ‘If you wait for tomorrow, tomorrow comes. If you don’t wait for tomorrow, tomorrow comes.’ What we’re doing today is trying to figure out what we want tomorrow to look like and working to make a difference right now for tomorrow’s sake. In building a STEM workforce, we must first understand we have to take advantage of all the talent that we have in this country. ”

Dr. Mae C. Jemison

First African-American Female Astronaut

CEO

BioSentient Corporation

Founder

The Earth We Share



PHOTO CREDIT: PAM FRANCIS © 2007

Contents

Introduction	1
Building a Diverse STEM Pipeline Matters	2
Best Practice Elementary STEM Education Programs	5
Best Practice Secondary STEM Education Programs	8
Dr. Leon Lederman: On Improving U.S. STEM Education	11
Education Partnerships: What Businesses Can Expect	12
Challenges & Rewards: Education Partners	13
Challenges & Rewards: Business Partners	14
Advice for Business & Industry	15
Stakeholders at the Table: Revitalizing STEM in California	16
Stakeholders' Recipe for Building a Diverse U.S. Innovation Generation	18
Conclusion	19
Appendix	20
Forum Agenda 2006	
Forum Agenda 2008	
<i>Bayer Facts of Science Education Surveys</i>	



By summarizing the ideas that have emerged from our work in the area of STEM education and diversity over the last five years in this document, Bayer wishes to provide important background for those who help set and oversee STEM education policy. The company invites national STEM and education experts, as well as elected local, state and national officials to utilize it. They, and others, including the media, may reproduce this report, either in whole or in part, with proper credit given to Bayer.

Introduction

Much of our nation's vitality and viability springs from discoveries and advances made possible by science, technology, engineering and mathematics – the so-called STEM disciplines.

Science and technology company leaders are acutely aware of this. At Bayer, we also understand that these advances require a robust and diverse STEM workforce.

It all begins with education. Through our Presidential award-winning, companywide *Making Science Make Sense*® initiative, we at Bayer have been involved in helping to build

such a workforce for decades. Our nationwide investments in and support of high-quality STEM education programs have helped to foster a properly prepared STEM workforce and a scientifically literate citizenry.

However, much remains to be done to bring more women, African-Americans, Hispanics and American Indians into the STEM workforce. Developing and unleashing that talent pool requires the commitment of many people and groups, including the science and technology industries.

Our Making Science Make Sense work has taught us two things: First, exemplary education programs can close the diversity gap in

STEM subjects. Second, companies can be part of successful business-education partnerships if they possess the necessary desire and commitment.

Bayer's goal has been to facilitate partnerships. We introduce STEM business executives and organization leaders to best practice K-12 STEM education programs that have a proven track record of helping students, especially girls and underrepresented minorities, to achieve and succeed in STEM.

Bayer Corporation has undertaken a series of STEM education diversity initiatives as part of *Making Science Make Sense*®. These include hosting national pre-college STEM education diversity forums in the last few years in Washington, D.C. and San Francisco. We've also commissioned several *Bayer Facts of Science Education* surveys to examine diversity and underrepresentation issues from the perspective of industry leaders, parents, the underrepresented scientists and engineers, themselves, and STEM department chairs of the country's top 200 research institutions.

This report, first published in 2007, incorporates the most significant findings from our pre-college forums and the most recent *Bayer Facts* surveys.

Bayer offers special thanks to Dr. Mae C. Jemison, who served as moderator for both forums. Her razor-sharp insights kept the conversation lively and on track.

We thank the nearly 400 people who attended both forums. They included leaders from STEM industries, government agencies, philanthropic organizations and STEM education leaders. Sincere thanks also to those who participated as panelists. They included successful STEM education program directors and a diverse group of participants from academia, philanthropic organizations, government and industry.

Finally, we thank the countless number of individuals who have participated in our STEM diversity-themed surveys over the last seven years.

In addition, in order to further galvanize STEM industry involvement, in addition to this report Bayer has published and made widely available a series of resource guides, including:

- *Planting the Seeds for a Diverse U.S. STEM Workforce: A Compendium of Best Practice K-12 STEM Education Programs*
- *STEM Education, Science Literacy and the Innovation Workforce in America: 2012 Analysis of the Bayer Facts of Science Education Surveys 1995 – 2011*
- *Bridging the Gap: STEM Diversity and Higher Education: Recruiting, Retaining and Reinvigorating College STEM Programs*

Copies of all reports are available as free PDF downloads on Bayer's Web site at www.BayerUS.com/MSMS.

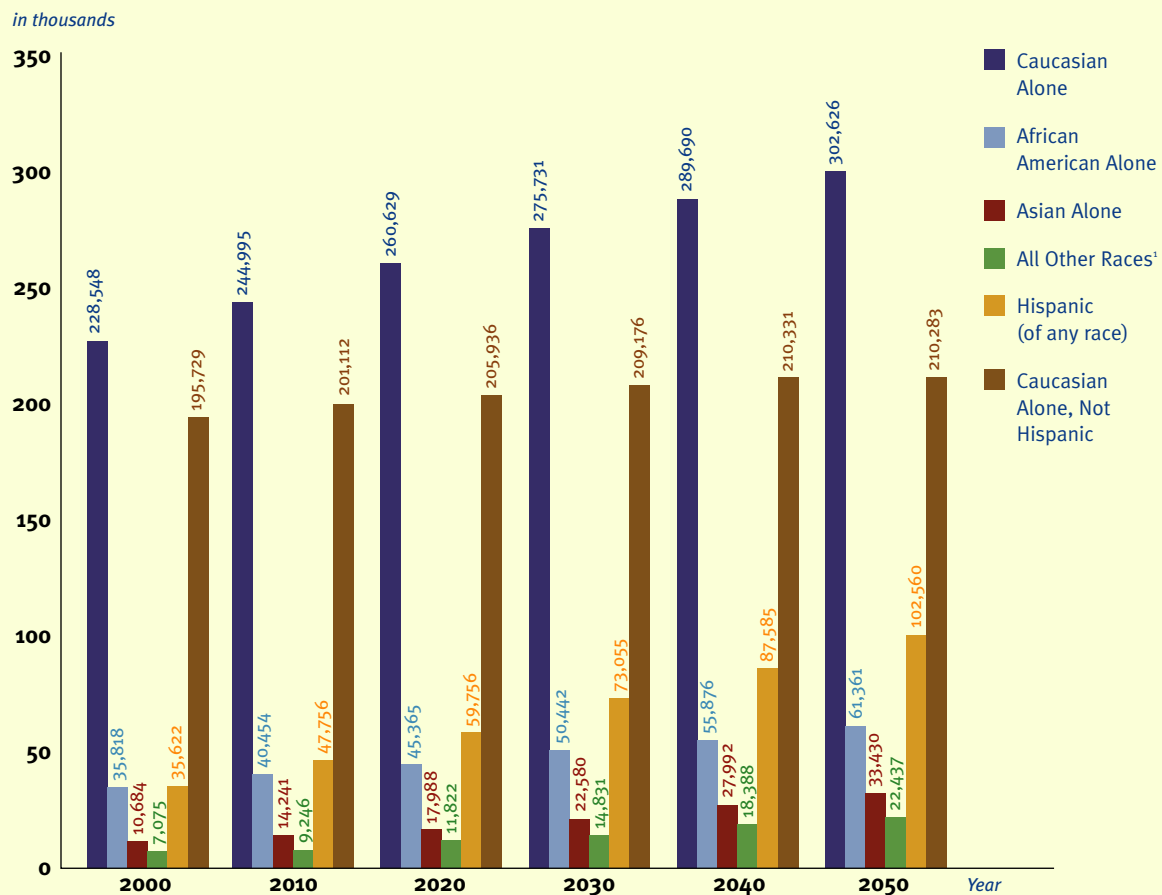
Building A Diverse STEM Pipeline Matters

For the United States, diversity is a key natural resource and perhaps our greatest strength. Building a diverse STEM education pipeline and workforce has never been more critical. One of the biggest challenges the United States faces today is the dwindling number of scientists and engineers we produce at a time when we also face increasing competition for this talent from other countries. At the same time, there exists in this country a vast untapped talent pool in those Americans who traditionally have been underrepresented in STEM fields.

