Fostering Innovation through STEM Support

By Cynthia Challenger, CoatingsTech Contributor

Paint may appear to be a simple product—a polymer in some type of solution that dries to leave behind a film. In reality, however, coating performance depends on complex chemical and physical interactions between the polymer and "solvent" molecules, additive components, and the surface to which the paint has been applied. A deep understanding of chemistry, physics, and engineering is therefore needed to develop innovative coating solutions to the challenges raised in industrial, architectural, marine, and other market sectors. Indeed, the coatings industry must constantly evolve its capabilities to address the diverse and ever-changing needs for beautification, protection, and more and more frequently, functional performance. Access to an employee base with a strong grounding in science, technology, engineering, and math (STEM) is absolutely essential.

In the United States, concerns have been raised about the performance of elementary and secondary school students in STEM subjects, as well as the limited number of college students majoring in these fields and pursuing careers that require such skills. Members of the coatings industry value chain have recognized the potential consequences for the sector if these trends are not reversed. They are actively involved in projects designed to encourage interest in science at all educational levels. Several companies shared with CoatingsTech their thoughts about the importance of STEM outreach and provided information about the specific initiatives they have underway.

Comments are from Tim Berveeld, vice president of Marketing for Dunn-Edwards Corporation; Ryan Dirks, vice president of Research & Development and Janet Smith, director of Crisis Preparedness & Community Relations, both with Arkema Inc.; Anne Shim, director of Technical and Quality at BASF Corporation; Rebecca Lucore, head of CSR and Sustainability in the Americas for Covestro LLC; Sylvia Insogna, North America marketing director for Coatings and Meredith Morris, global STEM leader, both at The Dow Chemical Company; Shenton King, director of Marketing and Commercial Development with King Industries; J. Mark Sutherland, corporate vice president—Global Communications & Public Affairs at The Lubrizol Corporation and president of The Lubrizol Foundation; and Marshall Moore, VP of Technology and Innovation Excellence and Ray Wettner, fellow, both with OMNOVA Solutions.
WHAT IS YOUR COMPANY'S VIEW OF THE STEM ISSUE?

Tim Bosveld, Dunn-Edwards: The STEM issue is very important to us. In fact, Dunn-Edwards has played an instrumental role in the development of the coatings program at Cal Poly San Luis Obispo.

Ryan Dirks, Arkema: We don’t need to look very hard to find statistics indicating that the majority of U.S. high school graduates are not ready for college-level work in math and science, and that fewer students today enter science, math-based degree programs. For example, the National Science Foundation’s National Assessment of Education Progress found in 2009 that only 26% of 12th grade students scored with good science and math fundamental skills for job market, innovation and to design and maintain effective, efficient, and safe manufacturing capabilities. Beyond that, we need people with the STEM skills it takes to run our manufacturing plants safely and efficiently. In addition, we need people with good science and math fundamentals for roles that are not primarily based on STEM skills. For example, we need people with science and math literacy to sell products that are based on science and technology, and to provide customer service to those who use our products. These needs will only increase with the growth that is projected for the coatings industry in the coming years. Anne Shin, BASF: STEM is very important to BASF. As a company, we build on our expertise to convert the interest of science into commercial innovation. One thing we continuously emphasize is that innovation is not the same as invention. Invention requires not only the entrepreneurial idea but also the ability to generate profits. BASF focuses on science education realizing that today’s students will be the thinkers, innovators, and leaders of the future.

Rebecca Lucero, Covestro: Science, technology, engineering, and mathematics are at the heart of everything we do at Covestro. Covestro drives innovation and sustainability in material science through the scientific and technological advancements made by our own workforce. The advances we are making in the construction, automotive, and entertainment industries impact people’s everyday lives at home and play, work and school, and on the road. As consumers, we all need to have a basic understanding of science and technology. As a science-based company, Covestro believes it has a responsibility to develop the STEM workforce pipeline, fostering it from the earliest elementary school levels right through employment and beyond with an exponential, hands-on, real-world approach. All students must have access to Standards-based, quality STEM education, including those in underserved communities. Today, we have a growing population of African Americans, Latinos, and to a lesser extent, American Indians, that is not adequately reflected in the STEM workforce. Working in these communities and partner schools is something Covestro believes in to ensure a diverse STEM talent pipeline that will fuel our and the country’s ever-growing need for world-class STEM professionals. Bottom line—we need the perspectives and ideas of all people, from entry-level manufacturing and technical workers to PhD research scientists.

J. Mark Sutherland, Lubrizol: Lubrizol is a market-driven company that is focused on addressing customers' needs through the company’s technology platforms. Advances in science, technology, engineering, and mathematics have long been central to Lubrizol’s ability to develop innovative products and grow our business. For Lubrizol to maintain its position of leadership and expertise in the market, it is essential to have a sufficient and well-trained STEM workforce. We believe our investment in STEM education helps to grow student interest in science and technology, and thereby helps grow the pool of a similarly oriented potential workforce.

