



Business-Higher  
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# FORUM FOCUS

Fall 2006



## Boosting K-12 Student Achievement

How Corporate America and Higher Ed Can Help

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## Cover Story | Page 5

### Boosting K-12 Student Achievement

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#### Features

BHEF Launches the K-12 Education Initiative . . . . .	9
Congress Acts on the American Competitiveness Initiative . . . . .	10
Investing in the Nation's Schools Battelle, IBM, Pfizer, and Raytheon Work to Improve American Education . . . . .	13

#### Interviews

Kentucky Succeeds in Increasing Math and Science Scores . . . . .	21
Ohio State University and Battelle Partners in the Improvement of Math and Science Education . . . . .	22

#### Columns

Chairman's Letter . . . . .	3
Vice Chairman's Message . . . . .	4



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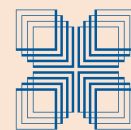
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## About BHEF

The Business-Higher Education Forum is composed of leaders of American corporations, colleges and universities, and foundations. The organization informs members, policy makers, and the public on issues of strategic importance to both business and higher education, and works to influence public policy on these issues. As an example, BHEF has been a leading voice in the public policy debate on the need to improve science, technology, engineering, and mathematics (STEM) education in the United States. The organization currently is embarking on an initiative to improve student achievement in K-12, particularly in the STEM disciplines. BHEF is chaired by Herbert M. Allison, Jr., Chairman, President, and CEO of TIAA-CREF. Its vice chair is David J. Skorton, President of Cornell University.

Founded in 1978, the Forum was hosted by the American Council on Education until it became an independent organization in September 2004.



## Chairman's Letter

As the new chairman of the Business-Higher Education Forum (BHEF), I'm pleased to report on the progress achieved by BHEF in recent months and to outline the ambitious action agenda that members adopted at the Forum's Summer 2006 meeting.

During the 2004-2006 chairmanship of Mark Wrighton, Chancellor of Washington University in St. Louis, BHEF solidified its position as an independent organization and a leading voice in science, technology, engineering, and mathematics (STEM) education. Most recently, it has sponsored an initiative to increase the number of graduates and qualified teachers in STEM disciplines. Mark deserves special thanks for his outstanding leadership, as do those members who have served on our STEM working group and on our executive committee.

At our June 2006 meeting, members heard from leading Washington, DC policy makers about another issue that requires the collective expertise of business and higher education leaders if America is to remain the world's economic leader: student achievement in K-12 education. Without dramatic improvement in student achievement, the United States will lack

the large numbers of highly educated students needed to become tomorrow's corporate and university leaders, scientists, and engineers.

Currently, support of K-12 education by corporations, universities, and foundations takes many forms. These efforts are diffused among many educational causes. Too often, resources are expended without assurance that they will improve student achievement. Frequently, programs are not evaluated and best practices are not shared. Several of BHEF members' companies have led the implementation of programs targeted on improving K-12 education, particularly in science and mathematics. This issue of *Forum Focus* features some of these innovative programs.

The K-12 challenges we face require the coordinated efforts of America's corporate and higher education leaders to address these problems. Focusing these collective efforts is the ultimate goal of BHEF's K-12 Education Initiative. Its objectives are to: 1) make improving K-12 student achievement, particularly in science and mathematics, a top corporate priority; 2) identify and promote effective strategies and programs that improve

student achievement, and disseminate information about them; and 3) change public attitudes about the need to prepare all students for college-level work.

The process envisioned by this K-12 initiative will provide corporate and university leaders with a forum for action. It will enable corporate CEOs, in particular, to align their philanthropic efforts with these successful strategies and programs, consistent with their own particular corporate philosophy.

We intend to acquaint them with this effort and, as the initiative evolves, to solicit the involvement of corporate, higher education, and foundation leaders across America. I encourage you to join us at our January meeting, where we expect to continue this dialogue.

Sincerely,

Herbert M. Allison, Jr.  
Chairman, President, & CEO, TIAA-CREF  
2006-2008 BHEF Chairman



## Vice Chairman's Message

My election as vice chair of the Business-Higher Education Forum (BHEF) comes at a time of increasingly rapid change in higher education, business, and our society in general—a time that calls for collaboration and innovation. During my term, I hope to work with all of you to engage business and higher education in addressing the pressing educational issues of importance to our nation. By working together, we can have a greater impact in a number of critical areas than we could by working separately.

As BHEF highlighted in its recent initiative on science, technology, engineering, and mathematics (STEM) education, America's demographics are changing rapidly in ways that directly affect future trends in college populations and graduation rates. These developments will pose significant challenges to our ability to provide access to higher education in our increasingly diverse society, particularly in the STEM disciplines. I commend BHEF for its leadership in addressing this issue that bears so directly on America's strength and well-being.

Universities, especially America's premier research institutions, can no longer wait until the high school years to engage with American students. We must help guide and enhance education in pre-K-12, working with leaders at local, state, and national levels.

Although American universities remain the envy of the world, American students and workers must compete on a global level now, and we must work with local schools to aid them in dramatically improving student achievement. This is a problem in our big cities. But, it is also a huge challenge across rural America. Delivering high-quality educational tools like computer networks and science labs to schools along Main Street throughout the country is a different sort of problem, but one we must solve.

By focusing corporate executives, higher education leaders, and foundation heads on collaboration to improve student achievement in pre-K-12 education, particularly in math and science, BHEF's initiative is an

opportunity for change that we simply must pursue for the sake of our children. I welcome this mission, and look forward to working with you, my colleagues in BHEF, in creating an agenda of engagement and action. Thank you for this opportunity.

Sincerely,

A handwritten signature in orange ink that reads "David J. Skorton". The signature is fluid and cursive.

David J. Skorton  
President, Cornell University  
2006-2008 BHEF Vice Chairman

# Boosting K-12 Student Achievement

How Corporate America and Higher Ed Can Help

**T**he U.S. public education system is in crisis. In schools across the nation—and in particular, in many urban and rural schools—too many students graduate from high school lacking the skills they need to succeed in higher education and the workplace.

Worse, nearly one-third of all students who begin high school fail to graduate, and face an uncertain future, one in which they stand to become a permanent drag on America's economic productivity and strain its social fabric.

Many of those who do graduate are disinterested in, or discouraged from, pursuing careers in the fields of science, technology, engineering, or mathematics, or STEM. General Electric CEO Jeffrey Immelt lamented recently in *Newsweek* magazine that “more people will graduate in the United States in 2006 with sports-exercise degrees than electrical engineering degrees. So, if we want to be the massage capital of the world, we're well on our way.”