Developing this talent pool of underrepresented students takes on even greater urgency in light of shifting demographics. In the very near future, as a good portion of our STEM workforce retires and the minority population continues to grow at a rate that far exceeds that of the majority population, we will rely increasingly on this talent pool to make the discoveries, advances and innovations that have and continue to position the United States as the world's scientific and technological leader.

In the 21st century, for social, economic and security reasons, diversity cannot and must not be ignored.

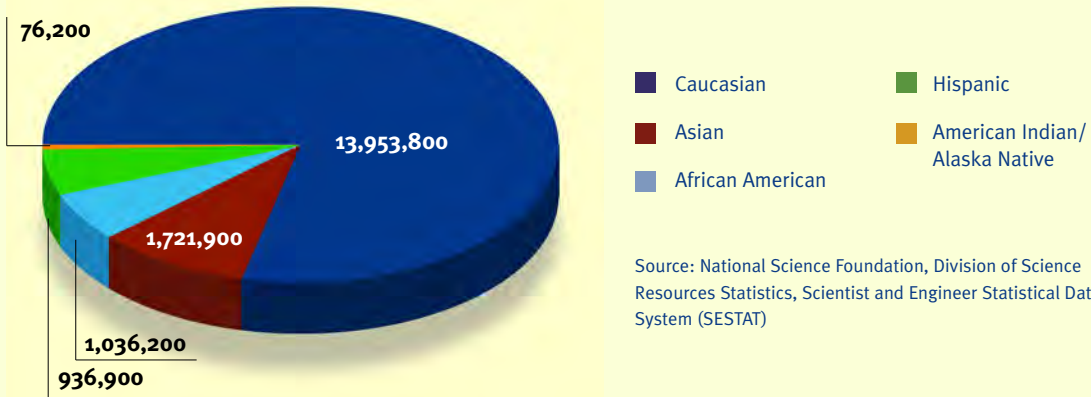
Projected Population of the United States by Race and Hispanic Origin: 2000 to 2050



¹ Includes American Indian and Alaska Native alone, Native Hawaiian and Other Pacific Islander alone, and Two or More Races

Source: U.S. Census Bureau, 2004, "U.S. Interim Projections by Age, Sex, Race, and Hispanic Origin," (<http://www.census.gov/ipc/www/usinterimproj/>) Internet Release Date: March 18, 2004

Employed Scientists and Engineers by Race/Ethnicity: 2003



Diversity and Underrepresentation: The Realities

Our latest *Bayer Facts of Science Education* survey of female and underrepresented minority chemists and chemical engineers demonstrates that, as a country, there is still much work to do. The good news is that interest in science begins early, with nearly 60 percent reporting they first became interested in science by age 11. This parallels the findings of a 1998 *Bayer Facts* survey of American Ph.D. scientists, which included Caucasian men. In that survey, six-in-ten also report interest by age 11. As a result, we have an opportunity to begin developing that interest at the earliest elementary school levels.

However, in the survey, more than three-quarters of the chemists and chemical engineers polled say that significant numbers of women and underrepresented minorities are missing from STEM fields today because they were not identified, encouraged or nurtured to pursue a STEM career early on.

Why are they missing? When asked to identify the reasons, the four causes or contributors in the chart below were most often given by the female and minority chemists and chemical engineers, including:

Top Causes/Contributors to Underrepresentation in STEM

Lack of quality science and math education programs in poorer school districts	75 percent
Stereotypes that exist that say STEM isn't for girls or minorities	66 percent
Financial issues related to the cost of education	53 percent
The fact that the STEM industries don't communicate the message to women and minorities that they are wanted and needed in these fields	51 percent

Source: *Bayer Facts of Science Education XIV: Female and Minority Chemists and Chemical Engineers Speak about Diversity and Underrepresentation in STEM*

Turning The Trend Around

It can be done. The sections that follow introduce the key hallmarks of quality K-12 STEM education programs that businesses or other interested organizations should look for when developing partnerships. They also provide valuable insights into the realities of developing successful business and education partnerships from those who have “been there and

done that.” In addition, we’ve included from the female and minority scientists and engineers surveyed recommendations to other key stakeholder groups about their role in improving STEM education for all of today’s students.

“This and previous Bayer Facts surveys confirm something that I’ve long known – that interest in science is genderless and colorless. All children have an innate interest in science and the world around them. But for many children that interest hits roadblocks along the academic system that is still not blind to gender or color. These roadblocks have nothing to do with intellect, innate ability or talent. On the contrary, they are the kinds of larger, external socio-cultural and economic forces that students have no control over. As students, they cannot change the fact that they do not have access to quality science and math education in their schools. But adults can. And we must.”

Dr. Mae C. Jemison

First African-American Female Astronaut

CEO – BioSentient Corporation

Founder – The Earth We Share



Elementary

A T - A - G L A N C E

In total, the two forums presented 10 best practice elementary school programs. They were a mix of formal and informal programs operating in rural, suburban and urban communities. Some focus exclusively on science, some on math and some on both science and math.

Despite the programs being disparate, they also share common traits that contribute to their success. For instance, they:

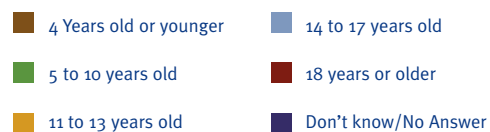
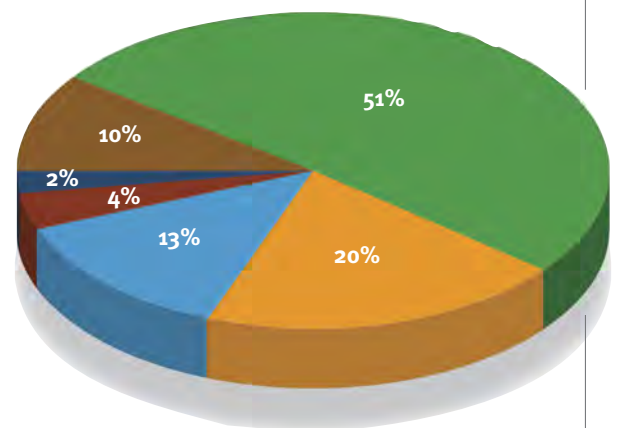
- align with National Science and/or Math Education Standards.
- utilize curriculum that is hands-on and inquiry-centered.
- provide sustained teacher training and support.
- maintain consistent, yet flexible frameworks for program implementation.
- enjoy the support of committed leadership.
- receive ongoing support from long-term community partners.
- conduct periodic assessment to benchmark progress.

In addition, several of the programs are modeled on the National Science Resources Center's five tenets of education reform.

The Elementary STEM Classroom: Hands-on, Inquiry-Centered and Real World

- At the elementary school level, growing research shows it is important for students to learn science in an experiential way using hands-on, inquiry-centered curriculum materials. Why is this important? In these early years, students are laying the foundation for understanding the scientific and mathematical concepts and principles they will build upon as they move through the education pipeline. When students are learning about issues that are relevant to their lives, it connects classroom learning to the real world and puts information into an everyday context.
- Even in school districts where traditional textbooks have been adopted as the official curriculum, the curriculum can also include a significant hands-on, inquiry-centered component, if district leaders make the commitment.