Meredith Morris, The Dow Chemical Company: In support of Dow’s 2025 Sustainability Goal of Engaging Employees for Impact, Dow is positively impacting the lives of one billion people across the globe by 2025 by engaging our people, our customers, and our communities. This goal is driven by our global citizenship commitment of Building the Workforce of Tomorrow, based on the belief that the economic and societal value of an employed, productive, and diverse workforce is fundamental to the health of each individual and community, and to the world. In addition, this trained workforce is essential for producing the talent necessary to solve major world challenges. We are committed to advancing STEM fields—particularly chemistry, engineering, and manufacturing—by getting students excited about STEM subjects, supporting our educators, and creating career advancement pathways in all areas within the education and workforce pipeline. This work is driven by Dow’s STEM Ambassadors, trained Dow employee volunteers who lend their passion and expertise to engaging teachers and supporting students.

Shenton King, King industries: Our efforts in STEM support and outreach have benefited us directly through our internship and recruitment programs. When a student completes his or her final year of our internship program and submits a job application, we all win. When students who complete our program decide to chase a technology career outside of King Industries, we still benefit because our contribution is linked to the cumulative growth of an industry or simply our nation as a technology leader, regardless of the industry.

There is, in my opinion, a sense of duty for industrial and mainstream media to engage the youth of America in communicating the amazing variety of career opportunities and potential impact on the economic health of our nation.

AMERICAN COATINGS ASSOCIATION TAKES ON STEM

A recent survey conducted by the American Coatings Association (ACA) found that coating industry leaders feel confident about their company’s success in doing the immediate need. Longer-term (50 years plus), however, they are concerned about having access to experienced, talented employees that can move up through the ranks to senior management and executive positions. The ACA has begun to investigate possible initiatives that can be pursued to support both short-term needs and address longer-term concerns. Over the coming years, and their longer-term need to attract highly educated graduates to the paint and coatings industry that are energized about science and technology, notes Stephen R. Sides, ACA’s vice president of Global Affairs and chief science officer.

The association’s Science and Technology (S&T) Committee has formed several subcommittees to address questions related to science and technology that are of interest across the industry and academia, including school counselors and students. "Big Data," studies on emerging coatings technology and drivers and STEM outreach. Several conference calls have been held and a consulting company was invited to submit a proposal for a specific action plan to build on existing programs and identify gaps in middle school science teachers and their students. Part of the program will involve individual industry experts engaging directly with middle school science classes and sharing their experiences. "We want to have more than 100 ambassadors from the industry appropriately equipped with resources to share in the industry's story in classrooms across the country," notes Xavier Ferrier, an environmental, health and safety specialist with the ACA. Adds Anne Shin, director of Technical and Quality at BASF Corporation and current Chair of ACA’s S&T Committee, "We are especially proud of this teacher outreach initiative that puts emphasis on coatings and the interplay of color and design and sustainability. Industry members are broadly represented and some of the strongest coatings scientists are pooling their expertise to make this engagement as effective as possible."

"The S&T subcommittee on STEM is made up of experts from emerging coatings companies that successfully reach young people and build their interest in coating science," says Sides. "The subcommittee is made up of technical representatives from the University of Southern Mississippi (USM) as one example. Elementary and middle school teachers are encouraged to contact professors at the university whenever they spot children with aptitude in STEM fields. The professors then seek out the children and help them understand that there will be a place at the university if they continue to do well in school. They also stay in touch and continue to encourage these children. USM has, as a result, been attracting highly motivated, successful students to its materials science and engineering programs. Programs conducted by other industry trade groups, particularly the American Chemical Society, have also been useful guides for the ACA S&T Committee."
Members of the industry are actively involved in projects designed to encourage interest in science at all educational levels.

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Rynt Unruh, AkzoNobel: We don’t need to look very hard to find statistics indicating that the majority of U.S. high school graduates are not ready for college-level work in math and science, and that fewer students today enter science and math-based degree programs. For example, the National Science Foundation’s National Assessment of Educational Progress found in 2009 that only 36% of 12th grade students scored at or above the proficient level in math. And, in 2012, the OECD’s Program for International Student Assessment (PISA) evaluation found that U.S. students scored below average in math and lower than the scores of students from 21 other OECD nations. Specifically, out of 34 countries, the U.S. ranked 27th in mathematics and 20th in science.

These results are a distinct concern for companies like ours, which rely heavily on the availability of a workforce with strong fundamental skills in science, technology, engineering, and math. Competition in our industry is more intense than ever before, and the ability to succeed in this environment rests squarely on our ability to find employees with these skills. We need strong engineers and scientists to drive innovation and to design and maintain effective, efficient, and safe manufacturing capabilities. Beyond that, we need people with STEM skills it takes to run our manufacturing plants safely and efficiently. In addition, we need people with good science and math fundamentals for roles that are not primarily based on STEM skills. For example, we need people with science and math literacy to sell products that are based on science and technology, and to provide customer service to those who use these products. These needs will only increase with the growth that is projected for the coatings industry in the coming years.

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Rebecca Lazore, Covestro: Science, technology, engineering, and mathematics are at the heart of everything we do at Covestro. Covestro drives innovation and sustainability in material science through the scientific and technologically advanced materials that we use to make our world a cleaner, better, safer place. Our business is making in the construction, automotive, and entertainment markets impact people’s everyday lives at home and play, work and school, and on the road. As consumers, we all need to have a basic understanding of science and technology.

