



# Norwin STEM Innovation Center for Teaching and Learning

Proposal for an Exemplary Business-Education Collaboration Model



A White Paper Prepared for the Norwin Board of Education

**William H. Kerr, Ed. D.**  
**Superintendent of Schools**  
**January 2013**

# NORWIN SCHOOL DISTRICT

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#### **Introduction**

The United States is facing a well-documented crisis in STEM (Science, Technology, Engineering, and Mathematics) education, training, and workforce development. Through this white paper, the Norwin School District Administration proposes that the School District can do its part to help equip students for the future by creating a Norwin STEM Innovation Center, a new facility that would be built on the Norwin campus without local taxpayer money through a business-education collaboration model. The proposed state-of-the-art learning and conference facility will also serve as a professional development center for K-12 educators at Norwin and other school districts. The business-education collaboration model will provide opportunities for STEM-related business and industry investors, non-profit organizations, private entities, and higher education agencies to offer on-campus instruction, mentorships, internships, cooperative learning experiences, and work study programs for Norwin High School students to gain real-world experiences in the workplace. This white paper begins with a comprehensive review of academic literature regarding the national importance of STEM Education, and explains how the Norwin STEM Innovation Center can serve as a blueprint for the future to help Norwin High School students meet the challenge. Two leading agencies that the School District has explored partnerships with – ASSET STEM Education in Pittsburgh and the United States Air Force – are included in the white paper to demonstrate how they could play a major role at the proposed Norwin STEM Innovation Center. The white paper concludes with a recommendation to the Norwin Board of Education to authorize a feasibility study to determine whether the creation of a Norwin STEM Innovation Center is the proper next step in the School District’s ongoing quest to develop a world-class organization.

#### **National Perspective: The Importance of STEM Education**

The importance of integrating Science, Technology, Engineering, and Mathematics continues to be a high priority in K-12 education and at colleges and universities in both undergraduate and graduate programs.

STEM education is defined as the preparation of students in competencies and skills in these four disciplines: Science, Technology, Engineering, and Mathematics. A successful STEM education

program provides students with science, mathematics, and technology/engineering in sequences that build upon each other and can be used with real-world applications (Eberle, 2010).

STEM education creates critical thinkers, increases literacy, and empowers the next generation of innovators. Innovation leads to new products and processes that sustain our economy. Innovation and literacy depend on a solid knowledge base in the STEM areas, and most jobs of the future will require a basic understanding of math and science. Ten-year employment projections by the United States Department of Labor show that of the 20 fastest-growing occupations projected for 2014, 15 of them require significant mathematics or science preparation (Eberle, 2010).

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*-- United States Department of Labor*

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The current and projected shortfall of workers prepared in STEM fields has been compared with the launching of the Russian Sputnik satellite in 1957 that led to the creation and passage of the National Defense Education Act which was signed into law in 1958. According to the Department of Defense, the United States again finds itself losing ground in STEM expertise in both the workforce and in academia, with countries other than the United States producing more scientists and engineers. Globally, the United States' competitors are increasing their investment in STEM education, training, and workforce development. STEM jobs are predicted to increase 10 percent during the next ten years, while non-STEM jobs are predicted to grow by only 4 percent (Department of Defense Strategic Plan, 2010-2014). One example of a STEM occupation with a bright future is biomedical engineering, which is projected to have an astounding 62 percent increase in employment from 2010 to 2020 (Bureau of Labor Statistics, 2013).

Based on international test score comparisons, students in the United States are being outperformed by students in other countries and are lagging behind in math and science performance throughout much of Asia and Europe (Eberle, 2010).

The Organization for Economic Cooperation and Development reports that the United States ranked 25<sup>th</sup> out of 34 nations on a 2009 international math assessment and ranked 17<sup>th</sup> on the science assessment, which were both administered by the organization. These rankings underscore the urgency for action by every educational institution in our country to place more emphasis on science and math curricula based on rigor, innovation, and creativity.

International test scores indicate that in science, United States eighth-graders were outperformed by eighth-grade students in nine other countries. In math, United States eighth-graders were outperformed by their peers in 14 countries. The 2010 ACT College and Career Readiness report found that only 29 percent of the tested 2010 graduates are considered college-ready in science and 43 percent are considered college-ready in math (Eberle, 2010).