Age at Which Interest In Science Begins



Source: *Bayer Facts of Science Education IV: Scientists on Science for the 21st Century*, 1998, Bayer Corporation/Roper Starch Worldwide

Best Practice Elementary School Programs

- ASSET Inc.: www.assetinc.org
- California Mathematics, Engineering, Science Achievement (MESA): www.mesa.ucop.edu
- Community Resources for Science: www.crs-science.org
- Environment As A Context For Opportunities In Schools (ECOS): www.bioedonline.org
- FOSS, GEMS, EQUALS Lawrence Hall of Science: www.lawrencehallofscience.org
- Kinetic City: www.kineticcity.com
- Math Out Of The Box™: www.mathoutofthebox.org
- Omaha Public Schools/Banneker 2000: www.cems.ops.org
- Science On Wheels Pacific Science Center: www.pacsci.org/sow/

Sustained Teacher Training and Support: Pre-Service and In-Service

- For the most part, today's elementary school teachers' pre-service training does not provide a strong foundation in science content. The science they experienced as undergraduates doesn't necessarily look like the science we want them to teach in the classroom. Thus, professional development becomes paramount. It is key to model the training as close as possible to the approach that teachers will use in the classroom. In

other words, teachers should learn challenging science content through hands-on, inquiry-centered experiences that build their knowledge base.

They then can replicate this same approach in the classroom for student learning.

- Having access to scientists and engineers can help teachers bolster their own knowledge of science content, making them more comfortable with the subject in the classroom.
- Some of the best practice programs have created teacher training programs with their local colleges and universities, aimed specifically at preparing undergraduate students to become elementary school teachers. By instructing these pre-service teachers in inquiry-centered, standards-based, research-based learning and teaching methods, the goal is to help them transition easily into

classrooms where this type of curriculum is the norm.

- For some of the longer-running programs, the provision of teacher professional development has some inherent problems, namely that, over time, there are changes with schools and teachers. Also, in large urban areas, driving distance can be an issue. How do you get teachers to professional development sessions, 30 or 40 miles across town? Some programs are addressing this by providing professional development online with streaming video and web-based instruction.

Partnerships: It Takes A Village... A Committed Village

- A true hallmark of all of these programs is the quality, consistency and number of strong working relationships they have successfully forged. These partnerships are both internal, formed among the various education audiences, as well as external, created between the education organizations and other organizations within their respective communities.
- Internally, a commitment from the school leadership is necessary in order to make programs work. To effect change, leadership

What are the National Science Resources Center's five tenets of education reform?

The National Science Resources Center (NSRC), a joint project of the National Academies of Science and the Smithsonian Institution, was established in 1985 for the purpose of improving teaching and learning in science in the nation's school districts. In order to bring about such improvement, the NSRC outlines five essential pillars:

1. quality hands-on curriculum materials
2. ongoing professional development for all teachers every year
3. centralized material support
4. assessment of student learning, as well as program evaluation
5. administrative and community support

“ Our program grew out of a request from teachers for ‘All-ologists.’ They said they need scientists, be they biologists, palentologists, geologists or botanists, etc., they needed professionals who weren’t teachers who could, just by their very presence in the classroom, communicate to the kids why science is important. Scientists in the classroom are important because kids need to see that people of all stripes do science. ”

Anne Jennings
Community Resources for Science

includes not just superintendents and district administrators, but also principals who should have higher expectations of their teachers and the teachers themselves who must be committed to change.

- External partnerships involve business and industry, as well as social organizations and higher education institutions. They can also extend to relationships with parents, specifically the development of parent-leaders. These parent-leaders are educated so that they can work with their children on STEM subjects and get the message out to the larger community that math and science are important subjects for their children to learn.

Consistent, Yet Flexible Frameworks

- In order to remain effective, programs need to maintain their overall integrity, yet recognize local conditions demand a degree of fluidity.

After all, states, cities, towns and local school districts are autonomous and maintain ultimate control over education requirements. Additionally, programs need to be cognizant that not all students learn the same way, nor do all teachers have the same level of expertise.

All Students Must be Expected to Achieve

- Teachers must check at the door their own assumptions about whether or not certain students can learn math and science. Rather, they must expect *all* students to succeed in these subjects.

The Residual Effect: Science Reform and Impact on Achievement in Other Subjects

- A number of the science programs demonstrate that inquiry-centered learning which utilizes experimentation, observation, problem solving and journal keeping can have a powerful and positive effect on students’ achievement in other subjects, particularly math, reading and language arts.

“ At the Lawrence Hall of Science, they have taken to heart the point about teaching science to improve reading literacy and have created a completely integrated science and literacy program called *Seeds of Science, Roots of Reading*. This combination of learning methods is powerful. If you do hands-on investigation and you talk a bout it and you write about it and you read engaging text that is written about the same thing, bingo. When you integrate science with other curriculum subject areas this way, you get the kind of thematic teaching that elementary teachers really love and are very skilled at. ”

Dr. Reeny Davison
ASSET (Retired)

Secondary

A T - A - G L A N C E

Like the elementary school programs, the best practice secondary school programs were a mix of formal and informal programs based in rural, suburban and urban communities across the country. For both forums, there were a total of nine programs presented.

While each program is uniquely shaped to meet its stated mission, similar threads are apparent. For instance, they:

- utilize a hands-on approach that integrates real-world experiences.
- provide ongoing professional development for teachers.
- work to overcome long-held stereotypes about who participates and achieves in STEM.
- become more discipline or subject specific.
- connect students with mentors or real-life STEM role models.
- introduce students to state-of-the-art technology and equipment.

Emphasize Real-World Experience

- At the secondary level, more formalized real-world experiences, combined with academics, become increasingly important for students. These experiences typically center on hands-on laboratory or problem-solving work either during the school year or as part of summer internship programs. In addition, summer internships that are fully paid or provide a stipend are key to raising students' self-esteem, and also address a practical issue for students, many of whom come from economically disadvantaged households.

Best Practice Secondary Education Programs

- American Chemical Society's Project SEED:
www.acs.org/projectseed
- Biotech Partners:
www.biotechpartners.org
- California Mathematics, Engineering, Science Achievement (MESA):
www.mesa.ucop.edu
- Gateway Institute for Pre-College Education:
www.gateway.cuny.edu
- Illinois Math and Science Academy's E2K+:
www.imsa.edu/programs/e2k
- JETS (Junior Engineering Technical Society):
www.jets.org
- Project Lead The Way:
www.pltw.org
- Science In Motion:
www.scienceinmotion.org
- Techbridge Chabot Space & Science Center:
www.techbridgegirls.org

Keep Teachers Well-Prepared and Up-to-Date

- Ongoing professional development for teachers continues to be important at this level, particularly for teachers who specialize in specific subject areas like biotechnology, chemistry or computer science. These teachers need training on the latest technology and equipment.

Role Models versus Mentors

- It's important to make the distinction between role models and mentors. Early on, role models are important for students, but as they move farther along the educational pipeline, mentors take on a greater role.

In sixth through eighth grades, the introduction of role models often provides students the "Ah-ha" moment, the "I could be that!" moment. And it gets students moving in that direction.

By the time they become juniors and seniors in high school, they begin to think more seriously about certain subjects and possible careers. That's when mentoring relationships become important. And they're particularly important for students moving into post-secondary education. In addition, often role models turn into mentors.