This is occurring at a time when a well-educated workforce, especially in the foundational disciplines of science and math, is more important than ever. In today's globalized or “flattened” world where technology continues to change at breakneck speeds, America requires workers who are highly skilled and adaptable if it is going to maintain its economic standing. Leaders in both the public and private sectors fear that the nation is falling short on that score and see the crisis, with its impact on U.S. competitiveness, escalating.

Policy makers have begun to react. In February, the Bush Administration unveiled the American Competitiveness Initiative (ACI) during President George W. Bush's State of the Union speech, and sent a budg-



As BHEF reported in its Spring 2006 issue of *Forum Focus* (see online version at [www.bhef.com](http://www.bhef.com)), trends suggest that the United States will lack the workforce it needs to compete globally by 2020 unless K-12 student achievement, college attendance, and degree attainment all increase, specifically among underrepresented groups and in the critical science, technology, engineering, and mathematics (STEM) areas.

Today, in launching its K-12 Education Initiative, BHEF plans to push ahead its work by bringing together the various stakeholders to make the improvement of student achievement a top national priority.

At its summer 2005 meeting, BHEF launched a new initiative, "Securing America's Leadership in Science, Technology, Engineering, and Mathematics or STEM." The initiative is developing new strategies to boost student interest and achievement in math and science, increase the pipeline of students pursuing STEM careers, and improve the teaching workforce in mathematics and science disciplines. A key part of BHEF's efforts involve working with policy makers and government officials on legislation to improve STEM education and to increase funding for basic research.

BHEF first began to focus on these challenges several years ago when its members called for U.S. business and university leaders to join forces to improve K-12 education. In 2001, the organization produced a report, *Sharing Responsibility: How Leaders in Business and Higher Edu-*

Trends suggest that the United States will lack the workforce it needs to compete globally by 2020 unless K-12 student achievement, college attendance, and degree attainment all increase, specifically among underrepresented groups and in the critical STEM areas.

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*cation Can Improve America's Schools*, which called for business, higher education, and school systems to form partnerships to boost student achievement.

Since that time, there has been growing recognition by business leaders that U.S. math and science education is no longer meeting the demands of an increasingly complex globalized economy. Alarmed by the impact this could have on U.S. competitiveness and innovation, BHEF released another report in early 2005. The report, *A Commitment to America's Future: Responding to the Crisis in Mathematics and Science Education*, outlined a multi-year systemic action plan for improving math and science education from pre-kindergarten to college, or P-16. ■

et to Congress that would increase funding for basic research and STEM education by nearly \$1 billion. So far, Congress has advanced a number of ACI's component parts, particularly those focused on increased research funding.

At the Business-Higher Education Forum's (BHEF) summer meeting on June 7 and 8 in Washington, DC, Forum members heard about and expressed support for these efforts (see related story, *Congress Acts*

*on the American Competitiveness Initiative*, pp. 10-12). However, they noted that government alone does not hold all the answers. The private sector must also take responsibility, with business and higher education playing key roles, according to new BHEF Chairman Herbert M. Allison, Jr., Chairman, President, and CEO of TIAA-CREF.

During the meeting, Allison announced the launch of a new BHEF initiative designed

to ensure this will happen: "The overarching aim of the BHEF initiative is to get corporate CEOs to support more programs that focus on the improvement of student achievement, while at the same time fostering corporate-university partnerships designed to impact K-12 student achievement." The new initiative is centered on:

- Making the improvement of student achievement a top priority for U.S. corporations and universities;



- Identifying strategic approaches for corporate and university support of K-12 education and identifying programs that are effective in improving student achievement and teacher quality, particularly in the STEM disciplines;
- Changing public attitudes about the need to prepare all students for college-level work, particularly in the STEM disciplines.

*(Allison discusses in greater detail the need for the initiative on p. 9).*

U.S. Secretary of Education Margaret Spellings, who addressed BHEF members, applauded the organization's leadership in improving K-12 education and urged members to get involved in programmatic as well as policy efforts such as the ACL. "I want this to be kind of a call-to-arms," she concluded. "We will not be able to pass

**"I want this to be... a call-to-arms..."**

these reforms and programs...without your help, and I hope we can count on you."

Spellings also urged BHEF members to be "tactical" in their efforts and to focus on those areas that will make the greatest difference, such as increasing the academic rigor of the K-12 curriculum. "I hope you all will go back to your own communities [and raise] some of the tough questions [regarding] rigor in the course of study requisite to succeed in higher education."

To launch its initiative, BHEF is planning:

- **Regional meetings** with CEOs, university presidents, and foundation executives

to raise their awareness of the problem, share solutions, and prompt a coherent, robust philanthropic response to the K-12 crisis. These meetings could culminate in a national summit of business and education leaders to bring a national focus to addressing the K-12 crisis.

- **Research** to identify strategic models for corporate and university support and to locate programs that are effective in improving student achievement and teacher quality in K-12 and, specifically, STEM.

Many leading corporations, including a number led by BHEF members, are among those developing innovative solutions to this daunting challenge, some in tandem with their higher education counterparts (*see feature article on partnerships to improve K-12 education, pp. 13-20*). The initiative will

Margaret Spellings, center, with, from left, Herbert Allison, Sean Rush (Former General Manager, Global Education Industry, IBM), Christine DeVita (President, The Wallace Foundation), and Mark Wrighton

Steven Purcell





Hank McKinnell

Photo Courtesy of Pfizer Inc

“China alone is on pace to graduate as many as 10 times the number of PhDs in the life sciences as America. The partnerships forged through the Business-Higher Education Forum will help America understand its competitive challenges and continue to lead the way in both commerce and higher education.”

build on lessons learned from these organizations.

- **The dissemination of information** about these successful strategies and programs to corporations, universities, foundations, and policy makers. This will provide business, in particular, with a menu of programs that can be adapted for their use in their respective states and localities.
- **A public education campaign** through which CEOs and the regional and national organizations to which they belong would encourage parents to demand high-quality and rigorous education for their children, particularly in the areas of mathematics and science.

Changing attitudes about the importance of rigorous curricula is particularly important, as parents play a critical role in influencing their children’s decisions to pursue math and science education. According to Secretary Spellings, “[There is] a big disconnect between what parents think their kids need and demand, and what the real demands of this new economy are; we also know that...fewer than one in five parents will proactively encourage their son or daughter to pursue a STEM field.”

