

How Educators and Employers Can Align Efforts to Fill Middle-Skills STEM Jobs

As the demand for workers with science, technology, engineering, and mathematics (STEM) skills grows ever higher, employers face stiff competition for qualified employees—and with retirements, the pool of employees grows ever smaller. Meanwhile, U.S. education and workforce systems could be failing to keep pace with the needs of the STEM economy, leaving talented people out of the running for STEM jobs because they lack the proper training or credentials.

How can educators help employers fill STEM positions in the near and long terms? RAND Corporation researchers examined the fast-growing oil and natural gas field in three states to understand how educators and employers are working together to meet demand for workers in STEM fields, as well as how both can improve collaboration. The study focused on well-paying “middle-skills” jobs, which require specialized education beyond high school but not a four-year college degree. The research team conducted surveys and held interviews with employers, STEM field college department heads, and instructors from four- and two-year colleges.

The study resulted in a deeper understanding of the challenges preventing full collaboration between educators and employers seeking to build a strong middle-skills STEM workforce, as well as ways in which employers, colleges, and instructors can overcome these challenges.





What Employers Want and What Colleges Offer in the Tri-State Region

Once thought of as “coal country” and “steel country,” the tri-state region of Ohio, Pennsylvania, and West Virginia contains the Utica and Marcellus shale plays, two of the nation’s largest natural gas reserves. Since 2011, the combination of horizontal drilling and hydraulic fracturing has boosted the oil and natural gas industries in the region. However, employers are struggling to find skilled workers who can contribute to company and regional growth and success.

To find which skills employers want and whether and how educators teach these skills, in 2016 and 2017, researchers conducted surveys with 67 employers, 87 four- and two-year college department heads, and 81 instructors; in addition, they interviewed 20 employers.

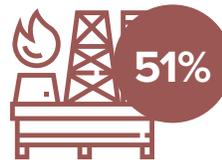


Employers value soft skills but still prioritize traditional academic knowledge.

Employers noted the importance of employee agility and well-roundedness, time management, problem-solving skills, and sound decisionmaking. Negotiation and social perceptiveness were also seen as very important. However, employers still valued traditional academic knowledge, such as writing, speaking, and management of personnel and resources.



Most regional college programs do not incorporate all the training and skills that middle-skills STEM jobs require. Analysis revealed disconnects between which skills employers want for high-priority middle-skills jobs and which skills education programs emphasize. For example, 51 percent of employers sought workers with time-management skills, but only 6 percent of colleges in the study focused on this skill as part of their oil and natural gas degree programs. In addition, instructors tended to emphasize *operational* skills (e.g., operation and control, equipment selection, technology design) and *content* (e.g., troubleshooting, learning strategies) that were less important to employers. Similarly, very few local colleges were set up to incorporate work-based learning, such as on-site experiences, into their classes, although students could obtain skills and knowledge through such on-the-job training opportunities as internships or cooperatives. College programming also tended to be relatively inflexible, not providing students (and eventually employees) with the versatility needed to move in and out of the middle-skills STEM labor market.



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6%





Instructors who directly partnered with employers designed more appropriate courses. Colleges and employers in the tri-state region wanted to forge deep partnerships but lacked the time and knowledge to do so. Instructors who partnered with industry tended to emphasize the skills that employers wanted more than instructors without active partnerships did. Instructors emphasized *cognitive* skills, such as critical thinking, active listening, and applying new learning, in many or all of their classes; about two-thirds of courses emphasized complex problem-solving, judgement, decisionmaking, and troubleshooting. *Safety* is a critical component of almost all jobs and tasks in technical fields, including the oil and gas industry, and was therefore reinforced in each course. It may be that instructors recognized the need for students to master specific areas as they collaborated with their industry peers, although the results of this study do not point to a direct correlation. Nevertheless, the successful associations noted in the study support the notion that more collaboration with industry is associated with industry-aligned coursework.

What Technical Education Institutions Can Do



Adjust programming to prepare agile workers who can fill positions as needed. Analyses revealed that the STEM middle-skills workforce development system in the tri-state region does not provide workers with the skills they need to enjoy versatile careers. Colleges can consider incorporating stackable credentialing models into traditional associate's or bachelor's degree programs. These models allow students to easily progress from a short-term certificate to a bachelor's degree and beyond as they grow in their careers.



