



# ASQ Education Brief

Education  
DIVISION



## Building Blocks for STEM Success

How Wisconsin schools are systematically meeting students' educational and career development needs

By Bryan Albrecht and Alan Gomez

Science, technology, engineering and math (STEM) is the interdisciplinary applied application of knowledge. STEM education is a philosophy designed around cooperative efforts to provide students with comprehensive, meaningful and authentic learning experiences. In the *Technology Teacher* article "STEM, STEM Education, STEMmania," Mark Sanders, a professor and program leader of technology education at Virginia Tech in Blacksburg said, "Integrated STEM education includes approaches that explore teaching and learning between/among any two or more of the STEM subject areas, and between a STEM subject and one or more other school subjects."<sup>1</sup> This relatively new approach to education requires a systematic approach to ensure quality and accountability in meeting students' educational and career goals.

When promoting STEM careers, the appeal should focus on the inspirational and optimistic perspective of the students' career plan. In the short documentary *Kick Out the Ladder*, Jim Keller, senior manager and chief engineer for Honda, states, "If people feel like they have the ability to influence the final result and see the result of their work they are much more committed to it."<sup>2</sup> Educators must strive to illustrate to students that they will make a difference in our world, and that education provides a path for opportunity.

In Wisconsin, the framework for STEM career pathways emerged through a grassroots effort to quantify the actions and results of diverse models for STEM being developed at the local level. Secondary and post-secondary institutions, industry and government organizations worked together to identify the following five success markers for STEM education:

1. Eliminate barriers that prevent learners from exploring STEM careers.
2. Increase emphasis on acquiring STEM knowledge and skills for all learners.
3. Increase public and private partnerships with a focus on STEM skills.
4. Establish a statewide awareness campaign for STEM careers.
5. Invest in pre and post-professional development for educators to fully understand and integrate STEM throughout the curriculum.

### **STEM Academy curriculum**

Wisconsin has set the stage through its report, "[Navigators to the Future](#)" which embeds STEM content into the state's education outcomes.<sup>3</sup> The Howard-Suamico School District, a suburban district near Green Bay, WI, implemented the STEM Academy ([www.stem101.org](http://www.stem101.org)) for Bay Port High School and Bay View Middle School. "We performed side-by-side comparisons of the

STEM Academy with other popular national programs. The STEM Academy was the clear choice,” said Scott Gutschow, technology and engineering instructor at Bay Port High School.<sup>4</sup>

Slinger High School, a rural school in Wisconsin, implemented the STEM Academy curriculum along with traditional offerings. “These are the only courses our school has that bring together multiple departments. The flexibility and variety allows many teachers to pull from the curriculum,” said instructor Russ Hermann.<sup>5</sup>

Success in today’s changing economy depends on having skills that adapt to career requirements, expected competencies and knowledge. Nick Pinchuck, CEO of Snap-on, spoke at the opening of the Advanced Propulsion Center at Gateway Technical College (GTC) in Kenosha, WI. A strong supporter of STEM, Pinchuck said, “Having a technically skilled workforce is the new requirement that separates companies in a global economy.”<sup>6</sup> STEM education provides a foundation for students to build upon throughout their postsecondary career.

At GTC, students are introduced to higher-level thinking skills while in middle and high school by collaborating with faculty. GTC has established program called College Connection that places college staff in each high school throughout the district. Working with teachers, counselors, parents and students builds relationships and greater awareness of the knowledge and skills necessary for college and career success. From developing elementary school learning gardens and middle school robotics competitions, to high school skills competitions and credit transfer courses, GTC reaches into the school community to build STEM career awareness. Lakeview Technology Academy in Kenosha, WI, is a specialty high school that provides a comprehensive STEM experience for all students. Beginning in the junior year of high school,

students are enrolled in college courses in advanced manufacturing, engineering, information technology and biotechnology. The Lakeview Technology Academy students earned 1,070 college credits in 2013—an average of 16 college credits per student. Graduating from high school with college experience and credits eases the post-secondary transition process, as well as establishes a cost effective way for all students to access postsecondary education.

GTC embraces STEM as a strategy to improve student retention and academic success by providing real world student led project-based learning experiences. During the summer months when most students are away from school, GTC in partnership with Snap-on offers college camps in STEM related fields of robotics, alternative energy and design engineering.

### **GTC invests in STEM**

In 2011, GTC began funding STEM training for high school teachers. To date, GTC has invested more than \$200,000 in STEM training for teachers, counselors and school administrators. Training is provided by the STEM Academy and engages participants in curricular design and builds connections between area school districts to gain STEM awareness throughout GTC's service district.