Pfizer Chairman Hank McKinnell, who chaired BHEF in 1998-2000, knows firsthand that America needs to accelerate efforts to improve math and science education if it is going to maintain its leadership in the world economy: “My recent trips to India and China add to my long-held conviction that America must step up the pace in scientific and technical education. China alone is on pace to graduate as many as 10 times the number of PhDs in the life sciences as America. The partnerships forged through the Business-Higher Education Forum will help America understand its competitive challenges and continue to lead the way in both commerce and higher education.” ■

# BHEF Launches the K-12 Education Initiative

**B**usiness Higher-Education Forum (BHEF) Chairman Herbert M. Allison, Jr. knows what it is like to attend a school with inadequate resources. Between the ages of seven and 10, he attended school for only three hours a day. So many students were moving into the Long Island suburb where he lived that the school ran in three, three-hour shifts—from 8 to 11 a.m., 11 a.m. to 2 p.m., and 2 to 5 p.m. “I had to almost fight to be taught,” he recalls.

As he moved up the corporate ladder at Merrill Lynch & Company and now as Chairman, President, and CEO of TIAA-CREF, a leading financial services organization, Allison has never forgotten that experience. As a result, he has worked with the United Negro College Fund and a number of other organizations that strive to help students. He also served on a state commission in New York that examined inequities in educational opportunity in the state. “I saw just how unequal schools are,” he says.

Now that he is leading BHEF, Allison wants the organization to play a significant role in improving education at a critical time in the nation’s history. “We have to equip young people with the education and skills they need to compete in the world community,” he says.

Allison says that corporations collectively give large sums to K-12 education, but “typically the money goes to small programs that are not vigorously assessed. Many companies do not share proven best practices and success factors with one another.”

Allison wants BHEF to help change that. Its new K-12 initiative will promote business leadership on the issue of improving student achievement; identify and support effective practices; and change public attitudes about the need to prepare all students for college-level work.

To accomplish this, BHEF will engage corporate CEOs, university presidents, and foundation executives to raise their awareness of the student achievement crisis. It will identify strategic models and programs that have been successful in improving student achievement, particularly in math and science, and then disseminate information about them to



Herbert M. Allison, Jr.

Steven Purcell

corporations, universities, foundations, and policy makers. He says that corporations could draw on all this information “to use their dollars most effectively to produce lasting improvement in learning outcomes.”

To change public attitudes about the importance of completing a rigorous curriculum and attending college – particularly among groups that historically have not attended college – BHEF will launch a public education campaign to encourage parents to demand a high-quality education that prepares their children for college and for the workforce.

In undertaking this initiative, BHEF is reaching out to foundations and higher education experts who have studied K-12 efforts around the country. “They can help us identify the most successful programs and the elements of those programs that explain their success,” says Allison.

The BHEF chairman has met with a number of executives in the Northeast and has found “unanimous interest” in the initiative. He says corporate leaders realize that although they continually assess returns on capital when they invest in business ventures, they often don’t assess the outcomes of their philanthropic contributions. “We want to help them do in the philanthropic area what they almost always do in their business activities,” he says.

Allison intends to arrange meetings under the auspices of BHEF in the months ahead among corporate CEOs, higher education leaders, and foundation heads to build support for the initiative and to work out the details. He expects the effort to begin to take tangible form next year.

“We are not trying to cajole companies into directing their giving in ways we suggest,” says Allison. “We want to provide them with information so they can take the lead.” ■

# Congress Acts on the American Competitiveness Initiative

At its summer meeting in Washington, DC on June 7-8, BHEF members heard from Bush Administration and Congressional leaders on critical legislative actions that would implement the American Competitiveness Initiative (ACI) and improve science, technology, engineering, and mathematics (STEM) education. BHEF members, together with other key organizations, have endorsed several of the legislative proposals discussed by the speakers at the meeting, including the proposed ACI.

U.S. Secretary of Education Margaret Spellings, Dr. John H. Marburger, III, Science Adviser to the President and Director of the Office of Science and Technology Policy, Senator Jeff Bingaman (D-NM), and Representative Sherwood Boehlert (R-NY), all spoke at the meeting.

While some differences existed among the speakers in terms of their assessment of the magnitude of the problem, all agreed on the need for a stronger U.S. science and technology base in order to make certain that the nation maintains its leadership in the world economy.

Secretary Spellings stressed the need to strengthen the K-12 “pipeline” in the STEM disciplines, if the United States is to double the number of math and science graduates by 2015 as BHEF and the Tapping America’s Potential (TAP) Coalition have proposed. “We need to begin in elementary and middle schools...by getting a more solid and more effective curriculum for our young children... We need to raise the level of rigor and the level of access to more rigorous coursework in high school,” she said.

She also pointed to the key role that teacher quality plays in preparing the next generation of scientists, engineers, and technicians. “We have to have more strength in our teachers to teach these competencies in our elementary and middle schools...” the secretary said.

Spellings’ “call-to-arms” was echoed by Representative Boehlert. In his 42 years on Capitol Hill, Boehlert—who announced earlier this year that he would not be seeking another term—has heard every State of the Union address dating back to President Lyndon B. Johnson. He said that



Margaret Spellings

Steven Purcell

“We need to begin in elementary and middle schools...by getting a more solid and more effective curriculum for our young children....”

this year’s was “one of the best” because President George W. Bush laid out the ACI. The initiative calls for doubling funding for the National Science Foundation (NSF), the U.S. Department of Energy’s (DOE) Office of Science, and the U.S. Department of Commerce’s National Institute of Standards and Technology (NIST) over the next 10 years, as well as increased funding for STEM education.

A year after he first spoke to the BHEF on math and science education, Boehlert reiterated that “we have a lot of work to do.” But this time around, he was more optimistic, saying that ACI “reflects a new-found commitment to basic research spending and science and math education in the Congress.” And thanks to stronger input from the business community, he said, the competitiveness issue has moved higher on the list of congressional priorities.

For Boehlert, nothing is more important than a commitment to ensuring that the nation remains competitive in the global economy. He called it “a national security issue,” warning that “we can’t take a nanosecond to glance over our shoulder because [other countries] are breathing down our neck. We are still number one and I want to make certain we stay there.”





Sherwood Boehlert

Steven Purcell

“We can’t take a nanosecond to glance over our shoulder because [other countries] are breathing down our neck. We are still number one and I want to make certain we stay there.”

