



Making STEM Careers Come Alive

Connecting the
STEM Industry to
the K-12 Classroom

CONTENTS

- 2 Introduction
- 3 The need for industry-school alignment
- 4 Connecting students and professionals in meaningful ways
- 5 Measuring the results
- 6 Giving students the tools they need to succeed
- 8 The importance of reaching girls and underserved students

INTRODUCTION

It's no secret that the connections between the classroom and the workplace in the U.S. are fragile at best. That is, if those connections even exist at all. And while the annual "career day" has withstood the test of time at many high schools, such events rarely entreat students interested in STEM (science, technology, engineering, math) with even a glimpse of what it's like to actually be a geothermal physicist, 3D-modeling expert, or biomedical engineer.

According to the **U.S. Department of Labor**, the U.S. will have more than 1.2 million job openings in STEM-related fields by 2018. The nation will also have a shortage of qualified college graduates to fill those positions. The U.S. Department of Education (DOE) has found that just 16 percent of American high school seniors are proficient in mathematics and interested in a STEM career and reports that U.S. students ranked 25th in mathematics and 17th in science among industrialized nations on international exams.



Furthermore, the number of U.S. students graduating with degrees in STEM fields is declining, according to a Microsoft Corp. study on STEM education and careers. The Seattle-based technology company reports that fewer than 15 percent of current U.S. college undergraduates are pursuing degrees in science or engineering — compared to more than 30 percent in India and more than 40 percent in China. And **according to the DOE**, even among those who do go on to pursue a college major in the STEM fields, only about half choose to work in a related career.

One of the biggest roadblocks standing between school-age students and prospective STEM careers is a lack of effective industry engagement in the classroom. To address this barrier, President Obama **recently announced** a long-term goal of mobilizing 1 million STEM mentors annually by 2020, thus creating "millions of moments of discovery — or, those life-changing events when children launch rockets, build robots, write a computer program, or look into the farthest reaches of the universe."

In this white paper we'll explore the issues associated with advancement of STEM education in the U.S., illustrate the impact that positive industry-school alignment can have on the problem, and examine the long-term value of connecting industry to every classroom.

THE NEED FOR INDUSTRY-SCHOOL ALIGNMENT

Shining a light on STEM-related challenges facing today's educators, students, and employers has helped identify the need for successful industry-school alignment among leading institutions and employers. In **Pathways to Prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century**, the Harvard Graduate School of Education reports that U.S. employers complain that today's young adults are not equipped with the skills they need to succeed in the 21st-century workforce. Through its research, Harvard found that far too many young people are unprepared for success, and that more than 50 percent of high school graduates were deficient in oral and written communication skills, critical thinking, and professionalism. "The Partnership for 21st-Century Skills, whose members include such companies as Microsoft, Apple, Cisco, and Pearson," Harvard notes, "has been equally critical of what it sees as obsolete and outmoded approaches to education, and is calling for more focus on the development of such 21st-century skills as critical thinking, problem solving, creativity, and communication."

In its study, **STEM: A Foundation for the Future**, Microsoft has uncovered significant gaps between the knowledge and experiences being imparted in U.S. schools and the actual skills and expertise required to succeed in STEM-related careers. "Social trends and global competition have created challenges as well as opportunities for U.S. businesses and the U.S. workforce," Microsoft asserts. "The good news is that this country is still a leader in scientific and technological innovation, and jobs in STEM fields will continue to be available for those who are qualified. But to maintain the country's position as an innovation leader, we must address the shortcomings in our STEM education."

Clearly one way to address these shortcomings is to close the gap between industry and education — to provide students with access to real science, math, and technology professionals who can provide guidance and inspiration to encourage more students to pursue these important and noble professions. As one engineering student expressed in a **recent Microsoft survey**, one of the best motivations is "... seeing how science, technology, engineering, and mathematics are actually applicable to real life." Yet, even if educators embrace the idea of connecting students with science and technology experts, it continues to be a challenge to bring such programs to life in their schools, for a variety of reasons:

- Professionals often can't take time off to visit schools in person.
- Even when professionals do attend events like career days, the opportunities for students to interact with them one-on-one in a meaningful way are limited.
- Most rural schools are at a disadvantage, because they are inaccessible to companies.
- Industry as a whole lacks knowledge of school curriculum and classroom needs.
- Teachers and students have limited ways of reaching and interacting with industry professionals.
- Most often it is not clear to both sides how to match the skills and knowledge of the professional to the classroom and curriculum objectives.