As a science-based company, Covestro believes it has a responsibility to develop the STEM workforce pipeline, focusing it from the earliest elementary school levels right through employment and beyond with an exponential, hands-on, real-world approach. All students must have access to Standards-based, quality STEM education, including those in underserved communities. Today, we have a growing population of African Americans, Latinos, and to a lesser extent, American Indians, that is not adequately reflected in the STEM workforce. Working in these communities and partner schools is something Covestro is committed to in order to ensure a diverse STEM talent pipeline that will fuel not only the countries but also the next generation of world-leading STEM professionals. Bottom line—we need the perspective and ideas of all people, from entry-level manufacturing and technical workers to Ph.D. research scientists.

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Stephen King, King Industrialists: Our efforts in STEM support and outreach have benefited us directly through our internship and recruitment programs. When a student completes his or her final year of our internship program and submits a job application, we all win. When students who complete our program decide to chase a technology career outside of King Industries, we believe we have contributed to the cumulative growth of an industry or simply our nation as a technology leader within the industry.

There is, in my opinion, a sense of duty for industrial and mainstream media to expand their reach to the youth of America in communicating the amazing variety of career opportunities and potential impact on the economic health of our nation.

AMERICAN COATINGS ASSOCIATION TAKES ON STEM

A recent survey conducted by the American Coatings Association (ACA) found that industry leaders are confident about their company’s succession plan for the next 10-year (or longer) term, however, they are concerned about having access to experienced, talented employees that can move up through the ranks to senior management positions. “The ACA Board has began to investigate possible initiatives that it can pursue to support both short-term needs of its members for continuing education and their longer-term need to attract highly educated graduates to the paint and coatings industry that are energized about coating science and technology,” notes Stephen R. Sides, ACA’s vice president of Global Affairs and Industry Programs.

The association’s Science and Technology (S&T) Committee has formed several sub-committees to address questions related to science and technology that are of interest across the industry and academia. Including "Big Data" studies on emerging coating technology drivers and STEM outreach, several conference calls have been held and a consulting company was invited to submit a proposal for a specific action plan to build community among the state and middle school science teachers and their students. Part of the program would involve individual industry experts engaging directly with middle school science classes and sharing their experiences. “We want to have more than 20 ambassadors from the industry appropriately equipped with resources to share in the industry’s story in classrooms across the country,” notes Xavier Ferrer, an environmental, health and safety specialist with the ACA. Add’s Anne Shin, director of Technical and Quality at BASF Corporation and current Chair of ACA’s S&T Committee “We are especially proud of this teacher outreach initiative that puts emphasis on coatings and the interplay of coatings technology who will maintain a diverse and skilled workforce,” notes Sharon and the students’ ability to understand the science and technology. Our member companies are broadly represented and some of the strongest coatings scientists are pooling their expertise to make this engagement as effective as possible.”

“The M&T subcommittee on STEM is tasked with informing our members about the importance of engaging young people and build their interest in coating science,” says Sides. He adds, "The approach taken by the University of Southern Mississippi (USM) as an example. Elementary and middle school teachers are encouraged to contact professors at the university whenever they spot young students with aptitude in STEM fields. The professors then seek out the children and help them understand that there will be a place at the university if they continue to do well in school. They also get in touch and continue to encourage those children. USM has, as a result, attracted highly motivated, successful students to its materials science and engineering programs.

Programs conducted by other industry trade groups, particularly the American Chemical Society, have also been helpful guides for the ACA S&T Committee.

Although the committee is working on competing with other industries for talented students, Sides believes there are many exciting research areas that will engage young people. “Color development, the formulation of smart and intelligent coatings, and the opportunity to create coatings that are designed to address some of the world’s most pressing problems and challenges are exciting new opportunities for us,” says Sides. The association is ready to help facilitate significant STEM outreach efforts to get that message out to young people, according to Sides. This board has approved funds for the initiative and members have expressed real interest in moving forward. “The key will be to implement a targeted program that is flexible to produce and maintain and has built in mechanisms for tracking and measuring progress,” Sides observes. A proposal that is extremely promising is the idea that these three critical needs will be brought to the ACA and the S&T Committee for consideration.

Sides also adds that the ACA will be pursuing the development of educational curricula resources and finding and providing educational resources that people that have been in the industry but might need an update on new technology developments or an introduction to technologies required for a new position.
The future of the coatings industry could benefit greatly from having an advocate group who placed STEM at the forefront of every coatings-related discussion, trade show, website, and editorial contribution.

WHAT IS YOUR PERCEPTION OF THE INDUSTRY’S APPROACH TO PROVIDING STEM SUPPORT?

WHAT SORTS OF INDUSTRY-WIDE STEM OUTREACH EFFORTS ARE UNDERWAY?