The Congressman said he recognizes that Corporate America is increasingly stepping up to the plate with substantial investments in programs to improve STEM education. “We want to replicate these programs and spread them out in the states,” he said.

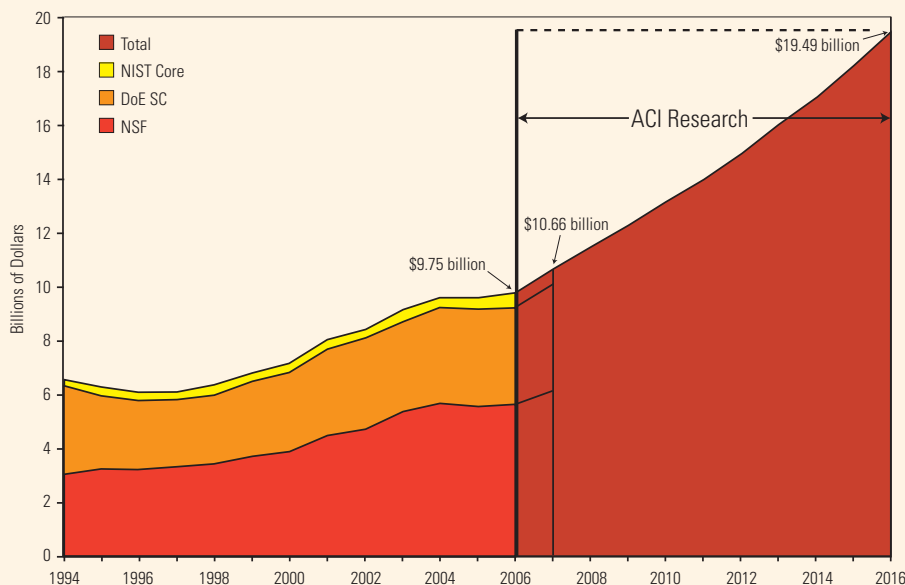
Calling himself “an unabashed cheerleader for the National Science Foundation,” Boehlert commended the U.S. Department of Education for its good work, but made it clear that NSF remained the key agency for STEM education. He said that NSF needed to be assured of the funding required to continue to generate research innovation and creativity.

“The business leaders among you need to convince the White House, NSF itself, and the Congress that education can’t be improved for free,” he said. “You have got to get some cold hard cash invested in it [and] the most important action to focus on in this area is what the appropriators do. That is the principal point where attention needs to be addressed. If authorization isn’t followed with appropriations, nothing gets done....”

Senator Bingaman spoke about legislation called the “Protecting America’s Competitive Edge Act,” referred to as PACE, which BHEF has supported. It stems from recommendations in last year’s National Academies’ report, *Rising above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (see Spring 2006 issue of Forum Focus at [www.bhef.com](http://www.bhef.com)).

Co-sponsored by Senators Bingaman, Pete Domenici (R-NM), Lamar Alexander (R-TN), and Barbara Mikulski (D-MD), PACE

### President Bush’s Proposed ACI Budget FY 2007-2016





Jeff Bingaman

Steven Purcell

is divided into three pieces of legislation. The hope, Bingaman said, is that this will get the bills moved through the system more quickly. The legislation would increase investments in training new teachers in math and science, provide access to summer institutes for teachers, and help prepare

teachers to offer advanced placement courses in math and science. Students would also be offered incentives, including scholarships, to pursue degrees in STEM fields.

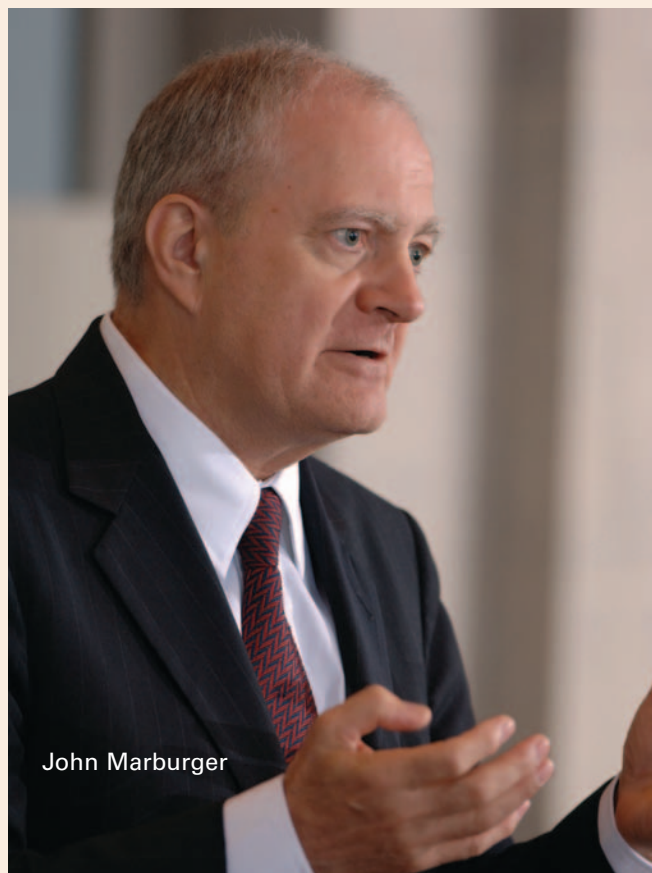
The legislation also calls for increased federal funding for basic research and for upgrading the quality of research laboratories at universities around the country. A major part of the legislation deals with research and development tax credits, which Bingaman noted is the most expensive item in the package of legislation. But with President Bush requesting a four-percent overall cut in education funding, increasing spending for math and science education will not be an easy sell. "We have a long way to go," Bingaman told BHEF. "We are very challenged fiscally and 'budgetary-wise' here in Washington." ■

### Federal Funding for Research

Dr. Marburger told BHEF members that federal funding for research in the physical sciences needs to be increased. He said that the ACI is aimed at doing just that.

Marburger helped put the need for the ACI in historical context. In the late 1990s, after the end of the Cold War, federal funding for the physical sciences started to suffer while funding for the biomedical sciences began to increase significantly. The National Institutes of Health (NIH) budget doubled while budgets for physical science research in the DOE, the NSF, and the Department of Defense stagnated.