Companies like Nepris are using technology to build an online community of professionals and educators to bridge these limitations, allowing teachers to easily find and connect with the right industry expert to bring the real world into the classroom. By making industry engagement part of the everyday classroom, and by involving educators, industry leaders, professionals, and community partners in the cause, Nepris effectively reduces the barriers between industry and education.

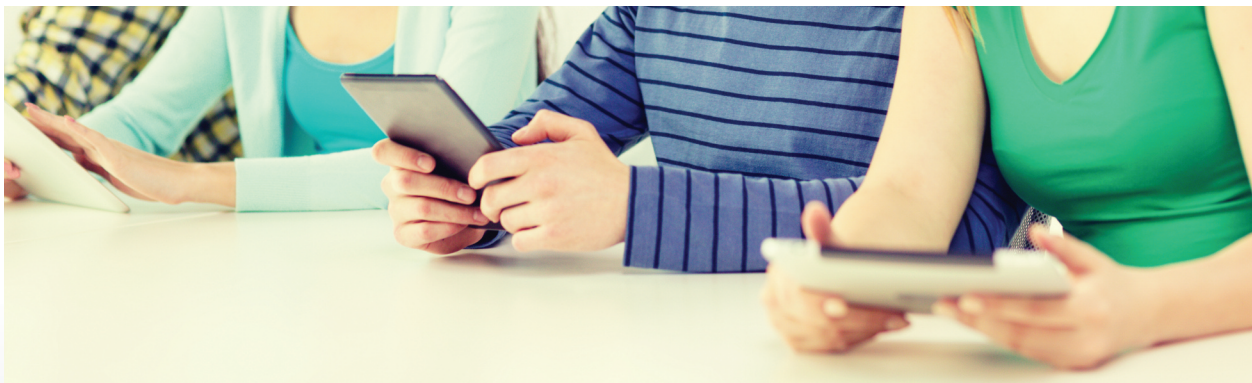
CONNECTING STUDENTS AND PROFESSIONALS IN MEANINGFUL WAYS

As a cloud-based solution that matches K-12 teacher requests to the right professionals, Nepris connects students to the real world by virtually bringing industry professionals for a live chat into the classroom. The platform has proven itself as a seamless connection among curriculum, industry expertise, and classroom needs.

From a physician who talks about how digestive systems work to the 3D-modeling expert who discusses how roller coasters are built from the ground up, Nepris connects classrooms in every corner of the country to professionals around the world. In doing so, the company's platform creates rare opportunities for students to link their learning to application in the workplace.

In addition, Nepris gives companies a reliable platform that they can use to inspire the next generation of workers by offering skills-based volunteering opportunities for their employees. The Nepris platform gives companies an actionable and cost-effective way to contribute meaningfully to the community in ways that can help engender knowledge and interest in STEM-related careers among students who might otherwise not be thinking about them.

One high school computer science teacher who recently used the program had five adjectives to describe his students' experience with a Nepris-based STEM professional: "Interesting, informative, cool, a great learning experience, and fun!" He added: "Students also liked being able to text questions to the presenters; I think more of them participated because they could text."



MEASURING THE RESULTS

The effectiveness of Nepris is not just anecdotal. In 2014, the University of North Texas (UNT) conducted a study to determine what impact the web-based program had on science teaching and learning at the school level. Survey responses were gathered from 58 teachers who had participated in one or more Nepris activities. The teachers, who represented a wide range of schools, answered questions like: “To what extent did the training increase the knowledge and skills of the participants?”, “To what extent did participants find the sessions as a whole valuable?”, and “To what extent did the session support higher levels of cognition for students?”