Sylvia Ingesoma, The Dow Chemical Company: Leading companies and institutions in the coatings industry provide STEM support through a variety of approaches. Typically they aim to educate industry professionals and the next generation about the science behind coatings and current and future STEM outreach efforts. As businesses, they look to their best technical candidates available, they have a vested interest in cultivating the scientific growth of our youth in the United States. Not only is it healthy for the state of their business, but it benefits the state of our nation as a technical leader as well.

The foundation of STEM support and awareness through associations like the American Chemical Society (ACS) has created a wealth of opportunity for organizations and schools to get involved. The ACS website is filled with information regarding their involvement with and support of STEM programs. While the ACS represents an exemplary level of support for STEM awareness, there is no particular focus on the topic within the coatings industry. The future of the coatings industry could benefit a great deal from having an advocate group who placed STEM at the forefront of every coatings-related discussion, trade show website, and editorial contribution. These types of efforts would increase our ability as an industry to reach the small to mid-sized companies who may not be aware of the different levels of support for STEM that are available.

J. Mark Sutherland, Lubrizol: We believe that most major coating industry participants have teacher resources to support STEM education ranging from enrichment and support of one program to work-study (co-op) programs. These programs likely are specific to company-based student programs, host industry/community profile. Several chemical industry professional associations, for example, the American Institute of Chemical Engineers (AIChE), etc. have outreach programs either at the local chapter or national level to raise awareness and encourage investment in STEM education. These programs often complement company-specific activities.

Shenten King, King Industries: Exemplary corporate participation like PPG, Axalta, and BASF have set the bar high in support of STEM programs through their widely celebrated donations and community outreach efforts. As businesses who recruit the best technical candidates available, they have a vested interest in cultivating the scientific growth of our youth in the United States. Not only is it healthy for the state of their business, but it benefits the state of our nation as a technical leader as well.

Lubrizol also participates in some broad-based STEM initiatives with peer companies in our region. For instance, the company has been a long-standing major sponsor of the Northeast Ohio Science and Engineering Fair for 7th to 12th graders convened by the Great Lakes Science Center and Cleveland State University. Coating industry participants Sherwin-Williams and RPM International are also among the sponsors. In 2015, Lubrizol also joined, which Chemical Houston Area Science and Engineering Festival sponsored by San Jacinto College.

Anne Shien, BASF: STEM continues to be of significant importance to most companies building on science and technology. The Industrial Research Institute included this topic at its annual meeting in May 2016. Boeing, Lockheed, CASIS, Boy Scouts, and others presented on various outreach programs for K-12. In general, we try to ensure that the students are taught the critical skills such as math and science to allow them to enter into a STEM career. We also try to educate the students on the industry and connect it with some of the amazing things that we take for granted in our everyday life.

WHAT OUTREACH EFFORTS IS YOUR COMPANY PURSUING?

Two Artek Inc. employees and a teacher work with a kit designed to bring science to life in the classroom during the company's Science Teacher Program at the Cotuit City plant in Kentucky. Picture are Jeremy Bose and Chris Fox. Both environmental engineers at Artek Inc., and Mary Barson, a fourth grade teacher at school in Cotuit, Kentucky.

Janet Smith, Artek: We believe that many companies in the coating industry are dedicating resources to supporting STEM education causes, and that this is appropriate given the critical need in our industry for a workforce with strong science and math literacy. As a company, Artek has a focus on supporting STEM education, and we have seen public statements by other companies in the coatings market showing that we are not alone. There is critical need to better prepare today's young people for jobs that are based on science, technology, engineering, and math. Not only is there an urgent need for these skills in our industry, but there is a need to give young people the skills they will need to take advantage of the strong supply of well-paid jobs that require STEM skills.

A number of engineering societies do sponsor initiatives supporting STEM education, including the Society of Women Engineers (SWE), the International Society of Automation (ISA), AIChE, and the National Society of Professional Engineers (NSPE).

Two Artek Inc. employees and a teacher work with a kit designed to bring science to life in the classroom during the company's Science Teacher Program at the Cotuit City plant in Kentucky. Picture are Jeremy Bose and Chris Fox. Both environmental engineers at Artek Inc., and Mary Barson, a fourth grade teacher at school in Cotuit, Kentucky.

Tim Boswell, Dunn-Edwards: In terms of specific outreach, we are very active with Cal Poly San Luis Obispo, and our last two hires have actually been very bright women that came from Cal Poly's Master's Program.

Most notably, Dunn-Edwards, under the leadership of CEO Kenneth N. Edwards, helped raise $2.5 million to fund construction of the Kenneth N. Edwards Western Coatings Technology Center (WCTC) at California Polytechnic State University. Other contributors included Behr Process Corporation, The Sherwin-Williams Company, Masco Corporation, and California Paint and Coatings. The WCTC is designed to expand industry-sponsored research on campus while providing state-of-the-art facilities for students to learn and conduct real-world coatings and polymer-related research with faculty and industry mentors.

Ken Edwards was, in fact, deeply involved with Cal Poly’s Department of Chemistry and Biochemistry and its coatings and polymers program for more than 25 years. He provided the lead gift to establish the Arthur C. Edwards Endowed Chair for Coatings Technology at Cal Poly, named in honor of his father who was a co-founder of the Dunn-Edwards Corporation. Dunn-Edwards has also offered a summer internship program for Cal Poly students for over 20 years.