According to the Academy Center for K-12 STEM Outreach and Research, “There is a dire future facing our nation’s corps of scientists, engineers, mathematicians, and technologists. Simply put, if the education and career trends of today continue, there will not be enough Americans in these fields for technology, science, and defense needs of our future.”

At a recent U.S. News STEM Leadership Conference in Dallas, Texas, the crisis within the United States economic and leadership status in the world was discussed. Because of an underprepared workforce and disengaged graduates and dropouts, conference leaders encouraged Americans to act now and address the skills and talent gap for 21<sup>st</sup> century careers. Estimates show the United States will have more than 1.2 million unfilled jobs in science, technology, engineering and math by 2018 (Bertram, 2012).

At a recent Pennsylvania Education Policy Leadership Center session in Harrisburg, it was noted that there are 75,000 unfilled STEM-related jobs in Pennsylvania because the workforce lacks the necessary skills. Contributing to the high unemployment rates nationally is a lack of qualified skilled workers, and there are concerns about a skills and expectations gap (Girton, 2012).

Here are some points about the STEM crisis provided by The National Math and Science Initiative:

- United States students recently finished 25<sup>th</sup> in math and 17<sup>th</sup> in science in the ranking of 31 countries by the Organization for Economic Cooperation and Development.
- Women currently constitute 48 percent of the United States workforce but hold just 24 percent of the United States jobs in STEM.
- Fewer than 15 percent of American engineers are women.
- Sixty percent of the new jobs that will open in the 21<sup>st</sup> century will require skills possessed by only 20 percent of the current workforce. The United States may be short as many as three million high-skills workers by 2018. Two-thirds of those jobs will require at least some post-secondary education. American universities, however, only award about a third of the bachelor’s degrees in science and engineering as Asian universities. Worldwide, the United States ranks 17<sup>th</sup> in the number of science degrees it awards.
- The competitive edge of the United States economy has eroded sharply over the last decade according to a new study by a non-partisan research group. The report found that the United States ranked sixth among 40 countries and regions, based on 16 indicators of innovation and competitiveness. They included venture capital investment, scientific research, spending on research, and educational achievement. The prestigious World Economic Forum ranks the United States as No. 48 in quality of math and science education.

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- Twenty-five years ago, the United States led the world in high school and college graduation rates. Today, the United States has dropped to 20<sup>th</sup> and 16<sup>th</sup> (National Math and Science Initiative Web page, *The STEM Crisis*, 2013).

Vince Bertram, President and CEO of Project Lead the Way, states, “It is critical that we equip today’s students with the knowledge, critical thinking, and problem-solving skills they need to fill these jobs and be prepared for the global economy. Through rigorous curriculum, hands-on classroom activities, and real-world experiences, PLTW engages students in activities, projects, and problem-based learning, providing a foundation and a proven pathway to college and career success.” According to the PLTW website, PLTW was recently cited by Harvard Graduate School of Education as a model for 21<sup>st</sup> century career and technical education (Bertram, 2012).

President Barack Obama’s Council of Advisors on Science and Technology recently emphasized, “To meet our needs for a STEM-capable citizenry, a STEM-proficient workforce, and future STEM experts, the Nation must focus on two complementary goals: we must equip all students to be proficient in STEM subjects. And, we must inspire students to learn STEM, and in the process, motivate many of them to pursue STEM careers.”

President Obama’s “Educate to Innovate” initiative is intended to move all students – including women and minorities – in the United States to high levels of science and math achievement during the next decade by expanding STEM education and career opportunities. In a recent speech to the National Academies of Science, President Obama said, “Reaffirming and strengthening America’s role as the world’s engine of scientific discovery and technological innovation is essential to meeting the challenges of this century. That’s why I am committed to making the improvement of STEM education over the next decade a national priority.”

The 2000 Report of the Congressional Commission on the Advancement of Women and Minorities for STEM Development, *Land of Plenty: Diversity as America’s Competitive Edge in Science, Engineering, and Technology*, addressed the STEM diversity issue as follows: “Growing the American talent pool requires a nationwide call to action and a major shift in how we educate, train, and recruit citizens in the fields of science, engineering, and technology. If we are to compete effectively in the global marketplace, we must advance the full and equitable participation of all Americans in STEM fields. Our economy will not only be positively affected by bringing more women and underrepresented minorities into the STEM workforce, but our high-tech, scientific and engineering industries will benefit from their diverse viewpoints and approaches, as well as their skills” (Bayer Corporation, 2010).

