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Survey: Educators aren't discussing STEM careers with students

Students say content is interesting, but teachers don't promote career options
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Teachers say they don't have the time or the resources to discuss STEM career options with their students.

In a recent survey, a majority of students said that while their science and math teachers seem knowledgeable and keep class interesting, they aren't teaching about science, technology, engineering, and math (STEM) career options. High school students also said they don't believe STEM knowledge is integral to getting a good job, which doesn't bode well for leaders counting on STEM education to keep the nation at the forefront of the global economy.

Spurred by the Obama administration's "Educate to Innovate" campaign—a **nationwide effort** by U.S. companies, foundations, government agencies, and nonprofit organizations to help move America to the top of the pack in math and science education—the American Society for Quality (ASQ) commissioned market research firm Harris Interactive to conduct an online survey to uncover how well teachers transfer their knowledge and passion for science and math to their students and inspire them to pursue STEM careers.

The survey, conducted in December, asked more than a thousand students in grades 3-12 to provide a scaled report card (with grades ranging from A-F) on their science teachers' classroom skills and activities.

Although 85 percent of students said their teachers deserve at least a "B" when it comes to knowledge about science topics (55 percent of students gave their teachers an "A"), 63 percent of high school students said their teachers are not doing a good job of talking to them about engineering careers ("C" or lower), and 42 percent of high school students said their teachers don't ably demonstrate how science can be used in a career ("C" or lower).

Also, students in grades 7-12 are less likely than third through sixth graders to believe a person needs to be skilled science and math to get a good paying job (66 percent vs. 80 percent).

“We believe that as students get older and begin to diversify their studies and become more aware of the wide range of available career opportunities, they start to think that math and science aren’t necessarily critical to their job hunt,” said Maurice Ghysels, chair of ASQ’s Education Advisory Council.

“In some cases, a contributing factor is that some teachers aren’t doing all they can to connect the dots between the math [and] science work that students are doing on a daily basis and how it relates to the real world and their future careers.”

Why the disconnect?

Teachers who make math and science interesting but fail to discuss STEM career options might feel limited by the time constraints placed on them.

“Good teachers in many cases are doing their best to cover a wide range of topics and required curriculum in science classes, but because of time and budget constraints, career discussions are often left out,” said Ghysels. “So, any support that teachers can receive from parents and local community members [in terms of] volunteer career speakers and programs is really valued.”

One former math teacher said teachers often don’t have time to discuss STEM career options because they’re too busy having to teach to high-stakes tests.

“A teacher’s primary responsibility is instruction that will provide all students with the math skills necessary to demonstrate proficiency on state-mandated assessments or exit exams,” said Judy Brown, math program manager for Sylvan Learning.

“Unfortunately, many high school students come into classes without essential prerequisite skills. This is particularly difficult in the math classroom, because higher-level skills are built on a foundation of basic skills. Finding additional time to incorporate STEM careers into high school math classrooms may not become a priority until state-mandated assessments include items assessing this topic.”

Other teachers agreed.

“I have discussed possible STEM careers with my students, but this is usually done one-on-one before or after school,” said Donald Worcester, mathematics instructor and curriculum leader at Winter Park High School in Florida.

“Very seldom do I discuss STEM careers, or any careers, during the class period. The problem is time. There is already a limited amount of time in the school year to cover the mathematical content that needs to be covered, and reducing this time [to cover] ‘extra’ content is difficult to do.”

Another challenge is that teachers themselves might not know about the many STEM career options that are available.

“I’m not sure teachers are aware of the number of opportunities that are open to students,” said Crystel Bloemen, a Colorado junior high teacher and Coalition for Space Exploration board member.

When students think of science careers, Bloemen said, they typically think of the medical field, biology, or engineering—and the average science teacher doesn’t always know about the vast variety of STEM career opportunities.

“Many teachers who teach science enjoy their content and kids and have found teaching to be the best way to marry their two loves; therefore, they haven’t looked beyond their field to see the opportunities awaiting their students,” she said. “Also, engineering is considered for the very gifted of math students and is not encouraged for the ‘average high-achieving’ student.”

Audrey Ettinger, associate professor of biology at Cedar Crest College in Allentown, Pa., said many students interested in science arrive at college thinking that medical school is the best career option.

“I suspect that both high school teachers and the families of these students see medicine as a high-prestige, high-earning potential career track, and suggest this option to bright students. However, medicine is only one option available to these students, and [it] involves a wide skill and interest set that only partially overlaps with an interest in science,” she explained.

“Even within the health professions, there are many options besides the traditional MD track that can be better matches for a student’s interests and abilities.”

Ettinger said teachers also are trained primarily as educators, and not as scientists.

“Their undergraduate majors in science may include a research experience, but they are unlikely to have conducted research at the graduate level,” she said. “While they have an excellent understanding of their fields and how to teach them, they are less likely to have personal experience with working in academic or industrial research labs. Many high school teachers, then, simply don’t have a strong understanding of the many laboratory based and non-laboratory based careers that scientists can choose, and then they can’t pass them on to their students.”

Also, schools and teachers might not have enough resources at their disposal to interest students in STEM careers.

Rose Lounsbury, a science teacher at the Charter School of Wilmington, Del., said the challenge of exposing students in an inspiring way to STEM careers comes from a lack of resources, such as high-quality lab equipment and skills development projects.

“It is really hard to simply tell kids about careers, so even bringing in guest lecturers is not enough,” said Lounsbury. “Visiting sites, working with equipment, thinking through science projects, or seeing others doing these things is what makes it all click. I wish I could do more of ... this for kids—that’s what inspires me.”

