



Science For A Better Life

Bridging the Diversity Gap in Science and Engineering:

Introducing STEM Industries to K-12 Best Practice Programs

H I G H L I G H T S R E P O R T

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



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By summarizing the ideas that emerged at the forum 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, industry executives, 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

As a company, we at Bayer strive to improve quality of life for humankind and the environment through our products and services, embracing science as the foundation for our actions as exemplified by our motto – Bayer: Science For A Better Life. As such, one of Bayer’s main priorities is to strengthen STEM (science, technology, engineering and math) education in the United States. We are keenly aware of the critical need to develop a more diverse STEM pipeline and workforce. We also know that exemplary education programs exist that are closing the diversity gap in STEM subjects and that businesses can engage

successfully in partnerships with these programs to help them grow.

To assist STEM companies and others in these efforts, Bayer Corporation has undertaken a series of STEM education diversity initiatives as part of our national award-winning corporate social responsibility program, *Making Science Make Sense*®.

One such initiative was the STEM Education Diversity Forum we hosted last September in Washington, D.C. The purpose of the forum was crystallized precisely in its title, *Bridging the Diversity Gap in*

Science and Engineering: Introducing STEM Industries to K-12 Best Practice Programs.

By showcasing a number of such programs from around the country that have a proven track record of helping girls, African-Americans, Native Americans and Hispanic Americans to succeed and achieve in STEM subjects, our objective was to

educate STEM business leaders about programs they might wish to support and/or replicate in their local communities.

At the forum, Bayer introduced a new resource guide titled *Planting the Seeds for a Diverse U.S. STEM Pipeline: A Compendium of Best Practice K-12 STEM Education Programs*. It features 21 best practice K-12 programs, including the 14 showcased at the forum, as well as other resources to help companies as they establish their own business-education partnerships.

This highlights report marks Bayer’s newest initiative under the STEM education diversity umbrella. In preparing the report during the last several months, we strove to outline the most significant ideas and findings that emerged during the forum. It is our hope that you find the information in both these documents useful as you strengthen existing or consider forging new business-education partnerships.

Special thanks to Drs. Mae C. Jemison and Leon M. Lederman, who served as moderator and luncheon keynote speaker, respectively. Their inspirational remarks and keen insights on these important issues are captured throughout the report.

We also would like to extend our sincere thanks to the nearly 150 STEM industry and education leaders, as well as federal, state and local government agency representatives and others who attended the forum, especially our panelists who are the program directors responsible for some of this country’s finest and most innovative STEM education programs.

If you would like to share the report and/or best practice compendium with colleagues or partners, PDF versions are available for downloading on Bayer’s Web site at www.BayerUS.com/MSMS.



Dr. Attila Molnar
President and Chief Executive Officer
Bayer Corporation



Bayer would like to acknowledge former U.S. Congresswoman Constance A. Morella of Maryland whose legislation resulted in the congressional commission that published the report *Land of Plenty: Diversity as America’s Competitive Edge in Science, Engineering and Technology* in 2000. This report helped to reframe the national discussion about diversity in STEM. We also would like to thank the National Science Teachers Association, American Association for the Advancement of Science, National Science Foundation, National Science Resources Center, National Research Council and the Council on Competitiveness and its Building Engineering and Science Talent (BEST) initiative. The work, reports and programs of these and other organizations helped inform both the forum and the best practice program compendium.

Forum Program Agenda

The 14 programs presented were a mix of formal and informal STEM education programs operating in rural, suburban and urban communities around the country. Some programs focus exclusively on science, some on math, and others on both science and math. Regardless, they all have been successful in closing achievement gaps between girls and boys, and majority and minority students.