Girls and Engineering

- Research from the Extraordinary Women Engineers Project and WGBH-TV in Boston shows perception, not ability, is a key problem when it comes to the dearth of girls choosing to pursue engineering disciplines. There need to be changes in the way engineering is presented to girls with greater emphasis on how it is relevant to their lives, how it can help solve society's problems, how engineering careers afford an excellent quality of life and so forth. Working on perception issues in this area is probably as important as developing proper skill sets for civil, mechanical or any other kind of engineering.
- Role models are key for helping girls make career choices, especially about engineering. Meeting role models helps dispel stereotypes and instill passion for the profession in the younger generation. Girls want advice and input as they figure out the best careers for them.
- For mentors, it's important to talk with girls about their careers, the benefits – both personal and professional – about balancing career and family, and about how their job helps them make a difference in the world because, again, girls often say they want to make the world a better place but they don't understand how engineering is compatible with that goal.

Bring School Guidance Counselors into the Fold

- At the secondary level, school guidance counselors who provide career counseling to students often are not well-informed about the countless career opportunities that exist for today's students in STEM. It is key then to educate these professionals who can properly advise students about these job opportunities.

Take A Holistic Approach

- Some of the programs are trying to build communities not just of learning, but also social communities that bolster student confidence and legitimize their aspirations. They're providing an environment free from the kind of negative peer pressure and low adult expectations that are detrimental to success.

For students working in professional laboratories, a major confidence booster is the fact that scientists trust them with the research and the equipment.

Some go one step further and, when necessary, provide additional support services to students and their families, both financially and personally, in the forms of scholarships, stipends, counseling, transportation and clothing for work.

Don't Forget the "T" in STEM

- Technology is a major part of society at large and the workplace in particular. Thus, access to the latest technology and equipment is a prerequisite to keeping students in STEM studies. At the secondary level, students are developing fundamental technology skills. Learning how to use materials and equipment helps them do so. By placing a strong emphasis on technology and getting students comfortable with it, students can seamlessly transition from basic education into technical jobs or from higher education into careers.
- Schools that lack the necessary resources can still access state-of-the-art technology and equipment through programs that bring such resources directly to the schools. Another alternative for resource-poor schools is to create partnerships with local colleges, universities, industry and government that involve opening their labs to students.

“ We need to be aware of the impact that peer pressure and societal concerns have on girls and minorities, resulting in them falling into familiar roles and patterns. What we don't want them falling into is the notion that STEM classes are NOT for them. ”

Rebecca Lucore

Chair, Bayer MaterialScience STEM Council

Involve Women and Minority STEM Professionals

- When it comes to leveling the playing field for women and underrepresented minorities in STEM, there are myriad opportunities for female and minority STEM professionals at all age and experience levels – from undergraduate to Ph.D. to corporate executive – to get involved. Indeed, there are a number of areas that could benefit from the participation of professional scientists, engineers, technologists and mathematicians. For example:
 - At the national, state and local levels, policy work and lobbying can make an impact.

- For more one-on-one involvement, mentoring is an option and also recognized as key at the secondary education level.
- There are also opportunities within education itself, such as curriculum development, assessment design, and program and partnership implementation.

“ Sometimes, especially with bilingual classes, it requires getting [students’] math skills up to where they should be and then once they are, we do all kinds of science and engineering. Because being an engineer is less about knowing a lot of content and more about theoretical knowledge and the ability to apply it to different problems.

For a company, the multi-cultural perspective is incredible. It’s not that they’re just trying to fill quotas, instead they see that someone who is from a different culture is going to look at problems differently because they’re coming from a different perspective.”

Judith D’Amico
Project Lead the Way



Dr. Leon M. Lederman:

On Improving U.S. STEM Education



Renowned U.S. physicist and educator, Nobel Laureate Leon M. Lederman recently served on a national commission mandated by Congress under the auspices of the National Science Board. *The National Commission on 21st Century STEM Education* was charged with providing a bold new set of proposals to fix the failures in American STEM education. These are some of Dr. Lederman's thoughts about remedying the problem.

1. Make Improving STEM Education a National Priority.

The federal government must make improving STEM education a national priority. Some people are skeptical of the federal government's ability to have any real impact on STEM education. Yet, in the 1940s, the federal government did something that changed America forever. The GI Bill enabled eight million returning World War II veterans to go to college. One economist estimated the U.S. Treasury collected \$10 for every dollar the government paid for the education of these veterans. What's the conclusion? Investing in education pays.

2. Recruit and Retain the Best Teachers.

In education, everything begins with teachers. If we want good education, any proposal must start with recruiting a corps of the best and brightest students who are then trained well, paid well, and afforded a teaching experience that is unencumbered by excessive bureaucratic and political red tape.

3. Establish a Coherent National Curriculum Strategy.

With roughly 16,000 independent school districts in 50 states, the complexities of American education are daunting. While respecting local control, we must also reduce educational disparities with a national strategy that outlines a coherent set of curriculum standards. The national standards movement of the 1990s was an important one. It provided the states with a framework from which to develop their own state education standards. Now it's time to do the same for the STEM curriculum.

4. Make Education Seamless.

Barriers that exist between educational epochs must be broken down so that education becomes seamless. Much more attention must be paid to the learning potential and intellectual growth that occurs in infants and young children. Head Start laid the foundation. Enlisting parents in the purposeful preparation of children for the K-5 school experience is the first step. Next, there needs to be good communication between primary school and middle school, which up until now has not been the case. The same goes for middle school and high school, and then the high school-college interface.

5. Establish State STEM Schools for Gifted Students in All 50 States.

Currently there are 15 state schools for students who are gifted in STEM, including the Illinois Math and Science Academy. In these residential schools, learning goes on day and night. Students bring with them their hobbies, their music, their art, all of their enthusiasms, opinions and arguments, which they share as much in the dormitory as in the classroom proper. Another 35 such schools certainly would benefit the nation enormously.

6. Galvanize Public Support.

No proposal will get very far without the full support of the American public. In order to do so, high-profile, thoughtful, media-savvy figures like Oprah Winfrey, George Lucas, Katie Couric and others need to get involved to help rally public support. We've seen them do it before on behalf of other issues that impact the public. Now we have to find a way to appeal to them on behalf of the future of the nation's STEM enterprise.

What Businesses Can Expect

At-A-Glance

It's clear that a growing number of companies are engaging in business-education partnerships. According to a recent survey from the U.S. Chamber of Commerce's Center for Workforce Preparation and the National Association of Manufacturers, education is:

- the #1 social issue that companies support philanthropically.
- the #1 social issue that companies believe they should play a role in.
- the #3 social issue companies believe affects the country's long-term competitiveness.

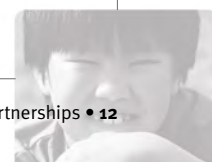
Bayer's own research confirms this trend. According to recent *Bayer Facts of Science Education* surveys, both Fortune 1000 and emerging STEM company CEOs view the support of STEM education programs as a corporate responsibility to society. While many report already supporting such programs, most of those who don't say they want to get involved.

While business-education partnerships are on the rise, there can be an inherent tension in such partnerships. In many ways, the two sectors are mutually exclusive, having little in common. Whereas industry tends to be results-oriented, operating on a more urgent basis, education focuses on the long-term development of a student, where outcomes are not immediately realized.

Yet, business-education partnerships can be enormously satisfying to both partners. The key is voicing clarity of intent at the outset, fostering good communications throughout, learning how to overcome challenges and recognizing benefits and rewards.