However, in 2004 and 2005, several groups issued reports and held summits calling for increased funding for basic scientific research. The National Academies' *Gathering Storm* report, issued in 2005, was perhaps the most influential of these reports, helping to generate broad attention and galvanize support that led to the introduction of the ACI proposed by President Bush. ■



John Marburger

Steven Purcell

# Investing in the Nation's Schools

Battelle, IBM, Pfizer, and Raytheon  
Work to Improve American Education

By Alvin P. Sanoff

In diverse ways, corporate America is striving to improve the nation's public schools, and members of the Business-Higher Education Forum (BHEF) are at the forefront of these efforts. BHEF members are engaged in everything from working in classrooms to helping school districts assess student learning.

Some members, including Raytheon Company and Pfizer Inc, focus on the critical areas of science, technology, engineering, and mathematics (STEM) education, where American students lag behind their peers in a number of nations. Others, such as Battelle and IBM, have a range of projects in their portfolios. "CEOs recognize that we are failing to prepare many young people for good jobs in the global economy," observes Herbert M. Allison, Jr., BHEF Chairman, who is also Chairman, President, and CEO of TIAA-CREF, a leading financial services organization.

## Battelle for Kids

Battelle takes a pragmatic, results-oriented approach toward its K-12 initiatives. "Our strategy focuses on participating in and creating programs that have direct links to outcomes," says Carl F. Kohrt, CEO and President of Battelle. "In designing programs, we have scalability in mind from the outset, so that programs that show promise can be replicated."

The portfolio of the Columbus, Ohio-based Battelle, a global science and technology enterprise that develops and commercializes technology and manages laboratories for customers, includes initiatives to enhance the professional development of



Photo Courtesy of Battelle for Kids

Ohio teacher works with students to prepare for performance assessments and measurement process pioneered by Battelle.





Photo Courtesy of Battelle for Kids

Battelle for Kids ascertains how schools impact learning.

# Battelle for Kids

Bringing clarity to  
school improvement

Photo Courtesy of Battelle for Kids



Jim Mahoney

teachers and to develop tools to evaluate student performance. Perhaps its most wide-ranging initiative is Battelle for Kids (*Read more about Battelle for Kids at: [www.BattelleforKids.org](http://www.BattelleforKids.org)*).

Launched in 2001, Battelle has put \$10 million into the venture, which began in Ohio, but has since expanded into other states and even abroad.

The primary focus of Battelle for Kids is on “value-added progress measures,” which analyze student test results on state exams in several subjects, looking at the progress that each student is making. The data can be aggregated for a class, a grade, a school, or an entire district.

By going beyond test scores and examining student progress over a period of years, Battelle for Kids is able to discover what impact schools actually have on academic performance. Schools and districts can see how their instruction, curriculum, programs, and practices impact student learning.

Jim Mahoney, Executive Director of Battelle for Kids, says passage rates on state

tests provide an incomplete picture of what students are learning.

“Let’s say you find that 85 percent of the students in one grade in a school passed math and only 65 percent in another grade passed reading,” says Mahoney, a former county school superintendent in Ohio. “If you dig down and see where the kids started in the subjects, you might find that their progress in math has declined, but that, given where they started, their reading has increased monumentally. That’s why you need to look at progress as well as achievement.”

Mahoney cites his experience with two schools in the same Ohio district that have comparable demographics. While both schools had solid passage rates on state achievement tests, students at one school made greater progress in science than those at the other.

“We asked the school that had better performance whether it was doing anything specific that might have contributed to the result,” Mahoney recalls. “We learned that the teachers had divided the science curriculum into four parts and each teacher taught one fourth of the curricu-



lum, giving them the chance to become more focused on the section that was their responsibility.”

“The data enable us to find trends and to figure out what they mean,” says Mahoney. “It is not the youngsters schools get, but what they do with those kids that makes a big difference.”

Battelle for Kids’ efforts have been so impressive that starting this fall the Ohio Department of Education will implement its approach throughout the state, assessing student performance in math and reading. Battelle for Kids will train school officials to interpret performance data and will continue to work with districts that want analyses in subjects other than math and reading.

### **COSI Columbus (Center of Science and Industry)**

While Battelle for Kids deals with a range of subject areas, many other Battelle initiatives have a math and science focus. COSI Columbus is a case in point. The project is headquartered at the Central Ohio Museum of Industry and Science in downtown Columbus, from which it gets its name. The COSI project offers professional development to Ohio elementary school teachers so they can be more effective instructors in science and math.

“We were interested in having teachers understand what science is,” says Kim Whaley, who heads the project and is an executive at the museum. “Elementary school teachers tend to be generalists and not that many of them understand science. At some colleges, you can get an elementary education degree with less than a full course in science.”

Whaley says that as a result of limited exposure to science, there are “lots of

teachers who have misconceptions about the subject. They don’t know simple things like does the earth revolve around the sun or the sun around the earth.”

Reaching well beyond the basics, COSI Columbus shows teachers how to use what is called “the inquiry method” of instruction. That approach engages students in finding the answers to questions rather than having them sit in place as information is thrust at them. Whaley says research has shown that getting students involved is the most effective way to teach science.

For example, she says, if the topic is light and shadows, “you can tell kids where shadows come from and teach them how light and shadows work or you can give them a big sheet and a light and let them try all sorts of experiments.”

Similarly, a teacher can stand in front of a class and talk about aerodynamics or students can learn by building paper airplanes and then changing the configurations and weights. In the inquiry method, says Wha-



Kim Whaley

Photo Courtesy of COSI Columbus

ley, “the teacher moves from being the sage on the stage to the guide on the side.”

The project, launched in 2002 with support from Battelle and the federal government, is now funded by contracts with participating school districts and to date about 300 teachers have taken part in the program. Teachers receive up to 100 hours of education, which they can use for professional development credits. As part of the initiative, scientists go into schools to work alongside teachers. Kohrt says research

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Student at Avondale Elementary, Columbus, Ohio, experiments with light and shadows.

Photo Courtesy of COSI Columbus





Photo Courtesy of IBM

Winston-Salem, NC schools are part of IBM's Reinventing Education program.

shows that students taught by COSI-trained teachers outperform their peers.

Whaley views Battelle's support of COSI as "a model for what corporations should be doing. Battelle wants to change things. They're not just paying for students to take field trips."

***(Read more about COSI at: [www.cosi.org](http://www.cosi.org))***

Battelle's overarching goal is to serve as a catalyst for sustainable improvement by partnering with others (*see related article on pp. 22-23 about its partnerships with Ohio State*). "We have a particular interest in advocating for more meaningful and sustainable interactions between the private sector and education to achieve true collaborative partnerships," says Kohrt.