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/
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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 E2K+

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

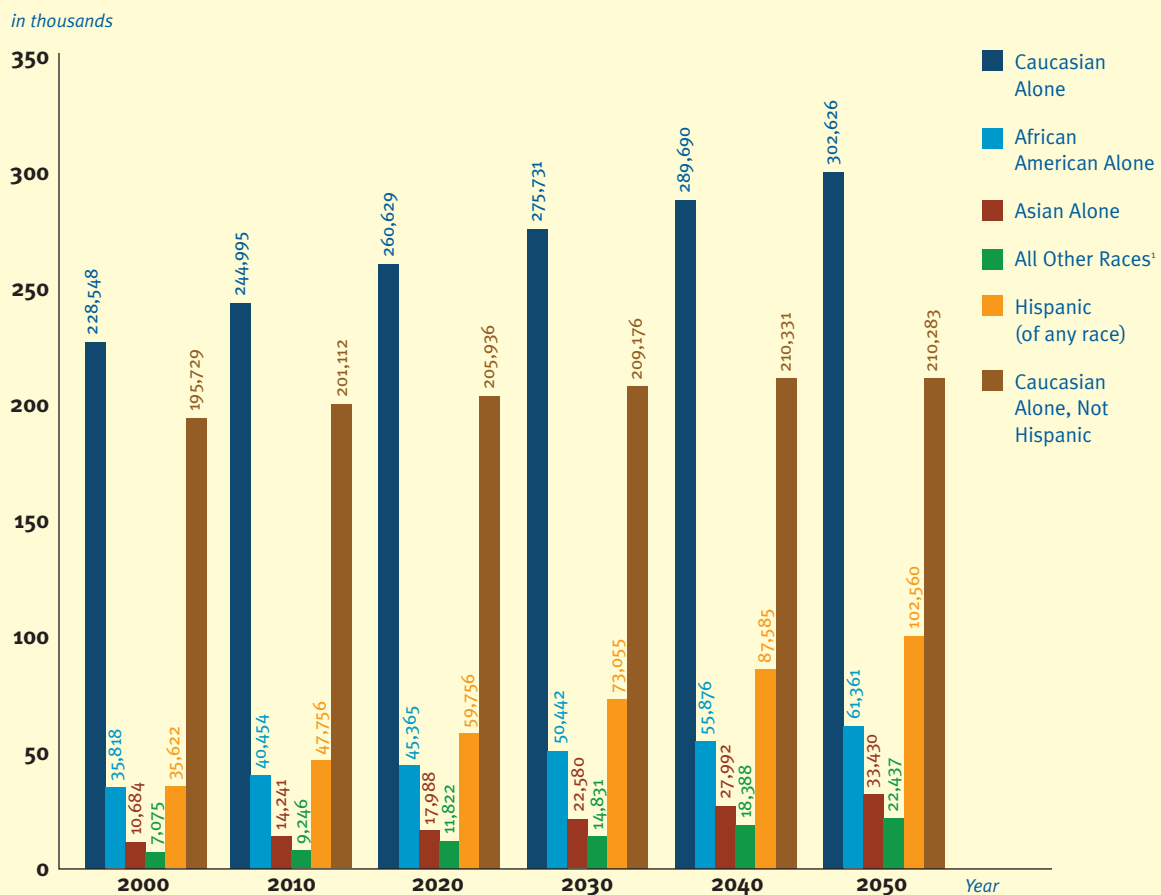
Why Building A Diverse STEM Pipeline Matters

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.

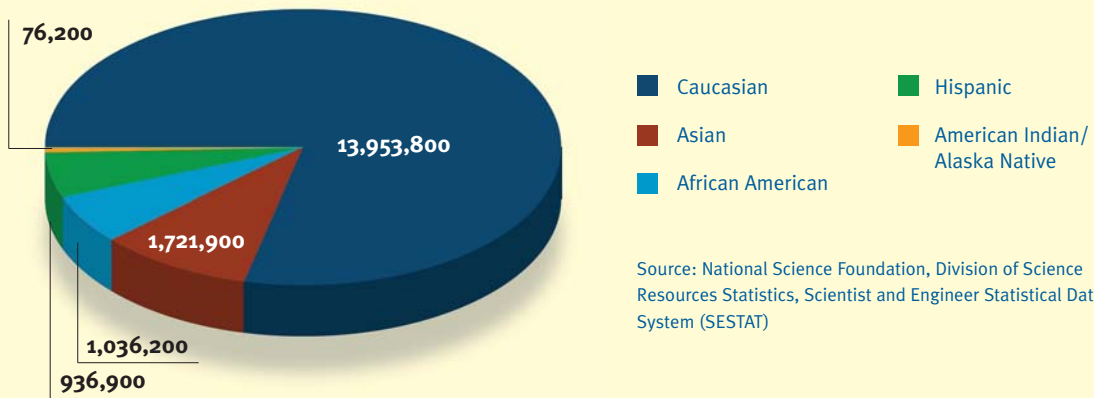
Projected Population of the United States by Race and Hispanic Origin: 2000 to 2050