“ We must do a better job of tapping the talent of citizens who are under-represented in STEM fields: women, African-Americans, Hispanics and American Indians. Our global competitiveness depends on our ability to attract and retain future generations in areas such as chemistry, engineering, the physical sciences, mathematics and the computer sciences. I'm happy to report that our surveys of Fortune 1000 and emerging high-technology company CEOs show that they “get it.” They know that science literacy and diversity are essential to their own companies and to America's position in the world. What's more, many are taking action through partnerships with educators and government leaders to get the job done. The time for such partnerships has never been better. ”

Lauren Trocano
Manager of Corporate Social Responsibility
 Bayer Corporation



Education Partners

- Garnering the critical mass of support from business and industry to move from the “discussion phase” to actually making the commitment and staying the course on core programs for the long-term, which can sometimes mean a decade or longer.
- Helping business partners understand the kind of commitment they must make to an education organization that is trying to bring about the kind of radical change involved in standards- and research-based teaching and learning.
- Convincing companies to avoid the “curriculum du jour” trap and instead support standards- and research-based education programs that have a track record, even when these programs may already have the support of other corporate partners.
- Articulating at the outset the outcomes both partners expect and how they will benchmark those outcomes and measure success.
- Identifying the win-win for both parties when the cultures are so different. Business is looking for a better-prepared workforce as one of its outcomes. Yet, the timeframe between when a company invests its money at the elementary school level and when that future workforce becomes mature is quite long.
- Finding common ground and developing mutual respect when the partnership involves scientists/engineers working with teachers, particularly when teachers, who may not be as well-versed as the scientists/engineers in content areas, see themselves as “just teachers.”

- Partnering with business brings a whole new level of resources to the table, helping them enhance their programs while overcoming barriers at the school and district level. These include:
 - *STEM expertise.* Professional scientists/engineers can help develop curriculum; work with teachers and students in the science classroom on curriculum implementation, experiments and lab work; and serve as mentors, informal career counselors and science fair judges.
 - *Financial resources.* Particularly unrestricted grants, which allow for operational flexibility. The corporate funding may come from either the business or philanthropic side of the company.
 - *Human resources.* Apart from their scientists/engineers, companies employ professionals with wide-ranging business expertise whose ideas and insights can benefit education partners, such as facilities engineers who can set up materials systems; philanthropic, marketing and public relations professionals who can assist with fundraising and awareness; and corporate executives who can sit on boards of directors or advisory boards and consult on a broad range of issues.
 - *Political clout.* No other sector has the potential to influence this nation’s education system more than business and industry at the local, state and national levels.

Business Partners

C H A L L E N G E S

- Changing personnel at partner schools and school districts can often lead to a lack of continuity and thus frustration. When lead teachers and/or program directors leave their positions, companies must go back and re-educate the district administrators about why it is important to continue the program.
- Facing the threat of a new curriculum potentially being adopted by a school district also can negatively impact the partnership and the work it has completed. This scenario, again, can require re-education of the partner district administrators by the business partner.
- Increasing state and federal mandates for schools that focus primarily on math and language arts can mean that, if a school gets in trouble in one of these two subject areas, science can be left behind.
- Gathering *and* keeping all the partners together at the table — university partners, other business partners and the schools.
- Uncovering the people within the company who have the energy—and passion—to make things happen. Employees can't be told they're going to volunteer, they must want to do it. Then they must know who is supporting them within the company and who their point person is at the school/district.

R E W A R D S

- Improving education for the next generation and helping to foster a diverse STEM talent pool and a science literate workforce.
- Finding the right partners who have the passion and commitment to affect change for the long-term.
- Creating an environment where the partners have an open dialogue and lasting relationships endure.
- Building employee morale and enthusiasm.
- Recruiting *and* retaining high quality employees.
- Fostering goodwill for companies in their communities.

“ For Toyota, the biggest reward is lasting relationships that work. We don't get into ROI or return on investment models. They represent very short-term thinking and we understand that educating a child is a minimum fifteen-year process and could go to 25 years. ”

Mr. Michael Rouse
*Manager
 Philanthropy and Corporate Affairs
 Toyota Motor Sales*

“ We've been very fortunate to be able to utilize engineers and scientists from major corporations in the development and revision of our curriculum. ”

Mr. Niel Tebbano
*Vice President
 Project Lead The Way*

“ We spent a year-and-a-half studying the K-12 landscape. We benchmarked other companies' involvement. We talked to non-profits. We interviewed administrators and academicians at the higher ed level. We learned a lot, particularly that the K-12 landscape is complex. We learned that we're not education experts, therefore we needed to partner with an organization that had credibility. ”

Ms. Nancy Thomas
Hewlett-Packard (retired)

Business & Industry

1. Return On Innovation, Rather Than Investment

For businesses it is wise to avoid the traditional notion of return on investment or ROI when it comes to education since it represents very short-term thinking when, in fact, educating a child is a long-term proposition. Instead, focusing on “Return on Innovation” can help companies measure their investment, not in terms of dollars and cents, but in the number of young people they’re helping to prepare to be innovators.

While it can be difficult for educators to put a price tag on the capabilities and potential of a single student, they must still be mindful of metrics. If they expect significant and long-term corporate investment, they must have clearly defined goals, outcomes and assessment tools that measure their progress on a periodic basis.

2. Partnership Versus Donation

There is a significant difference between a donation and a partnership. A donation is a financial transaction between a company and an education organization, often one-time in nature, that may require some degree of reporting on the part of the education organization.

A partnership, on the other hand, has clearly shared and defined visions, goals and outcomes that build upon each other’s strengths and strengthen each other’s weaknesses. It can be challenging at times because it involves sustaining personal relationships over a long period of time as the work becomes increasingly more complex and personnel changes occur.

A partnership can leverage resources in a way that a donation cannot. An education organization can grow much stronger if, for example, one of its corporate partners helps it bolster its fundraising by assisting with grantwriting and/or enlisting the support of other companies, rather than by being its sole means of support.

3. Picking the Right Partner

Do the research. Selecting the right education partner doesn’t just happen, it’s a process which involves:

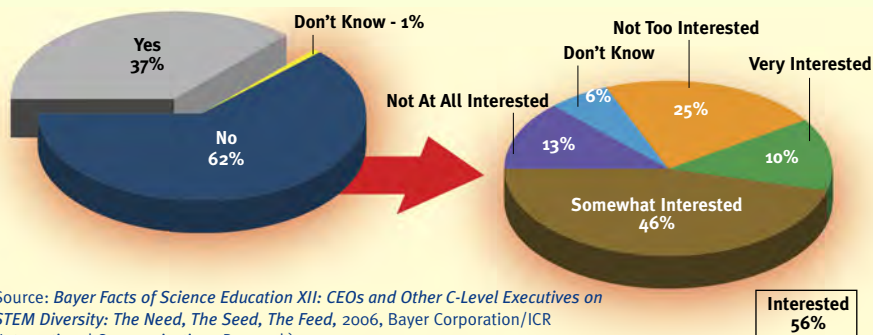
- identifying potential organizations that share a common vision and goals.
- meeting face-to-face to see if those commonalities, along with areas of expertise and infrastructure, correctly align.
- assessing other business-education partner models to learn what their experience has been.
- finding an education partner with credibility and a history of success in order to avoid re-inventing the wheel.

Define your role. Business is not an education expert, nor should it impose yet another set of demands on educators. In an effective business-education partnership, the education partner will allow the business partner to act as a facilitator and catalyst.

Determine your radius/location. If you want your employees to be involved, then partnering with local schools or education organizations makes the most sense. For companies wishing to take a more top-down approach, consider partnering with a national organization that has local chapters and programs that extend throughout the country.

Share the passion. Ultimately, picking the right partner boils down to passion. Do you both share the same values and enthusiasms about education? When you do, you’ll know it’s the right partner.