## Reinventing Education

IBM is another BHEF member with a broad spectrum of projects, the most comprehen-

sive of which is Reinventing Education. Launched in 1994, the program remains vital more than a decade later. As part of the program, IBM sends its researchers and consultants into schools to collaborate with teachers and administrators to design, test, and deploy new uses of technology to improve both teaching and learning. More than 20 school districts and state education departments have partnered with IBM in projects lasting up to five years, each tailored to the needs of the particular district.

The Charlotte-Mecklenburg School District in North Carolina was the recipient of the first Reinventing Education grant. At the time, Ann Clark, now a regional superintendent in the district of 126,000 students, was a high school principal. "When the public thinks about grants from IBM, they immediately think of a tractor-trailer arriving filled with computers," says Clark. "But the initiative was less about hardware and computers and more about bringing teachers to the table with software development experts to dis-

cuss what teachers need to be effective in the classroom and outside it in dealing with students and parents, and in communicating among themselves."

Piloted in four schools and subsequently rolled out to the entire district, the software enables teachers to go online and post lesson plans for their colleagues to use. It includes a web site with up-to-date information on educational activities for both parents and teachers that is set up for easy use by those with limited computer experience.

"If a youngster misses school one day, the child's parents have an ID that enables them to go online to see what the lessons for that day were," says Clark. "While the teachers control what parents see, at a minimum, parents can find out about the day's assignments and homework." The system also allows principals to seek parental feedback on such issues as whether to require students to wear uniforms. "One elementary school went to uniforms and used the software to enable parents to talk to each other as well as to the principal about the change," says Clark.

The software has been a boon for teachers. "Imagine that you are a brand new teacher and can go online and see a lesson plan developed by master teachers that you can tailor to the needs of your students," says Clark. "It eliminates hours of time that would be spent re-creating what already exists, yet you can put your own fingerprints on it."

This feature, says Clark, leads to better lesson planning and more consistency in what is taught across schools, which is especially important because North Carolina requires a standard course of study. "It provides a roadmap that keeps teachers from going off course," she says. "By making teachers more effective, it enhances student achievement."

An outside evaluation of the program found that it produced documented gains in achievement, especially among students in



grades 7 through 11 who had been performing at below-average levels.

IBM has maintained a close relationship with both the school system and Clark, even though the grant has ended. "IBM connected me to a network of educators across the country," Clark says. "It is the best professional development that I have received."

*(Read more about Reinventing Education at: <http://www.reinventingeducation.org/RE3Web/>)*

A number of IBM's other initiatives are directly linked to science and math, although each takes a distinctly different path.

### EX.I.T.E.

EX.I.T.E. (Exploring Interests in Technology and Engineering) encourages middle school girls between the ages of 11 and 13 to consider career opportunities in STEM fields. The girls spend a week at a day camp located at an IBM facility where, with help from company volunteers, they undertake an array of science experiments and projects. More than 50 camps are held every year at IBM sites in the United States and abroad.

Since the program began in 1999, 85 percent of the more than 5,000 participants have said they would consider pursuing engineering or technical-related degrees in college. That stands in sharp contrast to a recent survey by the Society of Women Engineers, which found that 75 percent of girls between the ages of 12 and 17 do not plan to pursue careers in math, science, or technology.

Emma Lloyd, an eighth grader in San Jose, CA, participated in EX.I.T.E. last year and this summer served as a volunteer in the same Silicon Valley camp. She says the experience "made my views about science and math really positive. I look forward to doing chemistry in school because I saw a

cool experiment where somebody from IBM put chemicals into a jar and made them change colors as they were spinning."

*(Read more about EX.I.T.E. at: <http://www.ibm.com/ibm/ibmgives/grant/education/camp.shtml>)*

### TryScience

IBM's TryScience web site (<http://www.tryscience.org/>) is another program designed to stir young people's imagination. The site, which attracts more than one million unique users annually, provides

Top: Camp held at IBM facility in Raleigh, NC. Bottom: Students enjoy trying science.

Photos Courtesy of IBM



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## The performance of U.S. students compared to that of peers in other nations gets worse as youngsters move into middle school.

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instant access to information and interactive experiments from more than 600 of the world's science and technology museums. The experiments include building a bridge out of uncooked spaghetti and listening to scrambled songs to see how the brain interprets what people hear.

IBM developed the architecture of the site and hosted it for several years. It is now hosted by the New York Hall of Science whose Director and CEO, Alan Friedman, devised the site in tandem with Stanley Litow, President of the IBM International Foundation, which spends about \$120 million a year on education, much of it on projects at the K-12 level.

Litow, a former deputy chancellor of the New York City Schools, says that when the amount of time employees spend volunteering in schools is factored in along with monetary contributions that employees make, IBM's total contribution to education reaches several hundred million dollars annually. "No other company on the planet even comes close," says Litow.

### Transition to Teaching

IBM's newest education initiative, Transition to Teaching, is designed to help address the nation's shortage of math and science teachers. Data compiled by the National Center for Education Statistics shows that in the 1999-2000 school year 23 percent of middle school students and 10 percent of high school students were taught math by

teachers who neither majored in nor were certified to teach the subject. The comparable figures for science were 17 percent in middle school and seven percent in high school. In low-income schools, the numbers were significantly higher.

Litow says that the performance of U.S. students compared to that of peers in other nations gets worse as youngsters move into middle school "because the teachers are not prepared and the curriculum is too diffuse and not focused enough."

Now, IBM is providing financial support for employees with math and engineering degrees who want to become teachers. They can stay at the company and take the necessary education course work at IBM's expense before making the transition to teaching.

Bill Bennett, a software engineer in Tucson, AZ, who has been with IBM for 29 years, is among about 100 employees enrolled in the program. Bennett says he had been thinking about becoming a high school science teacher once he reached the 30-year mark at IBM and could retire.

"Then, along came the program allowing me to do that."

Bennett is taking courses at the University of Arizona that will enable him to become a certified science teacher. IBM reimburses him for his tuition costs of almost \$7,000. Come next fall, he plans to be in the classroom "conveying to young people things I think are important and challenging."