In posing these queries, UNT found that 86 percent of teachers agreed or strongly agreed that the Nepris sessions improved student learning on specific topics. Seventy-one percent of teachers strongly agreed that the experts who interacted with the students were knowledgeable about the concepts being addressed. Ninety-five percent of instructors said the platform supported their school curriculum, and 91 percent saw true value in the Nepris session.

In addition, teachers agreed or strongly agreed that the Nepris expert was knowledgeable about the concept the teacher asked him or her to address, with 71 percent of the teachers strongly agreeing. Ninety percent of the teachers planned to request another session with an industry expert in the future — a strong indication that teachers see the sessions as valuable for learning. Seventy-four percent of instructors say the program positively impacted their teaching practice, while 83 percent agreed or strongly agreed that the Nepris virtual sessions improved classroom engagement.

When asked to what extent the sessions led to positive trends in student access to and use of technology for learning, 86 percent of teachers said the platform improved their students' learning of the topic. In general, teachers appreciate the valuable resources and services that are provided by the platform, especially the experts who contribute to learning in their classrooms. Not only did the experts contribute to the student knowledge and engagement but many of the teachers also agreed that the sessions had a positive impact on their teaching practices. Teachers judged that student knowledge and skills increased as the result of the sessions, and that the sessions supported their school curriculum.

GIVING STUDENTS THE TOOLS THEY NEED TO SUCCEED

When K-12 students are given the tools they need to connect classroom learning with real-life careers, the results can be downright magical. When one McKinney High School career and technical education (CTE) teacher decided to virtually bring a General Motors (GM) engineer into her classroom to talk about pneumatics, she quickly saw the benefits of her decision. “I can’t take very many field trips with my class, and this seemed like a great opportunity for my students to actually talk to people in the field,” says the CTE teacher.

The engineer showed the class how pneumatics are used to assemble cars and trucks, giving students live examples of such applications and showing them supply lines and industry components. “During the session, I learned how manufacturers change designs to suit new cars,” says one student. “I found the engineer to be very real. She answered our questions in very forthcoming ways and was easy to relate to.”

The GM engineer who conducted the session says she’s pleased with the results and with the feedback she received from the class. “I would consider this session a definite success, just from the enthusiasm and the students’ questions,” she said. “If I can even motivate one child to become an engineer in the near future, it means I’ve done my job.”

At Skyview Elementary School in Richardson, Texas, Independent School District (ISD), music teacher Austin Aeschbacher recently used Nepris to connect his students with an engineer, who helped the youngsters create a model of the new Anna and Elsa Frozen Adventure ride for EPCOT in Norway – all from recycled products. Aeschbacher used the platform to expose his students – many of whom live in government-owned apartments and 93 percent of whom receive free and reduced lunch services – to STEM careers. “Many of our students haven’t been outside of the Dallas area,” said Aeschbacher, noting that the school is “exemplary”, based on its student test scores. “The biggest problem our children are facing is poverty.”

Recognizing that his students, in their daily lives, have little to no access to STEM role models, Aeschbacher teaches his students that the power to shape their future comes in good grades in school and an active imagination – a combination that’s supported by his efforts to connect students with STEM professionals via the Nepris platform. “We have to teach our students creativity, and most of them are lacking in enrichment experiences,” said Aeschbacher, whose school recently implemented a program called Enrichment Clusters to provide real-world, project-based learning opportunities that are connected with career and college readiness. “Six years ago, we were the first school in our district to implement this program,” he said, “but now every school in our district uses this model.”

Programs like Nepris also allow girls to see female scientists at work, enabling them, perhaps for the first time, to imagine themselves in such a career. Daryel Sellers, who teaches eighth-grade science at Eagle Mountain-Saginaw ISD near Fort Worth, commented about his recent Nepris experience: "Many of our students had the image of an old man in glasses and a lab coat in their minds when they heard the word 'engineer.' One of my female students remarked after talking with a female engineer from Raytheon, 'I could see myself being an engineer.' Making science and math professions accessible to underrepresented populations like females is a personal goal of mine, and you have helped tremendously." Sellers shared the Nepris session with all the eighth-graders and observed that "the motivation level in class to learn science and math has increased, simply because you are a role model of what they can do as a career for our students."