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



Source: National Science Foundation, Division of Science Resources Statistics, Scientist and Engineer Statistical Data System (SESTAT)

“As a multinational corporation that has operations in countries around the globe, we at Bayer are very aware of just how important diversity is...how it brings with it the power of different ideas, styles and experience, enhancing virtually everything we do. We operate on the belief that similarities and differences make us strong... and we put that belief into action every day at Bayer.”

Dr. Attila Molnar
*President and CEO
 Bayer Corporation*



“By many measurements, we see our elite status in science and technology fading. Countries like China and India are now growing rapidly in their ability to do things. The Chinese Deputy Minister of Education told me that China is going to build 40 new universities, each one modeled on Harvard.”

Dr. Leon M. Lederman
*Nobel Laureate
 Director Emeritus
 Fermi National Accelerator Laboratory
 Co-Founder and Resident Scholar
 Illinois Mathematics and Science Academy*



Elementary

A T - A - G L A N C E

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

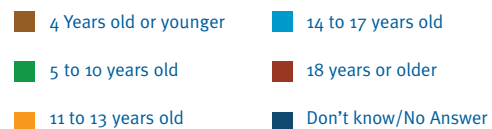
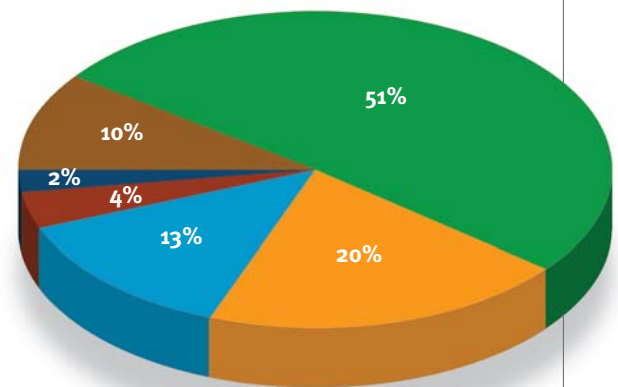
- align with National Science and/or Math Education Standards.
- utilize curriculum that is hands-on and inquiry-centered.
- provide sustained teacher training and support.
- maintain consistent, yet flexible frameworks for program implementation.
- enjoy the support of committed leadership.
- receive 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
- Environment As A Context For Opportunities In Schools (ECOS): www.bioedonline.org
- Kinetic City: www.kineticcity.com
- Math Out Of The Box™: www.mathoutofthebox.org
- Omaha Public Schools/Banneker 2000: www.cems.ops.org
- Valle Imperial Project In Science: mklent@ecsd.k12.ca.us

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.

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

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

“ We need to re-evaluate the importance of our elementary programs to lay the base for high school and beyond. In doing so, we need to take a look at the roles of the various subjects. What is the role of reading and language arts? What is the role of mathematics? In many cases, it’s to help us learn content. Yet, what we have are programs that are reading first, and often times reading only. ”

Dr. Michael Klentschy
*Principal Investigator
Valle Imperial Project in Science
El Centro, Calif.*

programs work. To effect change, leadership 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.



Secondary

A T - A - G L A N C E

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.

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.

Challenge Girls' Own Perceptions About 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.

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.

Best Practice Secondary Education Programs

- American Chemical Society's Project SEED: www.chemistry.org/education/seed.html
- Biotech Partners: www.biotechpartners.org
- 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

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.

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.

