



Shaping Tomorrow's Global
Built Environment Today

STEM EDUCATION AND HVAC&R WORKFORCE DEVELOPMENT

THE ISSUE

Commitment to providing a solid education in science, technology, engineering and mathematics (STEM) to develop the future workforce of technicians, engineers, and scientists is critical to our future well-being and standard of living. Students pursuing non-STEM specialties also need basic knowledge of scientific and technological applications for effective participation in the workforce, success in their personal lives, and responsible citizenship.

Moreover, there has been increased growth in jobs related to STEM that have not been filled due to a workforce shortage. The U.S. Bureau of Labor Statistics projects that employment in architecture and engineering occupations is expected to grow faster than other fields. The workforce shortage has driven salaries in architecture and engineering occupations such that the 2024 median annual wage was \$97,310 compared to \$49,500 across all occupations.¹ Additionally, about 195,000 openings for construction employment are projected each year on average over the next decade.²

The HVAC&R workforce in North America remains a male-dominated employment sector; the share of female workers in engineering and architecture is 14%³ and 5.9% of HVAC&R Technicians.⁴ Additionally, under-represented minority students receive only 24% of the degrees associated with the building and HVAC&R engineering sectors.⁵

ASHRAE's ROLE

As practitioners and educators in various STEM careers, ASHRAE strongly promotes active engagement by members in their local communities and national programs with mentoring and educational opportunities in STEM fields. ASHRAE is actively engaged in the Solar Decathlon, National Engineers Week, and other STEM education efforts worldwide, including through its 440 active student branches.

ASHRAE is also a member of the National STEM Education Coalition, which supports new and innovative initiatives that help improve the content, knowledge, skills, and professional development of the K-12 STEM teacher workforce and informal educators. ASHRAE is dedicated to ensuring quality STEM programs for teachers and students all around the world by encouraging its members to get involved with their local school systems.

ASHRAE's Board of Directors has committed to promoting diversity and inclusion in all levels of the society. This includes efforts to promote STEM education and training to children, schools, and educators, in a way that will attract, train, and retain more women, disabled, LGBTQ, and people of all socioeconomic and ethnic backgrounds to engineering education and employment.

¹ U.S. Bureau of Labor Statistics. 2024. Occupational Outlook Handbook: Architecture and Engineering Occupations.

² U.S. Bureau of Labor Statistics. 2024. Occupational Outlook Handbook: Architecture and Engineering Occupations.

³ U.S. Bureau of Labor Statistics. 2017. Women in architecture and engineering occupation in 2016.

⁴ Zippia, 2022. Heating and Cooling Technician Demographics and Statistics in the US. <https://www.zippia.com/heating-and-cooling-technician-jobs/demographics/>.

⁵ U.S. National Science Foundation, 2024. Women, Minorities, and Persons with Disabilities in Science and Engineering. <https://nces.nsf.gov/pubs/nsf21321/report/field-of-degree-minorities>

ASHRAE also supports strengthening the broader HVAC&R workforce, including technicians who install and maintain HVAC&R equipment as well as distributors, contractors, and facility operators and managers. The HVAC&R and buildings industry has been facing a serious shortage of skilled trade employees for several years and has more recently been exacerbated by the overall shortage of U.S. workers. Unfortunately, there is a broadening skills gap as well due to several factors, including: the retirement of the baby boomers, advancements in technology that require new skills, increased job competition in the global marketplace, failure to cultivate and retain skilled talent, a societal focus only on four-year degree programs to the exclusion of technical and technological education, and a lack of emphasis on the necessary skill sets for advanced manufacturing. Of these, the last two are the most critical to ensuring innovative, high-efficiency products can be manufactured and installed properly. Community colleges, training programs, internships, apprenticeships and certification programs can strengthen the pipeline for the HVAC&R workforce.

ASHRAE's VIEW

Future generations need to possess the skills and critical competencies necessary to be successful in a highly competitive, global, and technologically sophisticated economy. We must work cooperatively to ensure that students receive the STEM training essential for future success. ASHRAE encourages policymakers to implement the following recommendations:

- Increase government-funded research to improve teaching and learning of STEM concepts and critical thinking skills.
- Recruit, train, and retain qualified STEM teachers through the development of programs recognizing educators who excel in STEM education and incentives that encourage the best and brightest scientists, engineers, technologists, and technicians to act as role models and teachers to pave the way for future generations.
- Foster partnerships among educational institutions, industry and non-profit organizations and their members to introduce students of all backgrounds to STEM career opportunities, including those careers that do not require a university degree.
- Support and encourage students who choose to enroll in community college, or other career and technical education programs, that prepare and qualify individuals for careers as HVAC&R technologists, technicians, facility operators, and buildings managers by providing these students with affordable tuition options.
- Create opportunities and incentives for women and those of diverse backgrounds to pursue STEM coursework and careers and to stay in them.
- Encourage diversity in STEM education and the HVAC&R workforce.