Science teacher Meghan Hunt said one of her biggest challenges is showing her students — who include a mix of children from a wide variety of ethnic backgrounds — where the STEM opportunities are and what careers are available within those technical fields. "We're trying to do everything we can now, even at the elementary age, to help prepare them for the future," said Hunt, who used the Nepris program recently when teaching a lesson about soil.

"I thought it would be a great idea for my first-grade students to meet a real pedologist (a soil expert)," Hunt recounted. "I wanted the scientist to tell the children about the different types of soil and why soil is so important to us." Hunt signed up with Nepris, which in turn matched and connected her class with Dr. Dirt — a soil expert who participated in a virtual session with her classroom. Students learned about various types of rocks, the origins of those rocks, and the fact that, in some cases, soil actually tastes good. "It was a great experience for my class," said Hunt. "We might have a future pedologist sitting in my classroom right now because of this session."



Nepris is a web-based solution that connects teachers with industry experts to make curriculum topics relevant for students every day. We help educators expose students to different career and education paths, find real world applications to what students are learning, and inspire them to choose a STEM pathway. Nepris is designed to remove the logistical tasks for both companies and educators in setting up a meeting between the two, breaking down geographic barriers by providing a virtual connection, enabling companies to scale their outreach efforts beyond face-to-face meetings, and allowing educators to impact all students at the curriculum level, where they need it most.

For more information about how Nepris can match the right STEM professionals to students in your schools,

nepris@nepris.com

Twitter: [@neprisapp](https://twitter.com/neprisapp)

<http://www.nepris.com>

1-855-472-2567

THE IMPORTANCE OF REACHING GIRLS AND UNDERSERVED STUDENTS

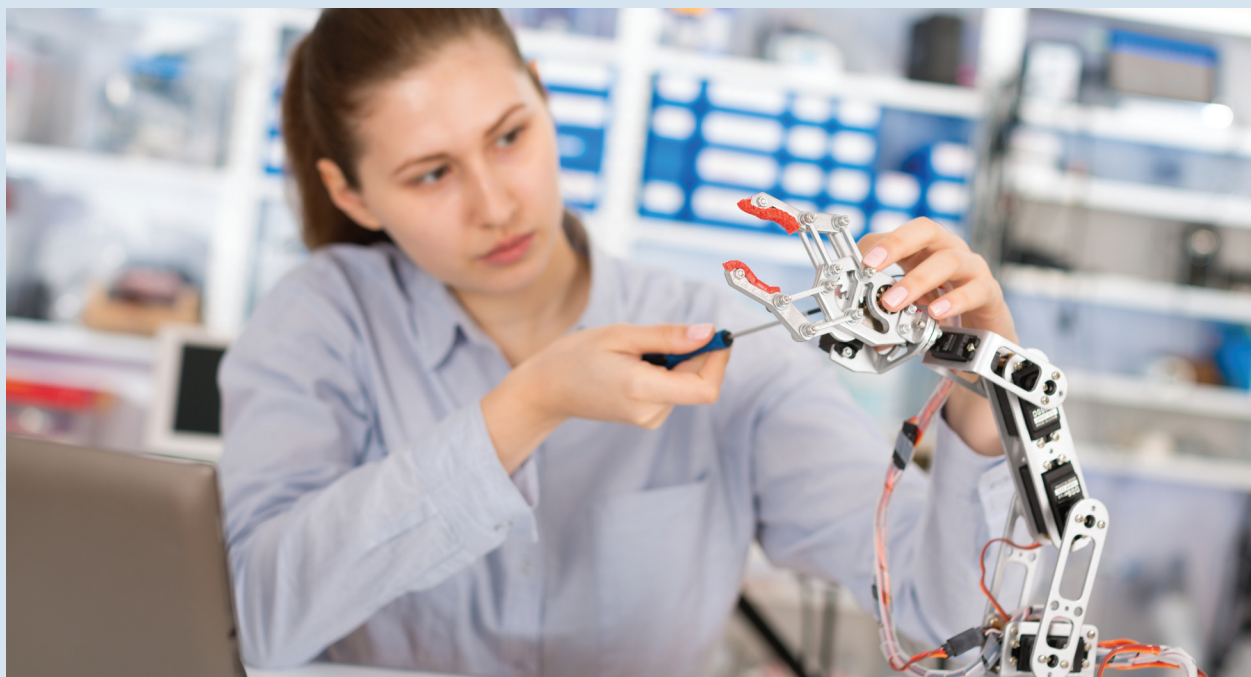
Data confirm that a subset of our student population needs special attention and access if we are to grow a next generation of STEM-career professionals.