A 2010 survey by the Bayer Corporation concluded, “Significant numbers of women and underrepresented minorities are missing from the United States STEM workforce today because they were not identified, encouraged or nurtured to pursue STEM studies early on” (Bayer Corporation, 2010).

The benefits of a quality STEM program transcend gender, ethnicity, geographic region, and education level. Students prepared in STEM-related disciplines enjoy higher starting salaries and lower unemployment rates than the population at large (Bertram, 2012).

The mastery of STEM skills is fundamental and an integral part of advanced curricula and project-based learning for both students and teachers. Professional development for teachers must be a high

priority in the effort to advance STEM education, noting that “one element influencing student progression is the education and continued professional development of STEM teachers” (Department of Defense Strategic Plan, 2010-2014).

According to the National Science Foundation, *America’s Pressing Challenge – Building a Stronger Foundation* (2006), “Those teachers who are not proficient in STEM and have not maintained the necessary knowledge and skills have been shown to be less effective. As a result, students are less likely to close the achievement gaps in STEM and are less prepared for success in the STEM workforce.” The situation is exacerbated by the limited professional development opportunities for teachers, due to the traditional school calendar and heavy teaching schedules at our schools (National Science Foundation, 2006).

The Bayer Corporation emphasized in its report, *Building a Diverse United States STEM Workforce: Perspectives on Creating Successful Business-Education Partnerships* (2010), that business and industry most certainly have a role to play in the nationwide call to action. “As a company that has long been involved in STEM education efforts, we at Bayer know that business-education partnerships can be effective. Given the current confluence of trends, the time for successful partnerships has never been better” (Bayer Corporation, 2010).

Many communities recognize the value of STEM education for regional economic development and are forging meaningful partnerships between schools and nonprofits as well as business and industry leaders (Bertram, 2012).

Schools have to embrace new ways of delivering education if they are going to prepare students for the 21<sup>st</sup> century workforce during an increasingly difficult fiscal environment. Public-private partnerships are a proven tool that have worked to bring more of a cost-benefit and return on investment mentality to the public sector to drive more effective resource allocation. There are schools showing how this tool can be applied so that policymakers can improve, if not reinvent, the American education system (Kenny and Gilroy, 2012).

Dr. Mae C. Jemison, CEO of Bio Sentient Corporation, recently offered this perspective by stating, “There’s a West African proverb that says: ‘If you wait for tomorrow, tomorrow comes. If you don’t wait for tomorrow, tomorrow comes.’ What we’re doing today is trying to figure out what we want tomorrow to look like and working to make a difference right now for tomorrow’s sake. In building a STEM workforce, we must first understand we have to take advantage of all the talent that we have in this country” (Bayer Corporation, 2010).

The Norwin School District looks forward to “tomorrow” with a vision of hope and promise for the future of STEM education as a top priority for its students and teachers. The School District will continue to work together with business, education, government, foundations, and non-profit organizations by taking STEM education to the next level using a blueprint for the future through a business-education collaboration model.

## **A Blueprint for the Future: Norwin STEM Innovation Center**

To do its part to meet the importance of advancing STEM education locally, the Norwin School District Administration proposes the creation of a Norwin STEM Innovation Center for teaching and learning. The Norwin STEM Innovation Center will be an exemplary business-education collaboration model of businesses, educational institutions, government agencies, foundations, and non-profit organizations working collaboratively to promote the 21<sup>st</sup> century skills of communication, collaboration, critical thinking, and creativity. The proposal includes construction of a modern and energy-efficient facility on the Norwin School District Campus, which will complement the recently renovated and newly constructed K-12 facilities. The facility will support the mission to increase the number of Norwin students who engage and excel in science, technology, engineering, and mathematics.

The Norwin STEM Innovation Center, a state-of-the-art learning and conference facility, will serve as a professional development center for K-12 educators at Norwin and others in nearby schools and will partner with non-profit organizations, private entities, and higher education to meet the goals and objectives for effective teaching and learning of STEM-related subjects.

The business-education collaboration model will provide opportunities for STEM-related business and industry investors to offer on-campus instruction, mentorships, internships, cooperative learning experiences, and work study programs for high school students to gain real-world experiences in the workplace. This proposal will build upon the District's ongoing collaboration and partnerships between business and education.

The career areas to be taught at the Norwin STEM Innovation Center may include, but will not be limited to, manufacturing technology, health care; education; biomedical; bioscience and medical technology; pharmacy, dentistry, renewable and clean energy, environmental sciences, aviation and aerospace; and information technology.