“ [In middle and high school] peer pressure and social concerns can conspire to put great pressure on students and often girls and boys fall into familiar roles and patterns. One thing we don't want them falling into is the notion that STEM subjects are NOT for them. ”

Mr. Ted Stewart

*Vice President
Human Resources
Bayer CropScience LP*

*Member
Bayer Diversity Advisory Council*

“ Somebody asked me if I knew any African-American women scientists [as a child growing up]? When I think of a scientist, I think of someone who's trying to understand what's going on in the world... willing to experience things... look things up... research. My mother was one of the best scientists, and many of my school teachers were, too. ”

Dr. Mae C. Jemison

First African-American Female Astronaut

*CEO
BioSentient Corporation*

*Founder
The Earth We Share*

Dr. Leon M. Lederman:

On Improving U.S. STEM Education



Renowned U.S. physicist and educator, Nobel Laureate Leon M. Lederman was recently named co-chair of a new national commission mandated by Congress under the auspices of the National Science Board. *The National Commission on 21st Century STEM Education* has been charged with providing a bold new set of proposals to fix the failures in American STEM education. While the commission is still working, Dr. Lederman has already done some serious thinking about potential proposals, which he shared with those in attendance.

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 the most recent *Bayer Facts of Science Education* survey, many CEOs of some of the fastest-growing U.S. science and technology companies view supporting STEM education as a corporate responsibility, with a good number saying they want to get more 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.



“ Industry is a leading customer of the education system... one of the major end-users of all that product development. And we want excellent products. As business leaders, we invest in proven designs. The same should hold true for education. There are a number of proven business-education partner models from which we can learn...and hopefully in which we can invest. ”

Mr. Rainer Schorr

Senior Vice President

Polycarbonates Business Unit

Bayer MaterialScience LLC



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

CHALLENGES

- 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.

REWARDS

- 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:

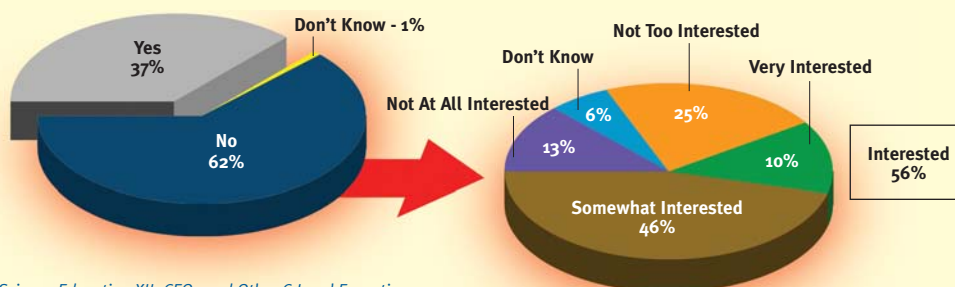
- identifying potential organizations that share a common vision and goals.
- meeting face-to-face to see if those commonalities, along with areas of expertise and infrastructure, correctly align.
- assessing other business-education partner models to learn what their experience has been.
- finding an 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)

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 companies can engage successfully in business-education partnerships if they possess the necessary commitment and will. 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.

“Our aim has been to present an array of exemplary programs that have diverse appeal. All with the goal, again, of helping our STEM colleagues forge their own partnerships in the name of a robust, diverse workforce. It's clear that we need to come together as individuals, as companies, and as industries... for the sake of our students....and the future of our country.”

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



About Bayer Corporation and *Making Science Make Sense*[®]

As a science and research-based company with major businesses in health care, nutrition and innovative materials, 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 company-wide 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.

More than 30 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.

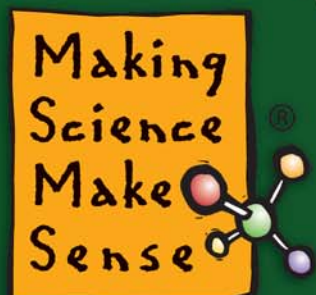
MSMS relies on a number of important national and local partnerships. Nationally, Bayer has forged relationships with the U.S. Department of Education, National Science Foundation, National Science Teachers Association, American Association for the Advancement of Science and National Science Resources Center to help raise awareness and 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 like critical thinking, creativity and adapting to change that are acquired from a high quality, hands-on science education. 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 program, a series of two-minute vignettes about science; the *C.A.U.S.E. Challenge[™] Film Festival*, an environmental documentary film competition for high school students; 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 public support for reform and recognition of the roles that science and science literacy play in everyday life.

For more information about *Making Science Make Sense* or to subscribe to the *Making Science Make Sense* E-News Update, please visit www.BayerUS.com/MSMS.





Science For A Better Life



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