“Gumdrop and toothpick towers are fun to build, but I’m not sure they have a significant impact on inspiring a student to pursue a career in engineering,” said Michele Perrin, a math and engineering instructor at Marian Middle School in Missouri. “The hardest part for me is obtaining enough materials to keep the class truly hands-on.”

How to improve

While time constraints, budget concerns, and lack of career knowledge are challenges, there are still ways to interest students in STEM careers.

“My students come in wanting to be doctors, or another health professional. Other than that, they know that they could work in a lab, or become an academic. None of them would ever think of becoming a science journalist, or a patent lawyer, or a quality control specialist at a brewery, just to name a few,” said Nathan C. Ackroyd, a second-year organic chemistry teacher at Mount Royal University in Alberta, Canada. “I think that the best way to get people interested in STEM careers is to discuss options when topics in science that are related to those careers come up.”

Another way is to start early.

“Our experience has shown that if you’re waiting until high school to talk about any career, STEM or otherwise, you’re too late,” said David Jones, an engineer and co-founder of Edamar Inc., a hands-on science education company that makes the [KitBook](#).

“Kids start forming ideas in their minds, consciously or sub-consciously, about what they’re good at or not good at by around fourth or fifth grade. By middle school, they’re already on a path.”

Jones said that in Europe, companies like Siemens enter schools and become involved with students beginning at the kindergarten level.

“Science is something you do, not just read about. Elementary students, not just high school students, need more hands-on lab activities,” he said. “Even if a student is not inclined to become an engineer or scientist, we are all living in an increasingly technology-driven world. It is important for everyone to have a basic understanding of the devices and technologies that are going to be a huge part of their lives.”

Incorporating more hands-on labs, as well as including real-world examples of STEM applications, is another logical way to get students interested in STEM careers.

Casey O'Hara, a physics, engineering, and green technology teacher at Carlmont High School in California and a **Knowles Science Teaching Foundation** fellow, recently spent a month at the South Pole participating in a polar research expedition to study neutrinos. While there, O'Hara communicated with his students via web chats and blogs, bringing scientific field research to life. He also incorporated his experience into his curriculum.

“By discussing real-life examples of STEM, it opens up conversation to STEM careers,” O'Hara said.

Greg Livadas, a spokesman for the National Technical Institute for the Deaf, a college of Rochester Institute of Technology, said his school offers summer programs to help high school students with hearing loss find their interest.

“They get to do a variety of hands-on activities, including building remote-controlled cars out of Legos, dissecting a cow's eyeball, doing CSI activities in a lab, writing a business plan, et cetera,” said Livadas. “Our **'Explore Your Future' program** is a week-long camp for high schoolers to help them figure out if college is right for them, and to offer suggestions on the type of careers that may interest them. We also have a week-long summer program focused on girls, called **TechGirlz**. We want more girls to enter technological fields, and this year we're seeing just as many girls as boys enrolled for the first time. TechGirlz offers girls hands-on activities, including building their own computers which they can take home.”

To help teachers learn more about what STEM career opportunities exist for students, as well as give educators a first-hand taste of a real STEM career, colleges and programs around the country are offering state-of-the-art professional development.

STEM fields are emphasized in the **Texas Essential Knowledge and Skills standards**, and Texas classroom teachers are expected to gear their instruction to vertically-aligned standards addressing college and career readiness for their students.

Indiana is also preparing student for STEM careers through the **I-STEM Resource Network**, a state-wide network linking 19 higher-education institutions, life science partners, and stakeholders to ensure the state has enough STEM career graduates.

“We have over 40,000 Hoosiers employed in the STEM-related workforce, and by 2016 many of those positions will be vacated with \$60,000-plus [salary] price tags,” said Teresa Morris, director of communications for I-STEM. “To make sure we don't go stagnant, we include the businesses that will be required to fill their shortcomings and engage education and community stakeholders to take ownership in the process.”

BioCrossroads is one of those partners. This month **BioCrossroads, Eli Lilly and Company**, I-STEM Resource Network, and the **Indiana Department of Education** (IDOE) hosted a science summit for education, business, and community stakeholders. The summit was the kick-off to the “Year of Science 2010” adopted by the IDOE and an opportunity to introduce an inquiry-based science pilot program to be launched next fall.

Parent support is key

One of the most obvious and effective ways to help motivate students to pursue STEM careers is by encouraging parental support.

In a separate ASQ member survey, professional engineers noted that parents were the major influence in their decision to pursue a career in the field, with teachers placing a close second.

“We have two daughters in a great middle school in [Indiana's] Cherry Creek School District,” said Sherry Knecht. “Both daughters are honors students with a strong interest in science, and my eighth grader has already been able to take courses in genetics and other areas of interest. Our seventh grader has sprinted forward in math. Our girls have the advantage of support at home—we have supplied them with bacteria testing kits, chemistry sets, electronic components, and other equipment. But I also think that the focus on college and careers by school personnel makes a big difference in the expectations that the kids have of themselves.”

What it all comes down to, said Travis Hartberger, a biology teacher and Advanced Placement chemistry chair in the Science Department at Washington, D.C.’s McKinley Technology High School, is understanding how STEM education fits into each individual school’s community.

“The truth is there are several models across the country,” he said. “While there are some parallels, interestingly, I think the approach has to fit the needs of your community, the larger goal for that community, as well as ample and appropriate learning styles to progressively improve student learning toward those goals.”