As a specific example of curriculum being researched by the Administration, the Project Lead the Way Biomedical Sciences (BMS) Program is a sequence of courses, all aligned with appropriate national learning standards, which follows a proven hands-on, real-world, problem-solving approach to learning. Students explore the concepts of human medicine and are introduced to topics such as physiology, genetics, microbiology and public health.

As more high-tech businesses and industries expand or locate in the region, there is a greater need for educated, well-trained "gold collar" workers who possess a strong academic background, sophisticated technical skills and personal commitment to excellence. Connecting education to the high-demand occupations is an integral part of developing workforce quality and sustaining the economic vitality of our region and country.

Opportunities for collaborative secondary and post-secondary education and training will be explored with Westmoreland County Community College (WCCC) and its workforce development initiative related to the Marcellus Shale industry and associated high-demand occupations in the oil and natural gas fields. The primary goal is to provide learning opportunities for Norwin High School students on the campus, and our intent is not to be in competition but in collaboration with Central Westmoreland Career and Technology Center and Westmoreland County Community College.

The Norwin School District will continue its good working relationship with the Central Westmoreland Career and Technology Center, which provides 24 industry-based technology programs that meet the needs of a changing workforce and develop skills for lifelong learning and living. Norwin students will continue to have the opportunity to enroll in an industry-based program at CWCTC that will support their individual career choices.

Westmoreland County Community College is part of ShaleNET U.S., a workforce development and continuing education consortium established under the Pennsylvania College of Technology, a Penn State University affiliate, Williamsport, PA, which received a federal grant to develop and implement standardized curriculum-based certificates and associate degrees in the oil and natural gas employment categories (Pennsylvania College of Technology, Penn State University, 2012).

Similar to the 21<sup>st</sup> century workplace and based on investments by business and industry, it is envisioned that the Norwin STEM Innovation Center will be equipped with state-of-the-art technology, math instruments, and science laboratories. It is anticipated that the estimated 22,000 square foot building will be designed with a high-tech environment providing open work spaces for team-building and skill development of collaboration, critical thinking, communication, and creativity.

The Norwin STEM Innovation Center will be financed and constructed by the School District after a process of identifying business-education tenants committed to leasing space on a long-term basis, as well as securing funds through Pennsylvania capital improvement program, grants, foundations, and Norwin Knight Alumni monetary giving and/or bequests. The School District will not make a commitment to finance the project until sufficient funding has been obtained to ensure the burden of constructing the facility will not fall to the local taxpayers.

The District Administration will explore funding options under the Redevelopment Assistance Capital Program (RACP), which is a commonwealth grant program administered by the Pennsylvania Office of the Budget for the acquisition and construction of regional economic, cultural, civic and historical improvement projects.

An option for naming rights of the facility will be considered, similar to monetary gifts and bequests provided by alumni of universities and colleges. Based on a business development plan, the revenue-generating project will require long-term commitments from business-education partners so that the Norwin School District's return on investment and innovation will be guaranteed at a maximum level.

The facility, which is envisioned to be designed aesthetically to complement other Norwin Campus facilities, will not use the Pennsylvania Department of Education's PlanCon funding and reimbursement provisions. It is believed that this approach, without state bureaucratic red tape for approvals and reimbursement expectations, will move the project forward in a more expeditious manner and with lower construction costs – all while guaranteeing minimum risks to the School District's taxpayers.

As preliminary discussions unfold and proposed plans are formulated with an emphasis on identifying interested businesses and industries in STEM-related fields, there are two partners in education in which professional relationships have been established: ASSET STEM Education and the United

States Air Force Junior Reserve Officers' Training Corps (JROTC). Both of these partnerships are a "works in progress" with additional details forthcoming from ASSET STEM Education and the United States Air Force JROTC, and these agencies are explained in the following two sections.

### **Achieving Student Success through Excellence in Teaching (ASSET) STEM Education**

The Norwin School District, a public entity with visionary leadership to forge public-private and non-profit partnerships, has established a partnership with ASSET STEM Education. ASSET STEM has indicated an interest in establishing a satellite site at the Norwin School District Campus.

ASSET (Achieving Student Success through Excellence in Teaching) is a national Pre-K through 12 STEM education improvement nonprofit that was established by Bayer Corporation and several community partners in 1994. It inspires innovation and excellence by providing highly effective educator professional development, hands-on classroom materials and consulting services to schools, universities and organizations. All of its programs are results-oriented, research- and inquiry-based, and aligned with national and state standards.