Janet Smith, Artek: Supporting STEM education is the primary focus of the Artek Inc. Foundation. One of the ways we pursue this goal is through our Science Teacher Program which is offered at many of our plant sites across the country. Under the program, each participating site hosts local elementary school teachers for two to five days. As part of the program, each teacher is able to select a science kit that can be used to hold science demonstrations in the classroom as a way of engaging students and bringing concepts to life. During the program, teachers interact with Artek scientists, get training in the scientific concepts behind their science kits, and see real-life examples of how science is applied every day in the workplace. In addition, each teacher is awarded $500 for additional supplies, and each of their schools also receives a donation of $500 to support science education.

Artek Inc. has been sponsoring the Science Teachers Program for more than 20 years now, and nearly half of the Artek Foundation budget goes towards supporting the program. In 2016, 71 teachers from 27 schools participated in the 18-week-long Program at 19 Artek Inc. sites. We try to select teachers who live and work in lower income school districts where there is a particularly high need for STEM education support.

In addition to the Science Teachers Program, many of our sites support science education through other means, whether through co-op and internship programs, scholarships for students entering STEM degree programs, hosting students for manufacturing plant tours, or sending scientists and engineers to speak at local schools.
The future of the coatings industry could benefit a great deal from having an advocate group who placed STEM at the forefront of every coatings-related discussion, tradeshow, website, and editorial contribution.

Sylvia Insogna, The Dow Chemical Company: Leading companies and institutions in the coatings industry provide STEM support through a variety of approaches. Typically, they aim to educate industry professionals and the next generation about the science behind paints and coatings and to expose individuals of all ages to STEM-related careers. These efforts often come in the form of providing financial support for STEM programs, participating in community events and initiatives, and engaging employees through a mix of curriculum and hands-on experiences. For students and community members, this exposure helps nurture curiosity and interest in the educational foundation that is required to enter into STEM careers. In doing so, the industry creates a larger candidate pool with strong leaders who join the STEM workforce to help solve global challenges.

Shenten King, King Industries: Exemplary corporations such as PPG, Axalta, and BASF have set the bar high in support of STEM programs through their widely celebrated donations and community outreach efforts. As businesses who recruit the best technical candidates available, they have a vested interest in cultivating the scientific growth of our youth in the United States. Not only is it healthy for the state of their business, but it benefits the state of our nation as a technical leader as well.

Labrizlo also participates in some broad-based STEM initiatives with peer companies in our region. For instance, the company has been a long-standing major sponsor of the Northeast Ohio Science and Engineering Fair for 7th to 12th graders convened by the Great Lakes Science Center and Cleveland State University. Coating industry participants Sherwin-Williams and RPM International are also among the sponsors. In 2015, Labrizlo also is a participant in the Chemical Houston Area Science and Engineering Festival sponsored by San Jacinto College.

Rebecca Lucero, Covestro: As a “new” old company, Covestro has been working to improve STEM education alongside many of our industry peers and trade association leaders for years. Our approach to STEM is not geared toward the coatings industry specifically, but because our business extends to polycarbonates and polystyrene, we view the STEM loss through the lens of a diverse chemical company. Coatings is an important part of our business, though, and as such we are aware of the industry’s STEM outreach initiatives.

We are actively involved in National Association of Corrosion Engineers (NACE) International, which has a robust STEM outreach program. For the past two years, Covestro has sponsored and participated in the NACE Foundation’s mini-camp for high school students. The day-long program is hosted at a local high school and covers science experiments, a keynote presentation, and a tour of the showroom floor. The goal of this initiative is to demonstrate how STEM is behind corrosion and its impact on the environment and the economy. Students also have the opportunity to network with industry professionals and learn more about research and career opportunities.

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Two Arkema inc. employees and a teacher work with a kit designed to bring science to life in the classroom during the company’s Science Teacher Program at the Canton City Plant in Kentucky. Pictured are Jeremy Rose and Christian Bates, both environmental engineers at Arkema Inc., and Mary Barrow, a fourth grade teacher at Oakland Intermediate School in Paducah, Kentucky.

Janet Smith, Arkema: We believe that many companies in the coating industry are dedicating resources to supporting STEM education causes, and that this is appropriate given the critical need in our industry for a workforce with strong science and math literacy. As a company, Arkema has a focus on supporting STEM education, and we have seen public statements by other companies in the coatings market showing that we are not alone. There is a critical need to better prepare today’s young people for jobs that are based on science, technology, engineering, and math. Not only is there an urgent need for these skills in our industry, but there is a need to give young people the skills they will need to take advantage of the strong supply of high paid jobs that require STEM skills.

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There is a critical need to better prepare today's young people for jobs that are based on science, technology, engineering, and math.

**Ann Skim, BASF.** BASF has a number of award-winning science education initiatives with both global and local reach. Globally, our Kids Lab program offers children (ages 6–12) the opportunity to explore chemistry through safe and engaging, hands-on experiments. Since its North American launch in 2010, Kids Lab has introduced STEM concepts to over 90,000 students.