Company Supports Pre-College Education Programs that Attract, Encourage and Sustain Girls’ and Minorities’ Interest in Math and Science (n=100) OR Company is Interested in Supporting (n=63)



Source: Bayer Facts of Science Education XII: CEOs and Other C-Level Executives on STEM Diversity: The Need, The Seed, The Feed, 2006, Bayer Corporation/ICR (International Communications Research)

Revitalizing STEM in California

At-A-Glance

While this discussion at our 2008 forum had a focus on California, a number of universal themes surfaced that apply to all states and the country, at large.

- No matter where you live, no state can afford to underinvest in education and particularly STEM education. In many states where education budgets have been cut and eight years of No Child Left Behind has had a negative impact on science education, in particular, it's going to take all stakeholders to pull together to ensure that STEM education is properly funded (even if it means raising taxes).
- All stakeholders have a role to play, both individually and collectively, when addressing the positive youth development approaches of mentorship, internships and partnerships.
- Stakeholders in STEM include:
 - STEM business and industry leaders;
 - Local, state and federal elected officials;
 - Members of professional societies, such as the Society of Women Engineers and the American Chemical Society;
 - Formal STEM educators like school superintendents, administrators and teachers; and,
 - Informal STEM educators, including heads of science museums and after-school programs, the philanthropic community and parents themselves.
- Increasing the number of highly qualified pre-college math and science teachers is critical for many, if not all, states. To attract and retain the best and brightest math and science majors to math and science teaching, create programs that keep teachers engaged in the STEM industries. Research shows that many math and science majors don't pursue teaching because they feel they will become isolated from the greater scientific community and stagnate. To address this, California Polytechnic College has created the STAR (Science Teacher As Resource) program that provides summer internships in academic, federal and industrial laboratories for aspiring math and science teachers for a period of five to seven years. In this way, the greater scientific community is engaged in supporting the teachers and the teachers are aligned with the laboratories right through the credential process.
- Teachers need support in their first few years of teaching. Research shows that nearly 50 percent of new teachers leave the profession within the first five years. Orchestrated induction programs like the National Science Teachers Association's New Teacher Academy provide beginning teachers in the first few years of their careers with ongoing support and resources that enhance their classroom confidence and improve their content knowledge.

“When medical students first graduate from medical school, we don't just presume they're doctors because they're not. They're still medical students. They become doctors over the next few years as they do their residencies. The same is true for teachers.”

Audience participant – Forum 2008

“If you're a teacher, or principal or administrator, no elected official is going to listen to you. However, if you're a CEO or a senior business executive, they will. We need industry people to show up in Sacramento or Albany or Harrisburg or wherever the state capital may be and begin talking with the state representatives.”

Audience participant – Forum 2008

- Unlike information technology, in the aerospace field, national security concerns prevent companies from hiring students outside of the U.S. Thus, numerous job openings for scientists, engineers and technicians exist in these companies with few qualified candidates to fill them.

- The various levels of education, as well as industry, can and must work together to make sure students are prepared for the transition from one level to the next. One way is through various independent STEM education programs that are implemented across the formal education system spectrum, from kindergarten through graduate school.

Stakeholder	Role/Responsibility
Business and Industry Community	<ul style="list-style-type: none"> ☞ CEOs and other corporate executives need to hold their states' elected officials accountable for education. Sometimes, a collective approach can be effective in raising awareness of the issues. ☞ STEM employers must get the message across that part of any economic recovery must include an investment in education.
Philanthropic Community	<ul style="list-style-type: none"> ☞ During critical periods, philanthropic foundations can and often do step in to fill the void by donating money and resources to support STEM education. ☞ Members of the boards of nonprofit organizations and foundations often have strong business connections. Hence, they, too, have influence in the country's state capitals and can make their voices heard on the issue.
Informal STEM Education Community	<ul style="list-style-type: none"> ☞ In states where the infrastructure for good science teaching is disappearing, institutions, such as science museums, zoos, aquariums and planetariums become safe havens for teachers and students. ☞ Informal science programs and community-based organizations also offer supplemental science programs and activities that sometimes are on the same level, or provide greater depth, than those of the schools.
Formal STEM Education Community	<ul style="list-style-type: none"> ☞ Abolish the notion of "gatekeeping" and the ability of teachers to steer students, particularly girls and students of color, away from STEM. ☞ Decisions about education must be research-based. That means the teaching methodologies and pedagogy we choose for the classroom must be based on what the research tell us works best.
Parents and Guardians	<ul style="list-style-type: none"> ☞ Children live up or down to parental expectations. Parents need to examine their own attitudes about science and math to determine if they're passing on their own fears to their children and then correct by communicating high expectations.

“Just as there is no special reading and writing gene, there is no special science and math gene. We're in the technology age and it's amazing how many people still think there is. In 100 years, people will look back and realize how foolish this thinking was.”

Audience participant – Forum 2008

Building a Diverse U.S. Innovation Generation

In the latest *Bayer Facts of Science Education XIV* survey, female and underrepresented minority members of the American Chemical Society offer recommendations about how to ensure the success of women, African-Americans, Hispanics and American Indians in STEM fields. Here's what they say to:

Stakeholder	Key Recommendations
Pre-College (K-12) Teachers/Educators	<ul style="list-style-type: none"> ☞ Encourage and support students' interest and passion in science ☞ Be proficient in science content and science teaching ☞ Offer more hands-on science experiences ☞ Teach without bias ☞ Strengthen K-12 science curriculum and classes ☞ Make science exciting, interesting and fun
Colleges/Universities	<ul style="list-style-type: none"> ☞ Offer scholarships, fellowships and grants to female and minority students ☞ Provide mentors, mentoring and role models ☞ Hire and promote more women and minority science faculty ☞ Encourage, engage and be involved with students ☞ Actively recruit and admit female and minority students to study STEM ☞ Create, encourage and support student groups for women and minorities
Parents	<ul style="list-style-type: none"> ☞ Encourage your children in STEM activities and interests ☞ Encourage your children to explore science outside of school ☞ Encourage your children to consider and explore STEM careers ☞ Be involved in your children's science education ☞ Challenge your children with high expectations
Government	<ul style="list-style-type: none"> ☞ Offer scholarships, fellowships and financial aid ☞ Increase financial support for STEM education at all levels ☞ Support and fund STEM education programs for women and minorities ☞ Encourage and support STEM organizations and programs that support women and minorities ☞ Recruit, hire and promote women and minorities for STEM jobs
Females and Minorities Themselves	<ul style="list-style-type: none"> ☞ Set high standards, work hard and never give up ☞ Develop self-confidence ☞ Serve as mentors and role models ☞ Build/take advantage of peer networks and support groups ☞ Don't let anyone tell you "you can't" ☞ Take the initiative and assert yourself ☞ Be open to/seek opportunities
STEM Corporations	<ul style="list-style-type: none"> ☞ Recruit, hire and promote women and minorities for STEM jobs ☞ Provide mentors, mentoring and role models ☞ Offer high school and college internship opportunities ☞ Encourage and support STEM organizations and programs that support women and minorities ☞ Get involved with elementary, middle and high school STEM education ☞ Create and support family-friendly policies and working environments ☞ Communicate broadly about STEM importance and opportunities
STEM Professional Societies/Organizations	<ul style="list-style-type: none"> ☞ Provide mentors, mentoring and role models ☞ Build and support peer networks for women and minorities ☞ Recruit, actively, women and minorities for professional society membership ☞ Get involved with elementary, middle and high school STEM education ☞ Communicate broadly about STEM importance and opportunities ☞ Support women and minority STEM programs in your organization

Conclusion

In 2000, the authors of the report, *Land of Plenty: Diversity as America's Competitive Edge in Science, Engineering and Technology*, framed the STEM diversity issue this way: "Growing the American talent pool requires a nationwide call to action and a major shift in how we educate, train and recruit citizens in the fields of science, engineering and technology. Barriers exist today throughout the [STEM] pipeline that limit the number of women [and] underrepresented minorities... seeking and retaining these jobs. If we are to compete effectively in the global marketplace, we must advance the full and equitable participation of all Americans in [STEM] fields. Our economy will not only be positively affected by bringing more women [and] underrepresented minorities...into the [STEM] workforce, but our high-tech, scientific and engineering industries will benefit from their diverse viewpoints and approaches, as well as their skills."