Changing the way science is taught and learned and with an 18-year track record of success, ASSET STEM works with more than 100 Pennsylvania school districts, impacting 4,000 teachers and 175,000 students. In 2010, the organization received a federal "Investing in Innovation" grant to expand statewide through the establishment of regional Professional Development Centers and an Advanced Professional Development program that targets the needs of teachers and students in rural and high-needs schools.

Recently, ASSET STEM Education joined STEMx, the host of a central repository for the highest quality STEM education tools and curriculum created by member states, as the Pennsylvania representative to the multi-state network managed by Battelle. Battelle is the world's largest research and development organization with a focus on laboratory management; national security; health and life sciences; and energy, environment, and material sciences. STEMx connects the leading state STEM organizations to one another, leveraging their strengths for maximum impact. Members share an imperative action on STEM, enabled by the network's community of practice to learn from and build upon their collective experiences. As a result of ASSET STEM Education joining STEMx, Pennsylvania joins 15 other states and Washington, D.C. to accelerate innovative and transformative work already underway in member states.

ASSET STEM plays a significant role in meeting the needs of the region's emergent economy by sparking the excitement and understanding of Science, Technology, Engineering, and Math at an early age. Norwin School District and ASSET STEM Education agree that by working together, teacher quality and effective teaching and learning will result in increased student achievement and high-performing schools.

An ASSET regional Professional Development Center at Norwin will:

- *Provide rigorous, high-quality professional development on STEM content and pedagogy for in-service, pre-service and out of school time (OST) educators from Norwin and other nearby schools.*
- *Develop leadership among educators through the instructional coaching process to empower teachers and administrators to continually examine, discuss and refine their practices to improve student achievement.*
- *Assist in the development of professional learning communities of educators, students, businesses, community members and parents to create, implement and sustain innovative teaching and learning programs and practices.*
- *Connect businesses with teachers and students for authentic, real-world learning opportunities.*

The partnership between the Norwin School District and ASSET STEM Education has a common purpose to promote the importance of STEM education, to improve teaching and learning, and to expand learning opportunities for Norwin School District educators and others across southwestern Pennsylvania. This collaboration began at Norwin's inaugural STEM Summit which was held at its High School in March 2012, attracting 300 participants from the region. In subsequent months, the collaboration has been highly interactive and successful, building a stronger partnership with common goals.

On February 18, 2013, ASSET STEM and Norwin School District will co-sponsor a second-annual STEM Conference for a day of keynote speakers, workshops, and networking. The title of the conference is ***A Vision for STEM Education: Exploring ~ Connecting ~ Transforming.*** It is anticipated that the STEM Conference will attract more than 500 participants, including those who will share resources for "best practices" and effective STEM teaching strategies, as well as leaders from business, industry, education, non-profit, and government sectors. The conference will be held at the David L. Lawrence Convention Center in Pittsburgh.

This joint venture is a shining example of how public and non-profit entities can work together to improve teaching and learning for increased student achievement and continuous school improvement for high-performing schools.

### **United States Air Force Junior Reserve Officers' Training Corps (JROTC)**

Norwin School District is studying a proposal to offer students in grades 9-12 the opportunity to participate in a new elective: The Air Force Junior Reserve Officers' Training Corps (JROTC) program.

The proposed JROTC program may be based in the Norwin High School; however, space consideration will be studied as part of the application process conducted by the United States Air

Force. By including JROTC in the business-education collaboration model, it strengthens the overall importance of STEM as a high priority in the Norwin curriculum.

Air Force JROTC is a three- or four-year program that can be offered to high school students in grades 9-12 with a minimum of 120 contact hours per year. The curriculum is 40 percent aerospace science, 40 percent leadership education, and 20 percent physical education. The curriculum emphasizes the Air Force heritage and traditions, the development of flight, applied flight sciences, military aerospace policies, and space exploration. All students are granted academic credit toward graduation requirements after successful completion of Air Force JROTC courses.

Enrollment in Air Force JROTC does not require students to commit to any military obligation and is not a recruiting program. All cadets earn college credits each year through the University of Colorado and have the opportunity for annual scholarship awards.