*(Read more about the program at: [http://www.ibm.com/ibm/ibmgives/news/transition\\_to\\_teaching.shtml](http://www.ibm.com/ibm/ibmgives/news/transition_to_teaching.shtml))*

### From Pfizer's Labs to School Labs

Pfizer Inc provides support of a different kind. As part of its overall education initiative, it has funded construction and renovation of laboratories in schools, enabling teachers to do their jobs more effectively.

Donna Kitchel, who has taught biology, anatomy, and physiology for 15 years at two Connecticut high schools, says during most of those years she received grants from the pharmaceutical company that enabled her to buy equipment she otherwise would have had to wait several years to purchase because of budget constraints. She says that the equipment, which includes a large model of the brain, has helped "me to bring science to a higher level with my students."

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SMART!'s goal is to improve science teaching and learning through a hands-on and inquiry-based design.

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Kitchel is among a number of teachers who have worked alongside Pfizer scientists in summer internship programs. She spent three weeks at the company's Groton, CT research and development facility paired with a scientist doing osteoporosis research. The scientist suggested ideas for lab experiments she could do with her students and provided her with needed materials. He subsequently mentored a group of her students in a semester-long forensics project. In all, about 2,000 Pfizer employees around the country volunteer to assist teachers and students.

In 1990, the company launched Science and Math Are Really Terrific! (SMART!), an educational outreach program within the global Pfizer Education Initiative (PEI). Each year, hundreds of employees volunteer in various SMART! programs, reaching thousands of local middle and high school students. The programs include SAMJAM, a Science And Math Jamboree held at Pfizer facilities, teacher professional development, and job shadowing—a program that enables students to follow a researcher for a day to see what being a scientist is like. SMART!'s goal is to improve science teaching and learning through a hands-on and inquiry-based design. Kitchel says 11 of her students participated in the program in the 2005-2006 school year. She says that Pfizer's range of activities "helps students really open their eyes to science."

*(Read more about Pfizer Inc's educational programs at: <http://www.pfizer.com/pfizer/subsites/philanthropy/caring/science.education.index.jsp>)*

Student participating in Pfizer's SMART! program.



Photo Courtesy of Pfizer Inc

SAMJAM 2006: Annual Science and Math Jamboree where 3,000 middle school students visit Pfizer to conduct hands-on experiments.

Photo Courtesy of Pfizer Inc





## Raytheon's MathMovesU

Raytheon Company is taking a distinctive approach to reaching students. Last fall, the defense and aerospace company launched a web-based initiative called MathMovesU ([www.mathmovesu.com](http://www.mathmovesu.com)) to excite middle school students about math.

The middle school years are critical to sustaining students' interest in math. However, a survey of sixth-, seventh-, and eighth-grade students, commissioned by Raytheon, found that only one out of three liked math a great deal, and it was at the top of the list of classes they'd most like to skip.

Raytheon Chairman and CEO Bill Swanson believes that those attitudes can—and must—be changed if America is to maintain its ability to compete in the global economy. "If we don't act, we will settle for mediocrity," says Swanson.

The MathMovesU web site shows students that math can be "cool" by illustrating how celebrities like professional bicycle moto cross (BMX) biker Dave Mirra, soccer star Mia Hamm, and video game designer Ted Price use math in their careers. Middle school students can win prizes, such as autographed soccer balls and video games, by answering math questions related to their favorite celebrity's career. Students can apply for scholarships and obtain matching grants for their schools by writing essays about how they would make math cool. Teachers and math volunteers can also win grant money for themselves and their schools if they are chosen as "Math Heroes."

The program has also brought celebrities into classrooms as substitute math teach-



Photo Courtesy of Raytheon Company

Raytheon's Bill Swanson (left) joins NFL star linebacker Willie McGinest (center) and students at the Maurice J. Tobin School in Boston.

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**“Being ‘high-fived’ by a sixth grader is a pretty neat thing. I saw how the company and the program can make a difference.”**

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ers. In March 2006, NFL star linebacker Willie McGinest was a surprise substitute at the Maurice J. Tobin School in Boston, MA. McGinest came to Tobin because the school's math teacher, Lynne Jones, had won a MathMovesU essay contest by writing about how it would help her students to have a celebrity substitute. At the time, Jones had no idea who the substitute would be.

McGinest showed the Tobin students, who gathered in the school auditorium, how he makes a quick mental calculation—in effect using the Pythagorean theorem—to figure out the quickest route to reach and tackle a ball carrier.

“The kids went nuts,” says Jones. “It was the highlight of the year. It did a lot for their self-esteem. Now they are very into the web site. If I had just told them about

the site, I don't know that they would have checked it out as much.”

Swanson, who spoke at the Tobin event, calls the experience “an unbelievable day. Being ‘high-fived’ by a sixth grader is a pretty neat thing. I saw how the company and the program can make a difference.”

Swanson is encouraged because companies like Raytheon, IBM, Battelle, and Pfizer are engaged with K-12 education. But he believes there is still a great deal that remains to be done. Says Swanson: “Everyone has to realize how serious our education problem is.” ■

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# Kentucky Succeeds in Increasing Math and Science Scores

For more than a decade, University of Kentucky President Lee T. Todd, Jr. has made the improvement of mathematics and science education in Appalachia's public schools a top priority. First as the head of a non-profit corporation and now in his current position, Todd has been involved in two key initiatives.

The first, the Appalachian Rural Systemic Initiative, began in 1995 through a National Science Foundation grant. It provided specialized math and science training to a select group of teachers from the poorest school districts in Appalachia, including 13 in Kentucky. This initiative was administered by the Kentucky Science and Technology Corp., a not-for-profit organization co-founded by Todd which focused on increasing university research capacity, developing science and technology education (K-12) programs, and encouraging an entrepreneurial economy throughout the state.

After completing the training, which focused on both subject content and effective teaching methods, the teachers then served as mentors to colleagues. Principals and superintendents also became involved in this effort, which aligned each district's math and science curriculum with state standards—all with impressive results.

Over five years, the 13 Kentucky districts saw student science scores on state tests increase an average of 20 percent at the high-school level, 26 percent at middle schools, and 27 percent at elementary schools. The average increase in math scores was similar at the high-school level and even higher in elementary and middle schools. For example, at a rural elementary school in Lincoln County, KY, the students' math scores more than doubled and their science scores increased almost as much.

The grant for the initiative has ended, but NSF is funding a second initiative, the Appalachian Mathematics and Science Partnership, in which the University of Kentucky is a key participant.