Each year BASF Corporation, in partnership with Kids’ Press Magazine, publishes a science-themed magazine. Children between the ages of 6 and 18 are encouraged to submit science-related articles, poems, drawings, games, and photographs to a fun and informative magazine that is distributed to local schools. We accept global submissions and select articles are printed in English, Spanish, and French. Through Kids’ Press, we provide the student “reporters” with a globally distributed magazine that features their work and inspires other children to explore science concepts and understand the role that science plays in all of our daily lives.

In the United States, BASF also engages middle school students through its national sponsorship of the ‘You Be The Chemist Challenge.’ The Challenge is a national academic competition where students in grades 5 through 8 are quizzed on various chemistry concepts in a format that both educates and entertains. Employee volunteers also support local school programs and mentor student competitors in Alabama, Pennsylvania, Michigan, New Jersey, New York, North Carolina, South Carolina, Iowa, and Virginia.

Additionally, high school students can take advantage of the BASF Science Academy and BASF TECH Academy. The Science Academy aspire to develop the technology-based workforce of the future by exposing students to local business applications and potential careers in chemistry. The TECH Academy supports BASF’s workforce development objectives, offering students in the 11th and 12th grades hands-on activities that reinforce the skills needed in technical disciplines and allow them to interact with industry professionals and gain insight into potential careers in manufacturing.

Aside from the above-mentioned programs, BASF Corporate partners with a host of academic institutions. For the last two years, BASF has hosted a Science Competition in North America. The competition encourages Ph.D. students and young researchers to submit proposals to solve a specific scientific challenge. This year’s winning team was from Northwestern University.

BASF employees are also actively engaged in promoting STEM, serving as judges of students’ scientific efforts and participating in many community science fairs. Regionally, our sites offer grant opportunities to schools to support the growth of STEM programs. Scholarships are also offered to students to encourage their future pursuits in a STEM-related field.

**Sylvia Ingsura, Dow Chemical Company.** Dow engages in a variety of STEM outreach efforts to empower teachers, motivate students, develop careers, and collaborate with communities to transform STEM education into a driver for innovation, manufacturing, and economic prosperity.

The Dow STEM Ambassador network enables Dow employees to engage in STEM outreach efforts. Last year, this network of employee volunteers included over 1,600 Dow ambassadors across 17 sites in six countries. Together, they clocked in nearly 2,000 hours supporting STEM-related activities, with the aim of increasing visibility and exposure for careers in STEM fields through project- and event-based learning opportunities. For example, Dow STEM Ambassadors who work on the coatings industry have access to science demo kits that act as teaching aids. One kit created with children in mind, teaches hydrophilic and hydrophobic properties through watercolor paints.

"Frequencies," a large mural painted on an old factory building in the Hunting Park neighborhood of Philadelphia, shows how STEM outreach efforts can positively impact a community. This mural is the result of a creative collaboration between the Paint Quality Institute (PQI) and Philadelphia's renowned Mural Arts Program, with support from Dow Coating Materials—a business unit of the Dow Chemical Company—and the well-respected Franklin Institute. Painted by young student-artists aged 10–14 with guidance from artist Ben Voila, this mural depicts intercon- nected neurons and synapses that crosscut. The interactive process that enabled this mural's creation offered several opportunities for Dow and PQI to teach community members about basic neuroscience and even the science behind the coatings used to paint the mural.

The Philadelphia Science Festival—a nine-day event that combines lectures, debates, hands-on activities, special exhibitions, and a variety of other informal science education experiences for the Philadelphia community—offers excellent opportunities for Dow to engage with community members of all ages to encourage scientific exploration. During this festival, Dow Coating Materials hosts the Hunting Park Science Day in conjunction with the Mural Arts Program to provide paint demonstrations, share the science behind paint technologies, and lead hands-on coatings experiences.
There is a critical need to better prepare today's young people for jobs that are based on science, technology, engineering, and math.

Sara Dirks, Artemis: We encourage individual employers to get involved in STEM initiatives and often provide supporting materials or funding for these activities. We also provide time away from work to allow employees to participate. Another effort we're involved in is supporting the Franklin Institute and its STEM initiatives, such as the STEM Scholars program. I believe the Institute has a great deal of impact in helping children to better understand science and technology and to think about potential career ambitions related to STEM education.

Ann Skime, BASF: BASF has a number of award-winning science education initiatives with both global and local reach. Globally, our Kids Lab program offers children (ages 9-12) the opportunity to explore chemistry through safe, engaging, hands-on experiments. Since its North American launch in 2010, Kids Lab has introduced STEM concepts to over 90,000 students.

Each year BASF Corporation, in partnership with Kids X-Press Magazine, publishes a science-themed magazine. Children between the ages of 6 and 18 are encouraged to submit science-related articles, poems, drawings, games, and photographs to a fun and informative magazine that is distributed to local schools. We accept global submissions and select articles are printed in English, Spanish, and French. Through Kids X-Press, we provide children with "educational "ers" with a globally distributed magazine that features their work and inspires other children to explore science concepts and understand the role that science plays in all of our daily lives.