GTC's STEM career pathways from secondary through postsecondary has increased enrollment in associate's degree engineering programs by 26%. Since 2008, university transfer upon completion of the associate's degree has increased by 10%.

GTC reinforces the focus on STEM education through business and education partnerships. Working with companies like Trane, Snap-on and SC Johnson, GTC has developed

additional learning experiences that connect students with employers. “At Trane we have established STEM education programs on energy awareness and conservation for elementary, middle and high schools connecting Trane professionals with teachers and students,” said Greg Josefchuk, director of strategic partnerships at GTC?<sup>6</sup>

In his thesis, “An Investigation Into the Relative Contribution of Engineering Courses ... ” Alan Gomez said, “When content is taught in a contextual or applied manner, knowledge can be retained by students and become more meaningful to them, thus intrinsic and quickly stored in their brain in an organized, connected manner so they may readily retrieve the information at a later date.”<sup>7</sup> STEM education provides an experience where coursework is integrated or linked together and used to solve problems and provides the building blocks for students to more effectively develop the knowledge and skills in STEM-driven careers.

## References and notes

1. Mark Sanders, “STEM, STEM Education, STEMmania.” *The Technology Teacher*, pp. 20-26, December/January 2009, [http://esdstem.pbworks.com/f/TTT%2BSTEM%2BArticle\\_1.pdf](http://esdstem.pbworks.com/f/TTT%2BSTEM%2BArticle_1.pdf).
2. Honda, *Kick Out the Ladder*, video, 2009, [www.youtube.com/watch?v=r2B8Z8RiKsl](http://www.youtube.com/watch?v=r2B8Z8RiKsl).
3. Bryan Albrecht et al., “Wisconsin STEM: Navigators to the Future,” policy brief, 2012, <https://static.squarespace.com/static/51c482b0e4b0998b1b533b22/t/5272b3ede4b0acc66cb2cd2b/1383248877598/WISTEMREPORT2012Full.pdf>.
4. Interview.
5. Interview.

6. Nick Pinchuck, speech delivered at Gateway Technical College during the opening of its Advanced Propulsion Center, 2009.
7. Alan G. Gomez, “An Investigation Into The Relative Contribution Of Engineering Courses In The Development of Problem Solving and an Investigation Into the Relative Contribution of Engineering Courses in the Development of Problem Solving and Thought Processes,” master’s thesis, University of Wisconsin-Stout, 2004, <http://minds.wisconsin.edu/handle/1793/41253>.

### **About the authors**

Bryan D. Albrecht, Ph.D, is the president of Gateway Technical College (GTC) in Kenosha, WI, ensuring that all aspects of GTC’s comprehensive programs and services meet the needs of more than 24,000 students through its 60 programs and 900 faculty, staff and support professionals. GTC includes three full-service campuses and six technology centers. Collaboration with business and industry serves as a cornerstone for GTC’s success.

Albrecht provides leadership on more than 60 local, state and national boards. He has been invited to testify on workforce and education issues to the U.S. Congress, U.S. Departments of Education and Labor, the National Science Foundation and the U.S. Economic Development Agency. He has been recognized as a distinguished educator by the International Technology and Engineering Association and received the international leader award by the National Chair Academy.

His interest in STEM is grounded in his experience as a technology education teacher and state consultant for the Wisconsin Department of Public Instruction. Bryan holds bachelor’s, master’s and master’s of education science degrees from the University of Wisconsin-Stout. He holds a doctorate in education from the University of Minnesota in the Twin Cities.

Alan Gregory Gomez, Ph.D, is currently the chief academic officer for the STEM Academy, a national nonprofit, and is an instructor at the University of Wisconsin-Madison’s College of Engineering. Gomez is responsible for the development and continuous improvement of the

STEM Academy's internationally recognized K-16 curriculum and professional development program. Gomez has published in professional journals, in conference proceedings for the American Society for Engineering Education (ASEE) and has presented in more than 40 states at major education conventions and conferences. Gomez has served as a reviewer of ASEE conference proceedings and for the National Science Foundation.

Gomez participated in the National Academy of Engineering committee that published the study report "Understanding and Improving K-12 Engineering Education in the United States." Gomez is a former NASA astronaut selection candidate and is the lead author of *Engineering Your Future: A Project-Based Introduction to Engineering* (Great Lakes Press, 2004).

He received a bachelor's degree in technology education and master's degree in industrial/technology education from the University of Wisconsin-Stout. He holds a doctorate in industrial and systems engineering from the University of Wisconsin-Madison. Gomez has taught in schools in Fort Worth, TX, Minneapolis and Madison, WI.