Prioritize work-based learning opportunities. Internships or cooperatives allow students to gain hands-on experience at a worksite, yet few colleges in the study provided these opportunities. Colleges can also provide hands-on learning through implementing *contextualized instruction*, which teaches basic academic skills through occupational application. However, fewer than half of the education programs and colleges included in the study used contextualized instruction.

What Individual Instructors Can Do



Continue to emphasize cognitive skills, safety, and soft skills. The relatively strong emphasis on cognitive skills, safety, and soft skills matches employers' requirements and helps future employees succeed in their chosen careers.



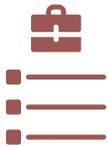
Incorporate interpersonal and management skills in courses. More employers sought nontechnical interpersonal and management skills compared with the number of instructors who emphasized these skills in their courses. These skills are in high demand, but instructors may undervalue them in their lessons.



KEY FINDINGS

- Middle-skills STEM workers with at least some education beyond high school are in demand in the oil and natural gas industry, as well as in other technologically innovative fields.
- Employees who have some work-related experience; critical thinking, problem-solving, and people skills; and a basic understanding of administration and management are highly sought by employers.
- Educators and employers can take steps to partner more closely to offer hands-on learning experiences, provide insights from industry, and share resources.

What Employers Can Do



Shape the curriculum. Schools need to know which jobs are currently in demand and which are likely to be in demand in the future. However, more than half of the surveyed employers reported that they did not communicate the results of their workforce planning with colleges. Of those that did, 17 identified and forwarded job vacancies to local education providers, and 15 provided key information on job needs and future occupational demands.

 **>50%**
of employers did not communicate the results of their workforce planning with colleges.



Share expertise. Forty-two of the 67 employers participating in the study reported that they did not offer any instructional support to colleges. Industry professionals can advise department heads and instructors on how to include job-related interpersonal and management skills in coursework. They can also provide on-the-job contextual learning experiences and equipment for students to engage in hands-on learning.

 **63%**
of employers did not offer any instructional support to colleges.



Get in the classroom. Industry professionals can enrich the classroom, helping students to transfer classroom learning to real-world applications. Professional expertise can cultivate students' perceptions of industry and particular careers and motivate those already in the field to continue to seek education. Employers may wish to offer incentives to employees who are interested in teaching at local colleges.



Donate resources. Most employers participating in the study did not provide any material support to colleges for workforce development. Of those that did provide support, only six offered scholarships or provided supplies and materials for hands-on training. Employers can help foster the next generation of workers through scholarship funds, offering cash support to low-income students, donating equipment, and lending laboratory space for realistic training.

Middle-skills jobs are as critical to the the oil and natural gas industry as they are to energy, construction, computer technology, health care, and other technologically innovative sectors. These sectors require a workforce that is agile and technically astute and that has strong interpersonal and management skills. Baby-boomer retirements and sector growth are likely to further shrink the supply of such workers relative to the demand for them. Without strong educator and industry collaboration, employers could continue to face difficulty, and many potential employees could be shut out of these potentially well-paying jobs. Rebuilding the education-to-work pipeline will help cultivate the skills necessary to support the future of the United States and its people.

This research was supported by a grant from the National Science Foundation (NSF #1535322).

This brief describes work done in RAND Education and Labor and documented in *Developing a Skilled Workforce for the Oil and Natural Gas Industry: An Analysis of Employers and Colleges in Ohio, Pennsylvania, and West Virginia* by Robert Bozick, Gabriella C. Gonzalez, Cordaye Ogletree, and Diana Gehlhaus Carew, RR-2199-NSF, 2017 (available at www.rand.org/t/RR2199) and *Supporting Middle-Skills STEM Workforce Development: Analysis of Workplace Skills in Demand and Education Institutions' Curricular Offerings in the Oil and Gas Sector* by Gabriella C. Gonzalez, Christopher Joseph Doss, Julia H. Kaufman, and Robert Bozick, RR-2899-NSF, 2019 (available at www.rand.org/t/RR2899). To view this brief online, visit www.rand.org/t/RB10053. The RAND Corporation is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest. RAND's publications do not necessarily reflect the opinions of its research clients and sponsors. RAND® is a registered trademark.

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