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Scientia Lucero, Covestar: Covestar became an independent company on September 5, 2013. Prior to that, at Bayer MaterialScience, we had a long, rich history of strengthening STEM education through the outreach and volunteerism of our many committed employees—something we knew we had to continue seamlessly at Covestar. And we do. On day one, Covestar rolled out our corporate social responsibility program I3 (Ignite,Imagine, Innovate), with corporate support from 1,600 ambassadors across 17 sites in six countries. Together they clocked in nearly 2,000 hours supporting STEM-related activities, with the aim of increasing visibility and exposure for careers in STEM fields through project- and event-based learning opportunities. For example, Dow STEM Ambassadors who work on the coatings industry have access to science demo kits that act as teaching aids. One kit, created with children in mind, teaches hydrophilic and hydrophobic properties through watercolor paints.

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Minority and female candidates continue to grow and account for 70% of the college students, but less than 45% of the STEM degrees.

Dow consistently works with universities to increase diversity and higher education. For example, two Dow Coating Materials scientists and four students from Drexel University, the host of the SPARK innovation competition. This 24-hour think-tank style event hosted by Drexel University, Villanova University, and O’Brien & Gere (ORB) challenges university students to work with professional engineers, scientists, and corporate representatives to come up with solutions to industries. Dow team addressed ways to improve sustainability in the paint manufacturing and distribution processes, and the solutions generated the team with the top prize of $5,000.

Shannon King, King Industries: For over 25 years, King Industries has been involved in outreach and education programs for our youth. We regularly host elementary, middle, and high school students at our headquarters in Norwalk, CT, to tour our laboratory facilities and demonstrate our role as a technology resource and manufacturer within a global economy.

For over 80 years, we have supported internship and co-op programs, which has been extremely rewarding for both the students and King Industries. A typical inter-summer camp from 8-20 students with varying backgrounds. The majority of the students are involved in technical lab service support, R&D lab support, and engineering support for production. Students get a clear understanding of how important a company like King Industries is to the local and national economy. Our company represents a wonderful diversity of jobs related to a global industrial workforce, and our interns leave with a clearer understanding of their potential impact on the world from within a STEM-based career.

We also proudly support our local middle and high school's camp with demonstrations designed to get children to think differently about the world around them. We have partnered with a local children's museum, Stopping Stones, to sponsor a free open house event to promote STEM education. We expect over 500 children (ages 4-12) to attend our displays, demonstrations, and hands-on exhibits, including a coatings demonstration, a science-theory game, and shifts thrums through a fun experience with water and cornstarch.

J. Mark Sutherland, Lubrizol: The corporation's primary vehicle for supporting STEM education in the community is Lubrizol Foundation. Established in 1992, the Foundation's mission of awarding financial support to educational institutions reflects the commitment to education by the company's founders. This commitment continues today with a particular focus on STEM-related education for underserved youth.

Major Foundation grants awarded in 2015 included a $3,000,000 grant to Case Western Reserve University's innovation center, a $550,000 grant to Cleveland State University's Chemical Engineering Laboratory, and a $200,000 grant to Cleveland's Benedictine High School for supporting STEM advancement. In 2016, the Foundation also awarded more than $400,000 in scholarships to universities and community colleges. These grants and scholarships anchor Lubrizol's commitment to developing the next generation of innovators, scientists, and engineers.

In addition to the Foundation's activities, the company further supports STEM education by sponsoring an annual award program for teachers in public, private, or parochial schools located in the corporation's home county. Each year, a Lake County (OH) teacher of the year is recognized for his/her excellence in teaching STEM disciplines and receives a $5,000 award for STEM-related teaching materials, and the honoree's school receives a similar sum for scientific or laboratory equipment. In the 22 years that the program has been offered, Lubrizol has honored more than 60 teachers. Also, Lubrizol employees often volunteer as guest instructors in local elementary and high school districts and science fairs.

Marshall Moore, OMMOV Solutions: We recognize that highly innovative scientists and engineers are often inspired by great teachers in their lives who cultivate their natural curiosity and push them to have the courage to be creative. The earlier this engagement happens in the educational process, the better for all parties. We believe today's students are OMMOV's future customers and employees. That is why supporting STEM is an essential ingredient of OMMOV corporate vision to be a growing, global, world-class provider of specialty chemicals.

OMMOV supports STEM education initiatives in middle school, high school, and higher education through its relationship with OMMOV, which provides scholarships and financial gifts. The OMMOV Foundation's support has been instrumental in the development of the Akron Public Schools' Science, Technology, Engineering, and Mathematics High School in Akron, OH, and the world-leading Akron University College of Polymer Science and Polymer Engineering. OMMOV Foundation has also supported the participation of Bio-Med Science Academy in Rootstown, OH, a high school focused on STEM plus M (Medicine), in Ohio's regional and state Science Olympiad. Last year, the Bio-Med Science Academy celebrated the first regional competition and the state finals of the Ohio Science Olympiad.