In this nationwide call to action, business and industry most certainly have a role to play. As a company that has long been involved in STEM education efforts, we at Bayer know that business/education partnerships can be effective. Given the current confluence of trends, the time for such partnerships has never been better.

In business, we build teams every day to solve problems and develop new ideas. This is also a sound way to promote innovation in education. Educators need industry's help to spearhead change through their school systems. Our expertise and resources are key to helping STEM education programs get off the ground, scale up and remain sustainable.

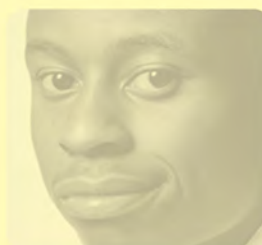
At Bayer, we pledge to continue our commitment to help strengthen STEM education for all American students and particularly those who are underrepresented. We pledge also to continue our work to galvanize other members of the STEM industries to get involved and do their part. In this we stand ready to serve.

It's clear that the STEM industries need to come together and recognize that the future is now. The investments we make in the students of today will result in the scientists, innovators and inventors of tomorrow.

Through our united efforts, we can sustain a talented and diverse STEM pipeline that will enhance everything we do as companies, as industries and as a country.

“ We need to generate the same sense of urgency to improve our country's science literacy as there was in the 1960's during the Sputnik era to help with our current generation of problems. We need to lay out a challenge for this country. ”

Mid-career African-American male chemistry professor and *Bayer Facts of Science Education XIV* survey participant



Appendix

2006 STEM Education Diversity Forum Program Agenda

HOST

Dr. Attila Molnar
President and CEO
Bayer Corporation

MODERATOR

Dr. Mae C. Jemison
Nation's First African-American
Female Astronaut
CEO, BioSentient Corporation
Founder, The Earth We Share

BEST PRACTICE ELEMENTARY STEM EDUCATION PANEL

OPENING SPEAKER

Dr. Mae C. Jemison

PANELISTS

Dr. Reeny Davison
Executive Director
ASSET Inc.

Mr. Robert Hirshon
Director
Kinetic City

Dr. Michael Klentschy
Principal Investigator
Valle Imperial Project in Science

Dr. Susan Koba
Project Director
Omaha Public Schools/
Banneker 2000

Dr. Nancy Moreno
Director
Environment as a Context for
Opportunities in Schools

Ms. Dorothy Moss
Director
Math Out of the Box™

Ms. Juanita Muniz-Torres
California Director
Mathematics, Engineering,
Science Achievement

BEST PRACTICE SECONDARY STEM EDUCATION PANEL

OPENING SPEAKER

Mr. Ted Stewart
Vice President
Human Resources
Bayer CropScience LP

PANELISTS

Dr. Susan Bisinger
Project Director
Illinois Math and Science
Academy's EzK+

Ms. Cecilia Hernandez
Manager
American Chemical Society's
Project SEED

Dr. Lorraine Mulfinger
Director
Science in Motion

Dr. Morton Slater
Director
Gateway Institute for Pre-College
Education

Mr. Niel Tebbano
Vice President
Project Lead The Way

Ms. Ghanya Thomas
Program Director
Biotech Partners

Ms. Leann Yoder
Executive Director
Junior Engineering Technical
Society (JETS)

LUNCHEON KEYNOTE SPEAKER

Dr. Leon M. Lederman
Nobel Laureate

Director Emeritus
Fermi National Accelerator
Laboratory

Co-Founder and Resident Scholar
Illinois Mathematics and Science
Academy

EDUCATION PARTNERSHIPS: WHAT BUSINESSES CAN EXPECT PANEL

OPENING SPEAKER

Mr. Rainer Schorr
Senior Vice President
Polycarbonates Business Unit
Bayer MaterialScience LLC

PANELISTS

Ms. Phyllis Buchanan
Manager
Office of Education
DuPont

Dr. Reeny Davison
Executive Director
ASSET Inc.

Dr. Robert Kumpf
Vice President
Future Business
Bayer MaterialScience LLC

Mr. Michael Rouse
Manager
Philanthropy and Corporate Affairs
Toyota Motor Sales

Ms. Sally Goetz Shuler
Executive Director
National Science Resources Center

Mr. Niel Tebbano
Vice President
Project Lead The Way

Ms. Nancy Thomas
Hewlett-Packard (retired)

Dr. Gerald Wheeler
Executive Director
National Science Teachers
Association

CLOSING SPEAKER

Dr. Wes Cetnarowski
Senior Vice President
Global Research & Development
Bayer Consumer Care
Bayer HealthCare LLC

Appendix

2008 STEM Education Diversity Forum Program Agenda

HOST

Mr. Greg Babe
President and CEO
Bayer Corporation

MODERATOR

Dr. Mae C. Jemison
Nation's First African-American
Female Astronaut
CEO, BioSentient Corporation
Founder, The Earth We Share

BEST PRACTICE ELEMENTARY STEM EDUCATION PANEL

OPENING SPEAKER

Dr. Mae C. Jemison

PANELISTS

Dr. Reeny Davison
Executive Director
ASSET Inc.

Mr. Robert Hirshon
Director
Kinetic City

Ms. Anne Jennings
Co-Director
Community Resources for Science

Dr. Nancy Moreno
Director
Environment as a Context for
Opportunities in Schools (ECOS)

Ms. Dorothy Moss
Director
Math Out of the Box™

Dr. Elizabeth K. Stage
Director
Lawrence Hall of Science

Dr. Dennis Schatz
Vice President
Pacific Science Center

BEST PRACTICE SECONDARY STEM EDUCATION PANEL

OPENING SPEAKER

Ms. Trina Ostrander
Community Relations
Bayer HealthCare Pharmaceuticals
Berkeley, California

PANELISTS

Ms. Deborah L. Bellush
Executive Director
Biotech Partners

Ms. Judith D'Amico
Director, State and Corporate
Relations
Project Lead The Way, Inc.

Ms. Kathy Fleming
Associate Director, Development
American Chemical
Society/Project SEED

Dr. Linda Kekelis
Director
Techbridge
Chabot Space & Science Center

Dr. Oscar F. Porter
President
Mathematics, Engineering,
Science Achievement (MESA) USA

Ms. Leann Yoder
Executive Director
Junior Engineering Technical
Society (JETS)

STAKEHOLDERS AT THE TABLE: REVITALIZING STEM IN CALIFORNIA

OPENING SPEAKER

Dr. Mae C. Jemison

Co-Moderator

Mr. Michael Tomasello
Senior Associate Director
MESA

PANELISTS

Dr. Warren J. Baker
President
California Polytechnic State
University

Dr. Dennis M. Bartels
Executive Director
Exploratorium

Mr. Ray M. Haynes
Director, Strategic University
Alliances
Northrop Grumman Space
Technology

Mr. Tom Torlakson
Assembly member
California's 11th Assembly District

Ms. Lisa R. Villarreal
Program Officer, Education
San Francisco Foundation

Bayer Facts of Science Education Surveys

Bayer Corporation's award-winning, company-wide *Making Science Make Sense*® initiative advances science literacy across the United States through hands-on, inquiry-based science education, employee volunteerism and a national public education campaign led by Dr. Mae C. Jemison, the nation's first African-American female astronaut.