The goal of this initiative is to generate student mastery of math and science, as well as to fuel the enthusiasm

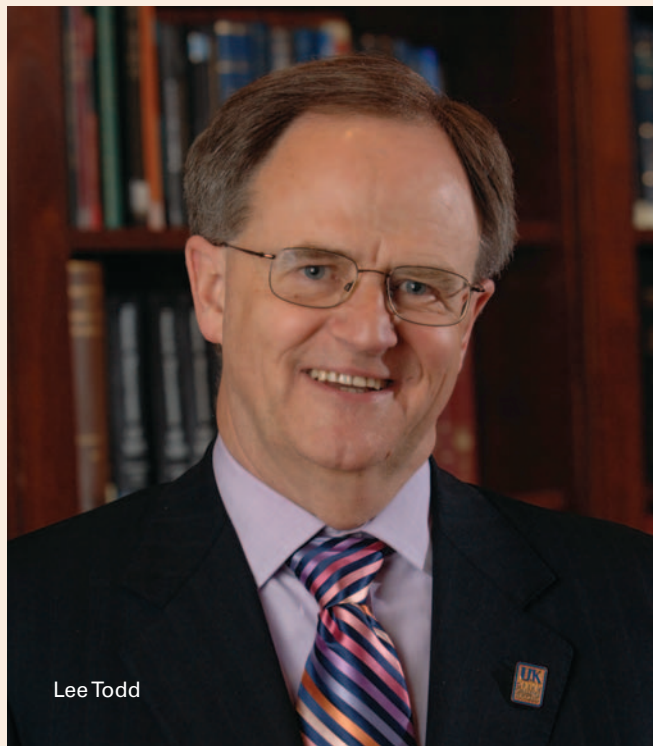
that translates into pursuit of college degrees and entry into careers in math, science, or technology. "We are trying to change attitudes in the region about the need for math and science education," Todd says.

As part of this effort, the university and other participating higher education institutions are developing new courses in math and science for aspiring teachers and offering professional development courses for those already in the classroom.

Wimberly Royster, retired Vice President for Research and Graduate Studies at the University of Kentucky, says "teachers in rural areas don't want to travel 100 miles for professional development so we hold workshops in their vicinity." As a result, several members of the Kentucky faculty spend about half their time in the field working with teachers.

"President Todd is a champion of these efforts," says Royster. "Being an engineer, he would like to see more youngsters become engineers." ■

Steven Purcell



Lee Todd



# Ohio State University and Battelle

Partners in the Improvement of Math and Science Education

The Ohio State University and Battelle, a global science and technology enterprise that develops and commercializes technology and manages laboratories for customers, are more than neighbors in Ohio's capital city of Columbus.

Headed by two Forum members, they are also partners in two initiatives designed to address the fact that too few young people are pursuing studies in the science, technology, engineering, and mathematics, or STEM, disciplines. One initiative, a new math- and science-oriented high school in the Columbus area, focuses on people. The other, a think tank at Ohio State, focuses on science and education policy.

## Metro High

The secondary school, Metro High, opened this fall with an initial enrollment of 100 ninth-graders, approximately 18 months after Karen Holbrook, President, The Ohio State University, first approached Battelle President and CEO Carl F. Kohrt with the idea for the school. The concept quickly gained support from the Columbus business and education communities. "It is amazing how fast it happened," says Holbrook.

Battelle contributed \$500,000 for the school's initial year of operations and the university is covering the three-year lease of the school building, located in Ohio State's research park adjoining its main campus. "We envision this as a small school with a big imprint," says Kohrt.

Ohio State and Battelle are also collaborating in this effort with the Educational Council, an educational consortium of 16 school districts in Franklin County, where Metro High is based.

The school, which will add 100 students a year until it reaches its enrollment target of 400 students from grades 9 to 12, is not just for math and science "whiz kids." It is open to students in the 16 Franklin County districts who have a desire to go to college and an interest in a science-



Steven Purcell

Karen Holbrook, Carl Kohrt



Photo Courtesy of Battelle

Battelle President and CEO Carl Kohrt helps students conduct a science experiment at Southgate Elementary School in Kennewick, WA. Kohrt visited the school during a trip to the Pacific Northwest National Laboratory, which Battelle manages for the U.S. Department of Energy.

and math-oriented approach to learning. However, half the slots are reserved for students from the Columbus schools. “We want real diversity,” says Holbrook.

The school’s program emphasizes the importance of gaining a fluent knowledge of the mathematical process. The curriculum blends academic coursework in the ninth and 10th grades with experiential learning in the last two years of high school, which will send students to community institutions, such as Battelle, where they can pursue and expand their knowledge and capabilities in areas that interest them.

For example, students who are placed at Battelle will work with scientists and, in the process, develop a number of skills including critical thinking. To assure that learning takes place, the school will use a variety of

assessments, including Ohio’s Graduation Test. If the curriculum requires tweaking, “we can do a mid-course correction,” says Kohrt.

Metro’s faculty is drawn from the participating school districts. Teachers will remain on the high school staff for three to five years and then return to their home districts. “They will take the lessons they have learned back to their schools to build new ways of teaching,” says Holbrook. In addition, Ohio State faculty will be a regular presence at Metro, conducting educational research and helping to assess the program.

***(More information on Metro High can be found at: [www.themetroschool.org](http://www.themetroschool.org))***

## **Battelle Center**

The other Ohio State-Battelle partnership is the recently established Battelle Center for Mathematics and Science Policy, which Kohrt describes as “another key feature in our joint efforts to strengthen our nation’s capabilities in the STEM fields.”

Battelle has committed four million dollars to the center, based at Ohio State’s John Glenn School of Public Affairs. The facility will bring people in higher education together with leaders in K-12 education, business, technology, and government to develop policies and practices designed to increase the number of students prepared to be leaders in the STEM disciplines.

***(More information on the Battelle Center can be found at: [www.glenninstitute.org](http://www.glenninstitute.org))*** ■

The Forum Welcomes New Members



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# 2007 Meeting Dates and Venues

Winter: Jan. 11-12, San Diego, CA

Summer: June 11-12, Washington, DC

## The Forum Online

This issue of *Forum Focus* is available online at [www.bhef.com](http://www.bhef.com)

All BHEF publications, including a brochure on the Forum's recent initiative on science, technology, engineering, and mathematics (STEM) education, *Securing America's Leadership in Science, Technology, Engineering, and Mathematics, or STEM*, can be viewed in downloadable Adobe PDF format at <http://www.bhef.com/publications>



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