By Julie Evans, CEO, Project Tomorrow

Girls, in particular, and underserved students, in general, need special care and attention if they are going to be drawn into STEM-related careers. That's what the data from Project Tomorrow's® Speak Up 2013 National Research Project* demonstrates.

In fall 2013, 180,838 students in grades 6-12 representing schools in all 50 states and the District of Columbia completed an online Speak Up survey at the direction of their school or district. The national data here has been analyzed through a variety of different lenses and was tested for statistical significance.

The picture that emerges from this data shows us that girls' interest in STEM and STEM-related topics lags far behind their boy counterparts; that underserved students actually have interest equal to that of other students, but not necessarily the access to information and inspiration about such careers; and that reaching all students at a younger age might have a better payoff in terms of cultivating more interest in STEM careers.



General STEM career interests

In terms of a future career in a STEM field, students were polled about their current level of interest. The data are aggregated to indicate the following levels:

- *Not interested* in a STEM career field
- *Somewhat or maybe interested* in a STEM career field
- *Very interested* in a STEM career field

Table 1: What is your current interest in a future STEM career?

	Grades 6-8 Students	Grades 9-12 Students
Not interested	33%	35%
Somewhat/Maybe interested	46%	41%
Very interested	22%	24%

Source: Project Tomorrow

As we can see, the highest percentage of students say that they are “somewhat or maybe interested” in a STEM career field. Too often, programs and initiatives to acquaint students with STEM careers focus on the students who already indicate an interest, in this case the 22 percent of middle school students and the 24 percent of high school students. For activities that require a self-selection process, such as competing in an after-school robotics event, the students most likely to participate are those who already have an interest and are looking to deepen it. The “somewhat/maybe” students (as we call them) are less secure in their STEM knowledge and are often seeking more comfortable and less competitive ways to explore an emerging interest. We believe that greater attention should be paid to the somewhat/maybe students in the pipeline.

It is also interesting that the percentage of middle and high school students who say that they are “very interested” in a STEM career has had changed very little in the several years of polling students on this topic, as noted in Table 2.

Table 2: How has the percentage of high school students interested in a STEM career changed since 2007?

	2013	2012	2011	2010	2009	2008	2007
Very interested	24%	23%	23%	23%	23%	21%	21%

Source: Project Tomorrow

Given the tremendous national interest in STEM and STEM-career awareness during the past seven years, an increase of three percentage points is a disappointing return on those investments.

So, what could be the underlying reason for this lack of increase in students' STEM career interests?

One explanation may be to look at the various subsets of the data such as by gender, type of community (urban, rural, and suburban), and high home-poverty rates (indicated by the school's Title 1 status) to understand a specific cohort's interest levels.

Gender differences

First, it is important to recognize that girls are still less likely than boys to view their technology skills as advanced. This difference is important to the discussion on STEM career awareness and recruitment, as it supports the idea that girls have less self-confidence in their abilities with technology, an important component within many STEM fields.

Table 3: How would you rate your technology skills compared to your peers?

	Girls – Grades 6-8	Boys – Grades 6-8
Advanced	18%	30%
Average	77%	64%
Beginner	5%	6%

Source: Project Tomorrow

Girls are also less likely to say that they are “very interested” in a STEM career and more likely to say that they are “not interested.”