One of the key components of the public education campaign is the *Bayer Facts of Science Education* survey series. Launched in 1995, this ongoing research project gauges public opinion about the state of science education in the United States, support for reform, and recognition of the roles that science and science literacy play in everyday life.

Over the years, these surveys have polled various audiences, including the nation's Ph.D. scientists and science teachers; corporate CEOs of science and technology companies and other business leaders; and deans of colleges and universities, as well as parents and the general public.

Following is a listing of all the *Bayer Facts of Science Education* surveys. For copies of the executive summary of each survey, please visit Bayer's web site at www.BayerUS.com/msms.

Bayer Facts of Science Education XV-2011

U.S. Female Students Enter College Most Prepared for STEM Studies, According to Faculty at America's Top Research Universities in a New Bayer Survey

Bayer Facts of Science Education XIV – 2010

Female and Minority Chemists and Chemical Engineers Speak about Diversity and Underrepresentation in STEM

Bayer Facts of Science Education XIII - 2008

FORTUNE 1000 Executives: New President Must Fix Education Gap

Bayer Facts of Science Education XII - 2006

New Survey Reveals CEOs of 100 of the Fastest Growing U.S. Science and Technology Companies Fear Rising International Competition for Scientific and Technical Talent

Bayer Facts of Science Education XI - 2005

Parents of Underrepresented Students in Science and Engineering Speak Out on Issue in New National Survey

Bayer Facts of Science Education X - 2004

Are the Nation's Colleges and Universities Adequately Preparing Elementary Schoolteachers of Tomorrow to Teach Science?

Bayer Facts of Science Education IX - 2003

In New Gallup Survey, Americans Call Science and Technology Critical to U.S. Security

Bayer Facts of Science Education VIII - 2002

In New Gallup Survey, U.S. College Students Believe Science and Technology Critical to the War on Terrorism

Bayer Facts of Science Education VII - 2001

"It's Not Your Father's Workplace Anymore," Says Latest Survey of U.S. Managers, New Employees

Bayer Facts of Science Education VI - 2000

In Science, Americans Like Being Number One, According to New Gallup Survey

What America Thinks About Science Education Reform:

An Analysis of The Bayer Facts Of Science Education I-V

Bayer Facts of Science Education V - 1999

Nation's Science Teachers Register Concern over U.S. Science Education in New Survey

Bayer Facts of Science Education IV - 1998

U.S. Scientists Predict Pace of Discovery to Accelerate In the 21st Century, Survey Says

- Facts About Men and Women in Science
- Female Scientists Face More Career Difficulties, More Negative Influences than Men
- Science Interest Sparked Early for Both Men and Women

Bayer Facts of Science Education III - 1997

Kids Shatter Myths about Science in New National Student Report Card on Science Education

- Science Education Myths

Bayer Facts of Science Education II - 1996

Business Executives See Continued Decline in Education, According to New National Survey

Bayer Facts of Science Education I - 1995

Nationwide Survey Finds Science Education Needs to be Stepped Up in Elementary Schools

About Bayer Corporation's *Making Science Make Sense*[®]

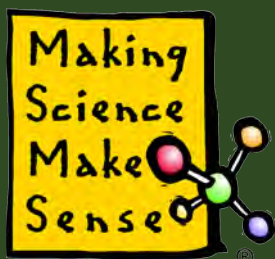
Bayer Corporation, headquartered in Pittsburgh, is a subsidiary of Bayer AG, an international health care, nutrition and high-tech materials group based in Leverkusen, Germany. As an inventor company, it sets trends in research intensive areas. The company's products and services are designed to benefit people and improve their quality of life. The Corporation is committed to the principles of sustainable development and to its role as a socially and ethically responsible corporate citizen. Economy, ecology and social responsibility are corporate policy objectives of equal rank. In North America, Bayer had 2011 net sales of EUR 8,177 million (\$11,366 million) and employed 15,800 at year-end.

For more information, go to www.bayerus.com.

As a science and research-based company, Bayer Corporation has a strong stake in helping to improve science education and to insure that all individuals are scientifically literate. Bayer demonstrates this commitment with its national award-winning *Making Science Make Sense*[®] (MSMS) program, a companywide initiative which advances science literacy across the United States through hands-on, inquiry-based science learning, employee volunteerism and public education.

MSMS is one of 300 corporate social responsibility programs Bayer supports globally. For more than a century, Bayer has been acting in the public interest, demonstrating a distinct kind of corporate citizenship that benefits humankind and society at large. MSMS has been honored with numerous awards, including two presidential accolades – The Ron Brown Award for Corporate Leadership and The President's Service Award – and the National Science Board's Public Service Award.

More than 40 years ago, MSMS was born when Bayer volunteers began helping teachers teach and students learn science the way scientists do – by doing it. Today, in Bayer site communities across the country, more than 1,000 volunteers work to foster science literacy and ignite student interest in science.



MSMS relies on a number of important national and local partnerships. Nationally, Bayer has forged relationships with the U.S. Department of Education, National Science Foundation, National Science Teachers Association, American Association for the Advancement of Science and National Science Resources Center to change the way science is taught and learned in the classroom. Locally, Bayer is spearheading education reform with school districts, other businesses, government and education organizations. Together, these groups work to implement Standards-based inquiry-centered curricula and provide teachers with ongoing professional development in science content and pedagogy. Thus, MSMS not only helps educate the next generation of scientists, technologists, engineers and mathematicians, it equips all students with the skills acquired from a high quality, hands-on science education like critical thinking, creativity and adapting to change. Skills that in today's scientific and technological world are essential to any career one chooses.

Bayer's national science literacy campaign, led by astronaut Dr. Mae C. Jemison, features the *MSMS Experiment Guides* for parents and children; the *MSMS Audio Series and Video Vignettes*, featuring two-minute sound byte science classes about everyday science topics; the *International Children's Painting Competition*, an environmental art competition for students ages six-to-14 with its partner the United Nations Environment Programme; and, the annual *Bayer Facts of Science Education* surveys, which gauge public opinion on the state of science education in the United States, as well as support for reform and public recognition of the roles that science and science literacy play in everyday life. In recent years, the surveys have also focused in on the issue of diversity and underrepresentation in STEM (science, technology, engineering and math) fields.

Also, in order to further galvanize STEM industry involvement in education, Bayer has published and made widely available several resource guides, including:

- *Building a Diverse U.S. STEM Workforce: Perspectives on Creating Successful Business Education Partnerships;*
- *Planting the Seeds for a Diverse U.S. STEM Pipeline: A Compendium of Best Practice K-12 STEM Education Programs;*
- *STEM Education, Science Literacy and the Innovation Workforce in America: 2012 Analysis and Insights from the Bayer Facts of Science Education Surveys 1995 – 2011.*
- *STEM Diversity and U.S. Higher Education: Recruiting, Retaining and Reinvigorating College STEM Programs.*

Collectively, these reports provide business leaders and others with information about best practice K-20 STEM education programs and practical advice for how they can support and/or replicate such programs nationally or in their local communities.

For more information, go to www.bayerus.com/msms.



Science For A Better Life



Making Science Make Sense[®] is Bayer's award-winning, company-wide initiative that advances science literacy through hands-on, inquiry-based science learning, employee volunteerism and public education.

For more information, please visit www.BayerUS.com/MSMS.

© Bayer Corporation 2012