The program, with a major focus on aerospace science, could be offered at Norwin as soon as 2014. The Norwin School District has submitted a formal application to the United States Air Force to complete a feasibility study for implementation of the program at Norwin. The program's emphasis on aviation and aerospace engineering will highly complement the District's focus on STEM education, and the program's emphasis on leadership education and management will support the District's goals regarding good citizenship and character education.

The United States Air Force has a STEM division that serves as an information and resource portal for students, teachers, counselors, and mentors. USAF STEM is a world leader in Air, Space, and Cyberspace technology and is committed to encouraging the Nation's youth toward careers in science, technology, engineering and math.

USAF STEM recently hosted a symposium, "*Preparing Today's Youth for a Bright Future.*" Dr. Wanda Austin, president and CEO of the Aerospace Corporation, said, "We have to enhance the science and technology enterprise through our youth now so that the United States can successfully compete, prosper, and be secure in the global community of the 21<sup>st</sup> century."

As stated on the United States Air Force website, "In the year 2020 and beyond, STEM careers will be key to revitalizing innovation and creativity in an increasingly competitive global environment." The USAF has been at the leading edge of technological advancement and is launching a year-long campaign designated to stimulate interest in STEM careers. USAF Airmen "will be connecting with schools to discuss the importance of STEM and the impact it has on the future of innovation in America."

The Norwin School District continues to renew its curricula and to expand learning opportunities for all students. Providing a JROTC curriculum in aerospace science with an emphasis on aviation and aerospace engineering, in cooperation with the United States Air Force, demonstrates a high-level commitment to STEM education and student leadership development for building strong character and the attributes of good citizenship.

## **Norwin Perspective: Norwin STEM Education**

The Norwin School District recognizes STEM literacy as an integral part of responsible citizenship, and that STEM education is a shared responsibility of schools, business, industry, government, and the general public. The District embraces the notion that STEM initiatives influence academic excellence and high-performing schools with a direct impact on the economic growth and national security of our country.

For the past two years, the District has expanded and advanced learning opportunities for students with hands-on experiences in the fields of science, technology, engineering and mathematics.

K-12 schools, universities, and organizations must be part of the national movement to advance education in math and science in order to compete internationally in 21<sup>st</sup> Century STEM careers. STEM curricula must be continuously renewed and enhanced so that students will have a gateway to college-level courses and be better prepared for success in college, careers, and citizenship.

The District's philosophy is that success in college, careers, and citizenship begins with a core belief that all individuals can excel in STEM subjects and can aspire to STEM careers, beginning in the elementary schools, and continuing through secondary and post-secondary education and training. By engaging elementary students in STEM experiences, it is the District's belief that early learning will inspire and motivate students to continue in these fields.

Promoting STEM is essential in every aspect of learning. Along with an emphasis on STEM application skills, literacy and language skills continue to be part of the K-12 initiative. Grants from the Alcoa and Grable Foundations have provided significant support for the District's initial efforts.

The District has sponsored winter and summer STEM innovation camps such as Camp Invention and Engineering Ideas for Young Knights for elementary students, and Middle School robotic competitions and camps including Data Loggers and AquaBots using Lego MindStorm robots. Also, third-grade students have been introduced to the LEGO WeDo robotics construction sets during the 2012-2013 school year with expansion to other elementary grades planned for next school year. Additionally, the High School participates in the Battle Bots competition and has a curricular focus on robotics and engineering. The popular Norwin School District K-12 Alumni Science Days and K-8 Science Fairs, as well as Partners in Progress career awareness sessions sponsored by the Norwin Chamber of Commerce, have been highly successful.

To further advance STEM education as a top priority, the District created the position of STEM Education Coordinator, established K-12 STEM Lead Teachers, coordinated teachers for professional development through ASSET STEM, placed emphasis on integrating a K-12 STEM curriculum, encouraged more business-education partnerships and senior internships with local businesses, and enhanced the School District's website to have its own STEM Education page as a resource for parents and students.

The advancement of STEM educational opportunities are continuing in January 2013, as Norwin High School is one of six southwestern Pennsylvania high schools to participate in the Penn State Electro Optics Center's Sea, Land and Air Challenge. This program will give regional high school students

experience in the design, integration, and testing of sensors (e.g. cameras, temperature sensors, GPS) into Remote Control vehicles. Interaction with engineering mentors will give exposure to 'real-world' engineering process and help incorporate scientific skills with hands on experience. Students will learn the standard engineering process, work with experienced engineers and scientists, learn the importance of teamwork in engineering projects, and learn that "a good engineering journey leads to a good engineering result" (SPARK Kids + Creativity Network, 2013).