JEFF RYAN, UMMOV SOLUTIONS: Beyond financial support, OMMOV associates provide direct input throughout the time and knowledge with organizations committed to the STEM field and with students interested in STEM fields of study. They are committed to STEM education, serving as board members, educators at STEM-focused organizations, and as mentors with local students, providing them with opportunities to learn about the advanced development of new materials and technology that is key to success in a global arena. In recent years, our company has lagged in STEM education compared with other countries, and consequently we have witnessed a decline of students pursuing higher STEM education. A strong multipronged effort from our government and industry reaching out to our youth is required. STEM programs and activiti- es are essential given the cultural and professional shift in recent years, which supports a service-only based economy. STEM education leads to a strong economy, and without a true investment in time and effort to support STEM programs, our manufacturing will continue to decline.

Additionally, from within the coatings industry, there is a great opportunity for the American Coatings Association (ACA) to outwardly show its existing support for STEM programs and initia- tives through the association website and print outlets. The ACA website should be recognized as the primary STEM resource for our industry and the next generation of scientists, engineers, and technicians. While the efforts of coatings and additives manufacturers are clear and admirable, we would all benefit from increased awareness of STEM through a unified and cohesive group such as ACA. One related article on page 36—Ed.

Anne Shin, UMMOV: STEM is very important to the coatings industry. We are fac- ing a high turnover rate, and we look for the best candidates due to age demographics. At the same time, there is a growing need for workers with STEM skills. A recent White House in February 2016 indicated there are already 500,000 jobs in the STEM area going unfilled, and this num- ber will increase to 2.4 million in 2018. Part of this gap can be filled by engaging minority and female candidates. This group continues to grow and account for 70% of the college students, but less than 45% of the STEM degrees.

However, the United States still continues the struggle to attract stu- dents to STEM. The National Math and Science Initiative website shows that in 2008 only 4% of bachelor degrees in the United States were awarded in engineering; in China the number was 31%. The lack of interest in STEM is concerning, and we need to counteract this trend. STEM is a wealth-creator, not just for the individuals, but for the company and for society. Part of the lack of interest is driven by insufficient math skills gained during elementary and high school. There is a stigma around STEM that scares people.

Brian Dinkl, Airforce: According to the U.S. Department of Commerce, in the last decade, growth in STEM jobs was three times as fast as growth in non-STEM jobs. In addition, statistics show that STEM jobs command significantly higher salaries than non-STEM jobs.

Clearly, careers in science, technology, engineering, and math create great opportunities for young people who are preparing today to take part in tomorrow's workforce. By enhancing STEM education, we can help ensure that these opportunities are real and attainable.

Sylvia Imegue, The Dow Chemical Company: We understand that inspiring the industr y's current and future leaders is the key to furthering innovation and success for a company and to meet the growth. Dow Coating Materials provides both career and technical paths across a number of primary and secondary schools. By educating students about current projects and work, we hope to spark curiosity and fascination for all STEM fields.

Rebecca Locure, Covestro: Improving STEM education for all and making STEM fields careers truly inclusive is a huge task. As individual companies and organizations, we have all done our part, and we've done and encouraged continued commitment by all. We still have much more work to do. 

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**Trenton King, King Industries: For over 45 years, King Industries has been involved in outreach and education programs for our youth. We regularly host elementary, middle, and high school students at our headquarters in Norwalk, CT, to tour our laboratory facilities and demonstrate our role as a technology resource and manufacturer within a global economy.

For over 40 years, we have supported internship and co-op programs, which have been extremely rewarding for both the students and King Industries. A typical intern group can range from 15-20 students with varying backgrounds. The majority of the students are involved in technical lab service support, R&D lab support, and engineering support for production. Students get a clear understanding of how important a company like King Industries is to the local and national economy. Our company represents a wonderful diversity of jobs related to a global industrial workforce, and our interns leave with a clearer understanding of their potential impact on the world from within a STEM-based career.

We also proudly support our local nonprofit’s camp with demonstrations designed to get children to think differently about the world around them. We have partnered with a local children’s museum, Stepping Stones, to sponsor a free open house evening to promote STEM education. We expect over 500 children (ages 4-12) to attend our displays, demonstrations, and hands-on exhibits, including a coatings steer demonstrated by our technicians to explain the theory and shear forces through a fun exercise with water and corn starch.

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In addition to The Foundation’s activities, the company further supports STEM education by sponsoring an annual award program for teachers in public, private, or parochial schools located in the corporation’s home county. Each year, a Lake County (OH) teacher is recognized for his/her excellence in teaching STEM disciplines and receives a $5,000 award for STEM-related teaching materials, and the honoree’s school receives a similar sum for scientific or laboratory equipment. In the 22-year history of the award, Lubrizol has honored more than 60 teachers. Also, Lubrizol employees often volunteer as guest speakers, to help others understand the breadth of careers in science or engineering.

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**Key Websites: univision solutions: Beyond financial support, OMNOVA associates provide direct input through sharing time and knowledge with organizations committed to the development of new materials with students interested in STEM fields of study. They are committed to STEM education, serving as board members, educators at STEM-focused organizations, and as mentors with local students, providing them with opportunities to learn of the advanced development of new materials and technology for the key to success in a global arena.

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