Table 4: What is your current interest in a future STEM career?

	Grades 6-8 Students		Grades 9-12 Students	
	Girls	Boys	Girls	Boys
Not interested	39%	26%	41%	28%
Somewhat/Maybe interested	46%	46%	40%	43%
Very interested	15%	28%	19%	29%

Source: Project Tomorrow

The gender differences in girls' and boys' interest in STEM careers also play out in terms of how they want to explore and learn about these careers. According to the Speak Up data, girls are more interested than boys in STEM career-awareness experiences that have a humanistic component and involve a social learning environment. Girls also have a greater interest than do boys in understanding their strengths and weaknesses with regard to STEM fields, supporting the previously shared data about their lack of self-confidence in technology.

Table 5: How do you want to learn about or explore STEM career fields?

Activities to support STEM career awareness/interest	Girls – Grades 6-12 % who indicate interest in activity	Boys – Grades 6-12 % who indicate interest in activity
Take field trips to companies to meet with career professionals	53%	43%
Play an online or video game to learn about a STEM career	25%	29%
Take a self-assessment test to learn about personal fit for STEM fields	33%	25%
Have a par-time job or summer internship in a STEM field	32%	23%
Work with career mentors to learn about potential STEM fields	29%	21%

Source: Project Tomorrow

Community differences

The difference in interest levels among students from different types of communities is surprisingly little. There is, for example, just a four percentage-point difference between suburban high school students and Title 1 school students who are "very interested" in STEM careers (compared with a 10 percentage-point difference between high school boys and girls).

Table 6: What is your current interest in a future STEM career?

	All Gr 9-12 Students	Gr 9-12 Students – Urban	Gr 9-12 Students – Rural	Gr 9-12 Students – Suburban	Gr 9-12 Students – Title 1 Schools
Not interested	35%	34%	36%	35%	35%
Somewhat/Maybe	41%	42%	42%	40%	43%
Very interested	24%	24%	22%	25%	21%

Source: Project Tomorrow

What these figures suggest is that stereotypes about the STEM interest of minority, poor, or otherwise underserved students are not necessary based in reality. Underserved students have the same interest in STEM as a career as their more advantaged peers, but by and large their access to information about these careers and their exposure to career professionals lags far behind other students. As we have learned from our STEM career awareness programs with disadvantaged youth, students have a strong desire to have more advanced math and science classes at their school and gain real-world level exposure to STEM careers through in-school and out-of-school programming. Programs like Nepris, which bring STEM professionals into the classroom, can make a tremendous difference in helping these students see what these careers look like in the flesh, bringing the possibility of such a pathway from the abstract to the concrete.

Get them while they are young[er]

Finally, we can infer across the data that a higher percentage of students in middle school indicate a level of “somewhat or maybe” interest in STEM compared to their high school counterparts. This finding tells us that there is a need for more attention to be paid in the middle school years on nurturing that emerging interest level, especially for girls and for students in underserved areas.

This country has put a tremendous effort into attracting students to study and careers in STEM. Our data tell us that there is still much work to be done. Concentrating on middle school students when their potential interest is highest, addressing the girl-boy confidence gap, and providing more and better opportunities for underserved students to see what a STEM career looks like - all of these efforts will go a long way toward building our next generation of STEM professionals.

** Speak Up 2014 data is available starting February 2015. For more information, visit tomorrow.org.*

eSCHOOL NEWS

This white paper was produced by eSchool News, the #1 direct-requested print and digital publication in the education technology industry today. We are a top marketing solutions company, and throughout our 25-year history we have created the most comprehensive portfolio of products and services in the industry. We offer access to the broadest reach and deepest range of K-12 education technology professionals and key decision-makers.

Every day, our editorial, sales, and marketing professionals share their content expertise to help our customers grow their businesses. We leverage the immediacy of online, the networking of face-to-face opportunities, the expert interaction of web seminars, and the breadth and depth of print to create compelling, focused media that delivers measurable results.

<http://www.eschoolnews.com>