In our corner of the world, the Norwin School District wants to help shape the next generation of scientists and engineers by expanding learning opportunities in STEM-related fields for those individuals who will continue to develop cutting-edge technologies. The District has a strong desire to provide strategic and well-planned opportunities for STEM-related business and industry partners to offer on-campus instruction, mentorships, internships, cooperative learning experiences, and work study programs for high school students to gain real-world experiences in the workplace. The District will continue to provide professional development opportunities for our teachers in STEM-related fields through District and federal funding.

The District, with the intent to be a regional leader in STEM Education, is committed to building upon the success of its STEM curricula and recent initiatives to advance teaching and learning. Effective teaching at the Elementary, Middle, and High School levels continues to be enhanced through the use of hands-on, minds-on, inquiry-based learning with connections to real-world experiences. By thinking "outside the box" and responding to the nationwide call to action for advancing STEM education and to meet the individual needs of our students, the Norwin School District has the opportunity to create an exemplary business-education collaboration model.

The Norwin STEM Innovation Center for teaching and learning has unlimited potential. It is an opportunity to inspire innovation and excellence by fostering internships, training, and careers. And, it is an opportunity to energize individuals and to create a culture of excellence for innovative teaching and learning in science, technology, engineering, and mathematics. The business-education collaboration model with government, education agencies and non-profits, business and industry, and the regional community is, in itself, an innovative and creative approach to better prepare our graduates as responsible and productive citizens for the 21<sup>st</sup> century workforce in a technological, global society.

The Norwin School District is dedicated to building and reinforcing the crucial link between academic achievement and future economic success. The business-education collaboration model will enhance the way STEM subjects are taught, provide for more accessibility for all students, and foster business-education internships through an integrated curricula that is connected by real-world experiences.

The District envisions freshmen and sophomore students engaged in workshops and with tutors working on rigorous projects through a mentorship program with scientists and engineers, while juniors and seniors will participate in demanding internships with STEM experts. STEM subjects will not replace core subject areas, but curricula will enhance integrated, interdisciplinary project-based learning and competency-based assessments. Students will master their own learning pathway by meeting high expectations, which will include multiple forms of support with tutors, mentors, and differentiated instruction.

Consistent with Norwin’s thinking, Gerhard Blicke’s article, *Mentoring Support and Power: A Three-Year Predictive Field Study on Protégé Networking and Career Success*, validates that “For students, service learning and well-designed mentoring programs are effective in developing STEM talent. Mentors – especially parents, teachers, and STEM professionals – can be significant in shaping career success” (Gerhard Blicke and others, 2008).

The District will provide additional information that describes “a day in the life of a Norwin High School student at the Norwin STEM Innovation Center” as research and development continues. Further, the District will focus on developing curricula that provides for enhanced STEM literacy and expanded learning opportunities, and in this process, will move the proposal for a Norwin STEM Innovation Center for teaching and learning by recommending that a Feasibility Study / Educational Plan be completed.

### **Feasibility Study / Educational Plan**

A Feasibility Study / Educational Plan is necessary to establish the viability of a Norwin STEM Innovation Center. Such a study will determine if the business-education opportunity is possible, practical, and sustainable. Further, a feasibility study will provide a realistic view of both the positive and negative aspects of the opportunity, so that the right decisions can be made.

It is recommended by the District Administration that an architect be identified through a Request for Proposal process. This process will help identify an architectural firm that has the necessary resources, professional expertise, and visionary leadership to conduct a feasibility study, providing levels of expertise to guide the coordination of stakeholders, planning, and preliminary design of a facility. A business development plan that identifies funding and sustainability is critical and an integral part of the process.

Based on the proposal for a Norwin STEM Innovation Center, the blending between business-education resources to achieve the goal of expanding learning opportunities for students and teachers is mutually beneficial for both the School District and business partners. By identifying business-education partners who have an interest in collaboration and the sharing of resources, Norwin School District will be a 21<sup>st</sup> century leader in the effort to reinvent and strengthen public education through public-private partnerships.

### **Developing a World-Class Organization**

The quality of community life is directly related to the quality of its educational system. The Norwin School District is a shining example of what is good and right about public education in the Commonwealth of Pennsylvania.

The Board of Education and all stakeholders of the greater Norwin community believe in its primary mission: “Through quality educational experiences, the Norwin School District prepares students to be productive and responsible citizens in an ever-changing global society.”

There is ongoing evidence that key stakeholders of the greater Norwin community greatly value their educational system. Parents, school community representatives, and businesses continue to be an integral part of current business-education alliances and they are very committed to advancing the educational programs and services for our students as 21<sup>st</sup> century learners. The outstanding accomplishments of our graduating seniors and the achievements of our alumni demonstrate that Norwin provides a strong foundation for life-long learning and successful careers.

In the collaborative effort to move the District forward from great to extraordinary, educators – in partnership with the greater community – want to serve all students. Now, more than ever, Norwin has an opportunity to respond to the nationwide call for action to improve STEM education and expand learning opportunities for all students and teachers.

By expanding learning opportunities and improving education attainment levels, our graduates will have the best chance for gainful employment and successful careers in the new economy. All children must have access to an education that will prepare them to succeed with 21<sup>st</sup> century skills and abilities. Making the right investments, using resources wisely, and having high expectations and accountability underscore our efforts to create a culture of continuous learning in our schools.

The proposed Norwin STEM Innovation Center for teaching and learning is an exemplary business-education collaboration model of business, education, government, foundations, and non-profit organizations working together to promote 21<sup>st</sup> century learning and to develop a world class organization. The business-education collaboration model provides numerous opportunities for STEM-related businesses and industries to offer on-campus instruction, mentorships, internships, cooperative learning experiences, and work study programs for high school students to gain real-world experiences in the workplace.

This business-education collaboration model offers an opportunity to reinvent and strengthen the public education system and to answer the nationwide call for action by accelerating STEM initiatives to improve teaching and learning for all students and teachers.

In conclusion, I am asking all stakeholders of the Norwin School District the same question that President Ronald Reagan asked at his second inaugural address when the nation was facing great challenges: “If not us, who? And if not now, when?” (Ronald W. Reagan, Second Presidential Inaugural Address, 1985).

## **Recommendations**

The Norwin Administration recommends that the Norwin Board of Education authorize the Administration to:

- Identify STEM-related businesses and industries who may be interested in participating in an Exemplary Business-Education Collaboration Model to expand and advance STEM education opportunities for mentorships, internships, cooperative learning experiences, and work study programs for high school students to gain real-world experiences in the workplace;

- Initiate a Request for Proposal process that would identify a professional firm that can conduct a Feasibility Study / Educational Plan regarding the creation of the proposed Norwin STEM Innovation Center;
- Explore other opportunities which will respond to the nationwide call for action to improve STEM education and expand learning opportunities for all students and teachers as 21<sup>st</sup> century learners through creative and innovative strategies to develop Norwin School District as a world-class organization.

### **About the Author**

William H. Kerr, Ed.D., is the Superintendent of Schools for the Norwin School District located in North Huntingdon, Pennsylvania. His professional experience includes 36 years as a classroom teacher, principal, and district administrator, and also 10 years as an elected public official, including four years' service on the Armstrong County Board of Commissioners, and 12 years as an appointed member of the Armstrong County Industrial Development Authority.

Dr. Kerr is a 1994 graduate of the University of Pittsburgh, School of Education. His doctoral dissertation was titled, A Triangular Model of Relationships: State Governance, Economic Development, and Education Policies. His dissertation explored career expectation shifts, school responses to those shifts, tax policy effects on a quality workforce, and long-term investments toward the development of the region's workforce.

Dr. Kerr served as a Visiting Fellow with the Department of Administrative Policy and Studies, School of Education, University of Pittsburgh, in the fall of 2007 to study the relationships between education and workforce quality. His fellowship focused on business-education partnerships, college and career pathways to jobs of the future, STEM Education, and the integration of academics, career education, and technology.

Dr. Kerr is participating in the Pennsylvania Education Policy Fellowship Program during the 2012-2013 school year. The Program brings together a diverse group of professionals who are interested in learning more about key policy issues while also enhancing their own leadership skills. The Education Policy Fellowship Program (EPFP) is a professional development program for individuals whose work record reflects strong leadership abilities and a concern for issues important to children and education.

Dr. Kerr is a charter member of The Forum for Western Pennsylvania School Superintendents, an organization that works in partnership with the University of Pittsburgh, and he continues to serve on the Forum's Executive Committee. The Forum provides a network of school leaders who share a commitment to children and youth; an insight into the equity of opportunity for all of our students; and a perspective on preparing citizens to compete in a global marketplace.

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